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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371		Attorney Docket No. US76497
		U.S. Application No. (if known, see 37 CFR 1.5)
International Application No. PCT/CN2017/096794	International Filing Date 2017-08-10	Priority Date Claimed 2016-08-11
Title of Invention INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
First Named Inventor ZHANG, Chongming		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information. 1. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received. 2. ☐ A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)). 3. An English language translation of the International Application (35 U.S.C. 371(c)(2)) a. ☒ is attached hereto. b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4). 4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) a. ☐ is attached. b. ☐ was previously filed in the international phase under PCT Rule 4.17(iv). Items 5 to 8 below concern amendments made in the international phase. <u>PCT Article 19 and 34 amendments</u> 5. ☐ Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)). 6. ☐ English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)). 7. ☐ English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)). <u>Cancellation of amendments made in the international phase</u> 8a. ☐ Do not enter the amendment made in the international phase under PCT Article 19. 8b. ☐ Do not enter the amendment made in the international phase under PCT Article 34. NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s). The following items 9 to 17 concern a document(s) or information included. 9. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 10. ☒ A preliminary amendment. 11. ☒ An Application Data Sheet under 37 CFR 1.76. 12. ☐ A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b). 13. ☐ A power of attorney and/or change of address letter. 14. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.3 and 37 CFR 1.821-1.825 (not required if sequence listing in text format was indicated on the PCT Request as part of the International Application and the sequence listing was published as part of the international application). 15. ☐ Assignment papers (cover sheet and document(s)). Name of Assignee: _____ 16. ☐ 37 CFR 3.73(c) Statement (when there is an Assignee). _____		

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U.S. APPLN. No. (if known – see 37 CFR 1.5)		INTERNATIONAL APPLICATION No. PCT/CN2017/096794		ATTORNEY DOCKET No. US76497	
17. ☐ Other items or information:					
The following fees have been submitted.					CALCULATIONS
18. ☒ Basic national fee (37 CFR 1.492(a)) \$300					\$ 300
19. ☒ Examination fee (37 CFR 1.492(c)) - If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... \$0 - All other situations \$760					\$ 760
20. ☒ Search fee (37 CFR 1.492(b)) - If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... \$0 - Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority \$140 - International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB..... \$520 - All other situations \$660					\$ 520
TOTAL OF 18, 19, and 20 =					\$ 1580
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)). Fee for each additional 50 sheets of paper or fraction thereof \$400					
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round up to a whole number)		RATE	
- 100 =	/ 50 =			x \$400	\$
Surcharge for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h))..... \$140					\$
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	- 20 =		x \$100		\$
Independent claims	4 - 3 =	1	x \$460		\$ 460
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$820		\$
Fee for submission of Sequence Listing text file of 300 MB to 800 MB (37 CFR 1.21(o)(1))..... \$1,000					\$
Fee for submission of Sequence Listing text file of more than 800 MB (37 CFR 1.21(o)(2))..... \$10,000					\$
Processing fee for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i))..... \$140 +					\$
TOTAL OF ABOVE CALCULATIONS =					\$ 2040
☐ Applicant asserts small entity status. See 37 CFR 1.27. Fees above are reduced by ½.					
☐ Applicant certifies micro entity status. See 37 CFR 1.29. Fees above are reduced by ¾. Applicant must attach form PTO/SB/15A or B or equivalent.					
TOTAL NATIONAL FEE =					\$ 2040
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31)..... \$50.00 per property +					\$
TOTAL FEES ENCLOSED =					\$ 2040

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

- ☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013, and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE 1: 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.**

NOTE 2: A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

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Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
First Named Inventor/Applicant Name:		Chongming ZHANG		
Filer:		Tung-Yun McNally		
Attorney Docket Number:		US76497		
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
NATIONAL STAGE FEE	1631	1	300	300
NATL STAGE SEARCH FEE - REPORT PROVIDED	1642	1	520	520
NATIONAL STAGE EXAM - ALL OTHER CASES	1633	1	760	760
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	1614	1	460	460
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 (\$)				2040

Electronic Acknowledgement Receipt	
EFS ID:	35100990
Application Number:	16324359
International Application Number:	PCT/CN2017/096794
Confirmation Number:	1032
Title of Invention:	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
First Named Inventor/Applicant Name:	Chongming ZHANG
Customer Number:	145688
Filer:	Tung-Yun McNally
Filer Authorized By:	
Attorney Docket Number:	US76497
Receipt Date:	08-FEB-2019
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Payment was successfully received in RAM	\$2040
RAM confirmation Number	021119INTEFSW00001718505142
Deposit Account	
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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	Specification	16R00986US_16986US_US76497-SPEC.pdf	133431	no	15
			24c2967dc28726b71e2757007e916e2c7afe9312		
Warnings:					
Information:					
2	Claims	16R00986US_16986US_US76497-CLM.pdf	58047	no	7
			0d6c980cf4643cca2d897ceca192b354faef61e9		
Warnings:					
Information:					
3	Abstract	16R00986US_16986US_US76497-ABS.pdf	31762	no	1
			537b3766e48a46ba414895494847ca9b084d3e3c		
Warnings:					
Information:					
4	Drawings-only black and white line drawings	16R00986US_16986US_US76497-DRW.pdf	128768	no	4
			df0f9afec4b4defc78f80881d76c3af21a8bb283		
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Form (SB08)	16R00986US_16986US_US76497-IDS.pdf	1035445	no	4
			d1f2aa2962fe8a0c35457ee99ea277d29f5b8120		
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6	Other Reference-Patent/App/Search documents	16R00986US_16986US_US76497-OT1.pdf	1943942	no	16
			3c331023616aac6a09750a07fe06d5df6df633d8		
Warnings:					
Information:					
7	Non Patent Literature	16R00986US_16986US_US76497-NPL1.pdf	1387087	no	140
			79bc6ccb8dd99f35d757b7936ca51813f9d8851		
Warnings:					
Information:					
8	Non Patent Literature	16R00986US_16986US_US76497-NPL2.pdf	97051	no	8
			e1df08d27e7c1cfa3f0d0b24be2b3942fc83aa34		
Warnings:					
Information:					
9	Non Patent Literature	16R00986US_16986US_US76497-NPL3.pdf	88563	no	9
			5e1de23f76d796808e10f02970d17a6816d7f6e6		
Warnings:					
Information:					
10	Preliminary Amendment	16R00986US_16986US_US76497-FPA.pdf	30221	no	5
			b2b630507e2effcdda081304dec1a15333d4d992		
Warnings:					
Information:					
11	Application Data Sheet	16R00986US_16986US_US76497-ADS.pdf	1823487	no	9
			a9522798fa4e6c39ba99f2d6e615418ee2b665c		
Warnings:					
Information:					
12	Transmittal of New Application	16R00986US_16986US_US76497-DSA.pdf	250427	no	4
			f0ad16940115802a18b72545e8509ddab7922f59		
Warnings:					
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13	Fee Worksheet (SB06)	fee-info.pdf	36726	no	2
			657bb92f458b2c09fd6febf5accadfb62b1e1c5		
Warnings:					
Information:					
Total Files Size (in bytes):				7044957	
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. <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. <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. <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.					

INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-
CELL MULTICAST SERVICE

Technical Field

5 The present invention relates to the field of wireless communications technology. More specifically, the present invention relates to an information change transmission method and device for a single-cell multicast service.

Background

10 With the rapid growth of mobile communication and great progress of technology, the world will move toward a fully interconnected network society where anyone or anything can acquire information and share data anytime and anywhere. It is estimated that there will be 50 billion interconnected equipment by 2020, of which only about 10 billion may be mobile phones and tablet computers. The rest are not machines
15 communicating with human beings but machines communicating with one another. Therefore, how to design a system to better support the Internet of Everything is a subject needing further and intensive study.

 For better implementation of the Internet of Everything, at the 3GPP RAN #69 plenary meeting held in September 2015, a new work item was proposed in the Third
20 Generation Partnership Project (3GPP) Long Term Evolution Project (LTE) standard (see non-patent document: RP-151621 New Work Item: NarrowBand IoT (NB-IoT), which may be referred to as narrowband Internet of Things (NB-IoT). In the description of this project, NB IoT is configured to be a narrow band system that operates on 180 KHz uplink and downlink, so that terminals in the Internet of Things would meet the
25 requirements such as low power consumption, long standby, cost reduction, wide coverage, and others. The first phase of the NB-IoT system has completed basic function designs, including broadcast notification of system information, point-to-point unicast uplink data transmission, and downlink data reception. Considering multicast requirements for software download, terminal system upgrade, and packet information
30 delivery in the future Internet of Things, it was determined that a new work item was needed to enhance NB-IoT and achieve multicast at the 3GPP RAN#72 plenary meeting held in June 2016 (see non-patent document: RP-161324 New work item proposal: Enhancements of NB-IoT). It was clearly pointed out that multicast transmission in the NB-IoT system is to be implemented on the basis of the features of the existing version
35 13 LTE SC-PTM.

 In an existing LTE system, SC-PTM (single-cell point-to-multipoint) refers to multicast transmission of a multimedia broadcast service performed within a single cell. The feature introduces two logical channels: an SC-MCCH and an SC-MTCH, which are

16R00986/US

multiplexed on a DL-SCH transmission layer channel. The SC-MCCH (Single-Cell Multicast Control Channel) is a control channel, and information carried on the channel includes a multicast service type broadcasted in a current cell, and scheduling and receiving configurations of the service channel SC-MTCH on which the multicast service is provided; the SC-MTCH (Single-Cell Multicast Traffic Channel) is a service channel carrying specific service content.

5 A terminal interested in a multicast service first acquires scheduling and configuration of an SC-MCCH channel through the broadcast content on a system information block SIB20, and then acquires information carried on the control channel. If the service the terminal is interested in exists in a current cell, the terminal establishes, according to scheduling and reception configuration of an SC-MTCH corresponding to the service and carried on the SC-MCCH, a corresponding radio bearer S-MRB (Single Cell Multimedia Broadcast Multicast Service Point to Multipoint Radio Bearer), including configuring an RLC (Radio Link Control) layer, a MAC (Media Access Control) layer, and a physical layer; then, the terminal starts receiving service information.

At the same time, the terminal further needs to periodically monitor whether information on the SC-MCCH channel changes, so as to obtain updated information on the SC-MCCH channel in time. A change notification only occurs during a change period. In a change period, a network repeatedly broadcast the same SC-MCCH information. Once a new service starts or ends, corresponding SC-MCCH information needs to be changed; and the network will broadcast both a change indication and information indicating new information of SC-MCCH information transmission in a next change period. When the next change period arrives, the network transmits downlink control information on a physical downlink control channel (PDCCH), and the PDCCH is scrambled by using an SC-N-RNTI. The DCI carried in the PDCCH includes 8-bit information, in which the last bit is set to '1' to indicate that information on the SC-MCCH is changed. After receiving the indication, a user needs to acquire, in the same subframe, the PDCCH that schedules an SC-MCCH transmission. The PDCCH is scrambled by using the SC-RNTI, where the DCI indicates information about the SC-MCCH transmission. The user may receive the changed SC-MCCH information on a corresponding time-frequency resource according to the information.

However, in the NB-IoT system, in order to reduce costs, the system based on a narrowband design does not support transmitting a change indication and scheduling a new SC-MCCH information transmission in the same subframe. Therefore, when the SC-PTM feature is introduced for the NB-IoT system, a new change notification mechanism is needed for the NB-IoT system.

In addition, the existing SC-PTM only uses one bit to indicate an SC-MCCH information change; nevertheless, the SC-MCCH information change is usually caused by one or several service information changes. At the same time, because indicated information is limited, all terminals receive SC-MCCH information when receiving the change indication. If service information of interest to the terminals is not changed, such reception causes additional power consumption for these terminals. Considering the design purpose of NB-IoT, one should try to avoid unnecessary power consumption as much as possible.

Summary of Invention

In order to resolve the above technical problems, the present application provides an information change transmission method and device related to a single-cell multicast service.

Specifically, according to an aspect of the present invention, a method executed by user equipment (UE) is provided, comprising: receiving downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH); receiving an information change notification for a single-cell multicast control channel (SC-MCCH) according to the information on the second NPDCCH; and receiving SC-MCCH information according to an indication of DCI on a first NPDCCH. The SC-MCCH information change notification is comprised in the DCI carried in the second NPDCCH or a message indicated by the DCI carried in the second NPDCCH.

According to another aspect of the present invention, a method executed by user equipment (UE) is provided, comprising: receiving a narrow-band physical downlink control channel (NPDCCH); and when an information change notification for a single-cell multicast control channel (SC-MCCH) is received in a field of a downlink control information (DCI) on the NPDCCH, receiving SC-MCCH information according to an indication of the same DCI.

According to another aspect of the present invention, user equipment (UE) is provided, comprising: a first receiving unit, configured to receive downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH); a monitoring unit, configured to receive an information change notification for a single-cell multicast control channel (SC-MCCH) according to the information on the second NPDCCH; and a second receiving unit, configured to receive SC-MCCH information according to an indication of DCI on a first NPDCCH. The SC-MCCH information change notification is comprised in the DCI carried in the second NPDCCH or a message indicated by the DCI carried in the second NPDCCH.

According to another aspect of the present invention, user equipment (UE) is provided, comprising: a first receiving unit, configured to receive a narrow-band physical

16R00986/US

downlink control channel (NPDCCH); and a second receiving unit, configured to receive, when an information change notification for a single-cell multicast control channel (SC-MCCH) is received in downlink control information (DCI) on the NPDCCH, SC-MCCH information according to an indication of the DCI.

5 According to another aspect of the present invention, a method executed by a base station is provided, comprising: transmitting downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH), wherein the DCI or a message indicated by the DCI comprises an information change notification for a single-cell multicast control channel (SC-MCCH); and transmitting DCI on a first NPDCCH
10 indicate transmission of SC-MCCH information, and transmitting the SC-MCCH information according to the indication of the DCI on the first NPDCCH.

 According to another aspect of the present invention, a method executed by a base station is provided, comprising: transmitting downlink control information (DCI) on a narrow-band physical downlink control channel (NPDCCH), wherein the DCI comprises
15 an information change notification for a single-cell multicast control channel (SC-MCCH) and an indication of transmission of SC-MCCH information; and transmitting the SC-MCCH information according to the indication of the DCI.

 According to another aspect of the present invention, a base station is provided, comprising: a first transmitting unit, configured to transmitting downlink control
20 information (DCI) on a second narrow-band physical downlink control channel (NPDCCH), wherein the DCI or a message indicated by the DCI comprises an information change notification for a single-cell multicast control channel (SC-MCCH); and a second transmitting unit, configured to transmit DCI on a first NPDCCH to indicate transmission of SC-MCCH information, and transmit the SC-MCCH information
25 according to the indication of the DCI on the first NPDCCH.

 According to another aspect of the present invention, a base station is provided, comprising: a first transmitting unit, configured to send downlink control information (DCI) on a narrow-band physical downlink control channel (NPDCCH), wherein the DCI
30 comprises an information change notification for a single-cell multicast control channel (SC-MCCH) and an indication of transmission of SC-MCCH information; and a second transmitting unit, configured to send the SC-MCCH information according to the indication of the DCI.

Brief Description of Drawings

35 The above and other features of the present application will become more apparent through the following detailed description made in conjunction with the accompanying drawings, where:

FIG. 1 is a block diagram of user equipment according to an embodiment of the present application.

FIG. 2 is a block diagram of a base station according to an embodiment of the present application.

5 FIG. 3 is a flowchart of a method executed by UE according to an embodiment of the present application; and

FIG. 4 is a flowchart of a method executed by a base station according to an embodiment of the present application.

10 Detailed Description of Embodiments

The following describes the present invention in detail with reference to the accompanying drawings and specific embodiments. It should be noted that the present invention is not limited to the specific embodiments described below. In addition, for simplicity, detailed description of the known art not directly related to the present invention is omitted to prevent confusion with respect to the understanding of the present invention.

In the following description, an LTE mobile communications system and its later evolved versions are used as exemplary application environments; a base station and a terminal device that support NB-IoT are used as examples to set forth multiple
20 embodiments of the present invention in detail. However, it should be noted that the present invention is not limited to the following embodiments, but is applicable to more other wireless communications systems, such as a future 5G cellular communications system, and is applicable to other base stations and terminal devices, such as base stations and terminal devices supporting eMTC, MMTTC, and so on.

25 Prior to the specific description, the abbreviations of several terms mentioned in the present invention are explained as follows. The abbreviations of the terms involved in the present invention shall have the meanings set forth below, unless otherwise indicated.

SC-MTCH (single-cell multicast service channel)

NPDCCH (narrowband physical downlink control channel)

30 DCI (downlink control information)

SC-RNTI (single cell radio access network temporary identifier)

SC-N-RNTI (single cell notification radio access network temporary identifier)

P-RNTI (paging radio access network temporary identifier)

DII (direct indication information)

35 CRC (cyclic redundancy check)

TMGI (temporary mobile group identity)

MBMS (multimedia broadcast multicast service)

FIG. 1 is a block diagram of user equipment (UE) (which may also be referred to as a terminal hereinafter) according to an embodiment of the present application. As shown in FIG. 1, UE 100 includes a first receiving unit 110, a monitoring unit 120, and a second receiving unit 130.

5 In an embodiment, the first receiving unit 110 is configured to receive downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH). The monitoring unit 120 is configured to receive an information change notification for a single-cell multicast control channel (SC-MCCH) according to the information on the second NPDCCH. In this embodiment, the SC-MCCH information
10 change notification is comprised in a field of the DCI of the second NPDCCH or a message indicated by the DCI of the second NPDCCH. The second receiving unit 130 is configured to receive SC-MCCH information according to an indication of DCI on a first NPDCCH.

Optionally, the UE 100 may further receive configuration information related to an
15 SC-MCCH. The configuration information includes carrier related information or time related information for receiving the first NPDCCH, or carrier related information or time related information for receiving the second NPDCCH.

Optionally, when the first NPDCCH and the second NPDCCH are on the same carrier, the first NPDCCH and the second NPDCCH are not within the same subframe.
20 When the first NPDCCH and the second NPDCCH are on different carriers, the first NPDCCH and the second NPDCCH are within the same subframe or within different subframes.

Optionally, the SC-MCCH information change notification may be included in a direct indication information (DII) message, and the message is in an NPDCCH DCI
25 format and scrambles a CRC check code by using a single cell radio access network temporary identifier (SC-RNTI) or a paging radio network temporary identifier (P-RNTI). In addition, the SC-MCCH information change notification may further be included in a paging message, and DCI indicating transmission of the paging message is in an NPDCCH DCI format and scrambles a CRC check code by using a P-RNTI.

30 Optionally, if the second NPDCCH indicates the transmission of the paging message, the paging message is received according to the indication; and the SC-MCCH information change notification included in the paging message is checked.

Optionally, the SC-MCCH information change notification is indicated by one bit or a plurality of bits.

35 In another embodiment, the first receiving unit 110 may be configured to receive a narrow-band physical downlink control channel (NPDCCH). The second receiving unit 130 is configured to receive, when an information change notification for a single-cell multicast control channel (SC-MCCH) is received in a field of a downlink control

information (DCI) on the NPDCCH, SC-MCCH information according to an indication of the same DCI.

FIG. 2 is a block diagram of a base station (BS) according to an embodiment of the present application. As shown in FIG. 2, the BS 200 includes a first sending unit 210 and a second sending unit 220.

In an embodiment, the first sending unit 210 is configured to send downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH), wherein the DCI or a message indicated by the DCI includes an information change notification for a single-cell multicast control channel (SC-MCCH). The second sending unit 220 is configured to send downlink control information (DCI) on a first NPDCCH to indicate transmission of SC-MCCH information, and send SC-MCCH information according to the indication of the DCI on the first NPDCCH.

Optionally, the BS 200 sends configuration information related to an SC-MCCH, wherein the configuration information includes carrier related information or time related information for receiving the first NPDCCH, or carrier related information or time related information for receiving the second NPDCCH.

Optionally, when the first NPDCCH and the second NPDCCH are on the same carrier, the first NPDCCH and the second NPDCCH are not within the same subframe. When the first NPDCCH and the second NPDCCH are on different carriers, the first NPDCCH and the second NPDCCH are within the same subframe or within different subframes.

Optionally, the SC-MCCH information change notification may be included in a field of a direct indication information (DII) message, and the message is in an NPDCCH DCI format and scrambles a CRC check code by using a single cell radio access network temporary identifier (SC-RNTI) or a paging radio network temporary identifier (P-RNTI).

Optionally, the SC-MCCH information change notification may be included in a field of a paging message, and DCI indicating transmission of the paging message is in an NPDCCH DCI format and scrambles a CRC check code by using a P-RNTI.

Optionally, the BS 200 sends a paging message including the SC-MCCH information change notification.

Optionally, the SC-MCCH information change notification is indicated by one bit or a plurality of bits.

In another embodiment, the first sending unit 210 is configured to send downlink control information (DCI) on a narrow-band physical downlink control channel (NPDCCH), where the DCI includes an information change notification for a single-cell multicast control channel (SC-MCCH) and an indication of transmission of SC-MCCH information. The second sending unit 220 is configured to send the SC-MCCH information according to the indication of the DCI.

Several examples of the present invention are described in detail below.

Example 1

5 A terminal receives configuration information of an SC-PTM control channel SC-MCCH, where the configuration information may be broadcast by using a system message or may be issued to the terminal by using dedicated signaling.

The configuration information is used to acquire SC-MCCH information. The configuration information may include information about a carrier for receiving the SC-MCCH channel, or a subframe offset for receiving the SC-MCCH channel, and may be
10 used for receiving a first NPDCCH described below. In addition, the configuration information may further include receiving information about a carrier for reception of an SC-MCCH information change notification, or a subframe offset the SC-MCCH information change notification, and may be used for receiving a second NPDCCH described below.

15 The SC-MCCH information refers to information/messages carried on the SC-MCCH channel. Transmission of the SC-MCCH information may be indicated by an NPDCCH (referred to herein as the first NPDCCH) in an NB-IoT system. DCI carried on the first NPDCCH indicates in some fields about time-frequency resource and encoding information for an SC-MCCH transmission, and optionally, repeated times of SC-MCCH
20 transmissions. The terminal may receive the SC-MCCH information according to the indication of the DCI.

The terminal starts to monitor the second NPDCCH after first receiving the information/messages transmitted on the SC-MCCH according to the configuration information. Upon receiving a change indication of the SC-MCCH information according
25 to DCI information carried on the second NPDCCH, the SC-MCCH information is acquired again according to the indication of the DCI on the first NPDCCH. The process specifically includes:

Scheme one. According to the configuration information, if the configuration information includes only related information of the first NPDCCH, locations at which
30 the first NPDCCH and the second NPDCCH may appear may be considered to be the same; and the terminal needs to perform detection at these locations. The detection process includes:

First, in order to distinguish the first NPDCCH from the second NPDCCH, a network uses different RNTIs to scramble CRC check codes of the DCIs on the first
35 NPDCCH and the second NPDCCH. Specifically, the CRC check code of the DCI on the first NPDCCH may be scrambled by using an existing SC-RNTI or a newly designed RNTI; and the CRC check code of the DCI on the second NPDCCH may be scrambled by

16R00986/US

using an existing SC-N-RNTI or P-RNTI or a newly designed RNTI, which is different from that of the first NPDCCH.

Based on different RNTIs, if the terminal detects that the DCI is scrambled by using the SC-N-RNTI at a particular location, it indicates that the second NPDCCH
5 appears at this time point; and then the terminal reads a change notification therein and continues detection at a next location. If the SC-RNTI is detected, it indicates that the first NPDCCH appears at this time point; and then the terminal reads the SC-MCCH transmission information therein so as to acquire the SC-MCCH information.

Preferably, the network and the terminal may agree on or notify one another in
10 advance of a location where the second NPDCCH may occur. For example, the SC-MCCH is periodically transmitted in a change period. If change information occurs, the network will release the change information at a location of an odd (or even) period of the SC-MCCH transmission during a change period. For example, when a change period includes six SC-MCCH transmission times, SC-MCCH information transmitted at the six
15 transmission times is the same when no change occurs. However, during reception, the terminal selectively performs RNTI detection only at the first, the third, and the fifth transmission times of the change period, and determines whether an SC-RNTI or an SC-N-RNTI appears at this time. If an SC-RNTI appears, it indicates that the information is not changed. If an SC-N-RNTI appears, it indicates that the information is changed; and
20 the SC-MCCH information will be received at a next time, for example, at the second, the fourth, and the sixth transmission times.

Scheme two. The first NPDCCH and the second NPDCCH are included in the same common search space, and may adopt an existing Type2-NPDCCH common search space design or a similar common search space. The common search space consists of a
25 plurality of subframes and may include a plurality of NPDCCHs. The terminal needs to detect different NPDCCHs in the same common search space. The detection process includes:

First, in order to distinguish the first NPDCCH from the second NPDCCH, a network uses different RNTIs to scramble CRC check codes of the DCIs on the first
30 NPDCCH and the second NPDCCH. Specifically, the CRC check code of the DCI on the first NPDCCH may be scrambled by using an existing SC-RNTI or a newly designed RNTI; and the CRC check code of the DCI on the second NPDCCH may be scrambled by using an existing SC-N-RNTI or P-RNTI or a newly designed RNTI, which is different from that of the first NPDCCH.

35 Starting from a starting location of the common search space, the terminal sequentially searches for NPDCCHs that may be included in the space, and detects whether DCI scrambled by using the SC-N-RNTI exists. For example, the common search space includes 10 subframes; the 0th-3rd subframes refer to a location where a

16R00986/US

first NPDCCH locates; the 4th-6th subframes refer to a location where a second NPDCCH locates; and the 7th-9th subframes refer to a location where a third NPDCCH locates. The terminal receives the first to third NPDCCHs on the respective and corresponding subframes and detects whether CRC check codes of the NPDCCHs are
5 scrambled by using an SC-N-RNTI, so as to determine whether the second NPDCCH exists. If so and an information change is indicated, the terminal searches for DCI scrambled by using an SC-RNTI, i.e., the first NPDCCH, in the same common search space, thereby acquiring the SC-MCCH information.

10 Scheme three. If the DCI carrying the change notification is scrambled by using the P-RNTI, the terminal first acquires the second NPDCCH.

If the second NPDCCH indicates transmission of a paging message, the terminal receives the paging message according to the indication, and checks the information change notification included in the paging message.

15 If an information change is indicated, the terminal receives the SC-MCCH transmission information on the first NPDCCH, thereby acquiring the SC-MCCH information; or

if no information change is indicated, the terminal does not need to update the SC-MCCH information.

20 If a direct indication information message is carried in the second NPDCCH (i.e., the transmission of the paging message not indicated), the terminal checks the information change notification included in the DCI.

If an information change is indicated, the terminal receives the SC-MCCH transmission information on the first NPDCCH, thereby acquiring the SC-MCCH information; or

25 if no information change is indicated, the terminal does not need to update the SC-MCCH information.

30 Scheme four. The configuration information respectively includes information about a location (e.g., a carrier or a time) for receiving the first NPDCCH and information about a location (e.g., carrier or time) for receiving the second NPDCCH. In this case, the terminal first performs reception at the location of the second NPDCCH. If the terminal receives DCI indicating a change, the SC-MCCH transmission information is received on the first NPDCCH, thereby acquiring the SC-MCCH information. If DCI indicating a change is not received, it means that the SC-MCCH information is not changed; and the terminal does not need to receive the SC-MCCH transmission
35 information at the location of the first NPDCCH.

Optionally, when the first NPDCCH channel and the second NPDCCH channel are on the same carrier, the first NPDCCH channel and the second NPDCCH channel do not exist in the same subframe.

Optionally, when the first NPDCCH channel and the second NPDCCH channel are on different carriers, the first NPDCCH channel and the second NPDCCH channel may exist in the same subframe or may exist in different subframes.

5 In all the foregoing schemes, optionally, the DCI on the first NPDCCH may adopt an existing NB-IoT DCI format: NPDCCH DCI format N1 or N2 (the definition of which can be found in TS 36.212); or a newly designed NPDCCH DCI format may be used. At the same time, the CRC check code of the DCI may be scrambled by using an existing SC-RNTI or a newly designed RNTI.

10 The SC-MCCH information change notification may be included in a field of the DCI carried on the second NPDCCH. Optionally, the DCI on the second NPDCCH may adopt the existing NB-IoT DCI format: NPDCCH DCI format N1 or N2 (the definition of which can be found in TS 36.212); or a newly designed NPDCCH DCI format may be used; and the CRC check code of the DCI may be scrambled by using an existing SC-N-RNTI or a newly designed RNTI (the RNTI may be the same as or different from the
15 RNTI on the first NPDCCH).

Optionally, when the SC-MCCH information change notification is included in a direct indication information message, the message may adopt the existing NB-IoT DCI format: NPDCCH DCI format N1 or N2 (the definition thereof can be found in TS 36.212); or a newly designed NPDCCH DCI format may be used. At the same time, a
20 CRC check code of the direct indication information message may be scrambled by using an existing SC-RNTI or a newly designed RNTI, or by using an existing P-RNTI for paging or a newly designed RNTI for paging.

Optionally, the SC-MCCH information change notification may be included in a paging message, and DCI indicating transmission of the paging message may adopt the
25 existing NB-IoT DCI format: NPDCCH DCI format N1 or N2 (the definition of which can be found in TS 36.212); or a newly designed NPDCCH DCI format may be used; or a CRC check code of the paging message may be scrambled by using an existing P-RNTI for paging or a newly designed RNTI for paging.

30 Example 2

A terminal receives configuration information of an SC-PTM control channel SC-MCCH, where the configuration information may be broadcast by using a system message or may be issued to the terminal by using dedicated signaling.

35 The configuration information is used to receive SC-MCCH information. The configuration information may include information about a carrier for reception of the SC-MCCH channel, a subframe offset for reception of the SC-MCCH channel, repeated times of SC-MCCH transmissions, or the like, and may be used for reception of a first NPDCCH described below.

The SC-MCCH information refers to information/message propagating on the SC-MCCH channel. Transmission of the SC-MCCH information is indicated by an NPDCCH (referred to herein as the first NPDCCH). DCI carried on the first NPDCCH indicates in some fields about time-frequency resource and encoding information for an SC-MCCH transmission, as well as repeated times of SC-MCCH transmissions, and the like. The terminal may acquire the SC-MCCH information according to the indication included in the DCI. Optionally, the DCI on the first NPDCCH may adopt the format NPDCCH DCI format: N1 or N2, or a newly designed format; and a CRC check code of the DCI is scrambled by using an existing SC-RNTI or a newly designed RNTI.

10 The SC-MCCH information change notification may also be included in a field of the same DCI carried in the first NPDCCH.

The terminal starts to monitor the first NPDCCH after first receiving the information/messages transmitted on the SC-MCCH according to the configuration information.

15 If an SC-MCCH information change indication is received in the DCI carried on the first NPDCCH channel, indicating that the information changes, the SC-MCCH information is acquired according to the indication of the DCI on the first NPDCCH. If the change indication indicates that the information is not changed, the terminal does not need to receive SC-MCCH information.

20

Example 3

As described in Example 1 and Example 2, the SC-MCCH information change notification may be indicated by one bit. When the bit is set to '1', it indicates that the SC-MCCH information is changed.

25 When the bit is set to '0', it indicates that the SC-MCCH information is not changed; or when the change notification does not appear, it may be that the corresponding bit does not appear, or the second NPDCCH channel does not appear, or the terminal may not detect the DCI scrambled by using the SC-N-RNTI on the second NPDCCH channel. All of which may indicate that the SC-MCCH information is not
30 changed.

Example 4

As described in Example 1 and Example 2, the SC-MCCH information change notification may be indicated by a plurality of bits. The terminal first receives a reception
35 service list broadcast by a cell. The list indicates an MBMS service supported by the cell; and each service is characterized by its corresponding service information. The service information may include a TMGI assigned to a particular MBMS service, and an MBMS session identity used to characterize the particular MBMS service.

In the service list, the terminal may perform sorting according to the sequence of each service in the list, or according to the values of the TMGI, or according to the values of the MBMS session identity, so as to obtain a sequence number of each service.

The plurality of bits included in the SC-MCCH information change notification
5 may be used to indicate a sequence number corresponding to a changed service, thereby indicating the changed service.

A specific indication method may be a value method. For example, the value indicated by the plurality of bits included in the SC-MCCH information change notification is 3(011), indicating that service information of a service with sequence
10 number 3 in the service list is changed. When the value is 0(000), it indicates that no service is changed. Alternatively, the changed service is indicated by a bitmap. For example, eight bits are included in the SC-MCCH information change notification; and the bits from low to high correspond to eight types of services with sequence numbers from 1 to 8 in the service list. If the bit corresponding to sequence number 3 is set to '1',
15 it indicates that service information of a service with sequence number 1 is changed. If it is set to '0', it indicates that no change occurs.

When the terminal receives a change notification, the terminal first determines whether changed service information is of interest based on a serial number carried in the change notification; if so, the terminal continues to receive SC-MCCH information; if
20 not, the terminal may ignore the current change notification without receiving the SC-MCCH information.

FIG. 3 is a flowchart of a method executed by UE according to an embodiment of the present application; and As shown in FIG. 3, a method 300 starts at step S310.

Step S320: Receive downlink control information (DCI) on a second narrowband
25 physical downlink control channel (NPDCCH).

Step S330: Receive an information change notification for a single-cell multicast control channel (SC-MCCH) according to the information on the second NPDCCH. For example, the SC-MCCH information change notification is comprised in the DCI of the second NPDCCH or a message indicated by the DCI of the second NPDCCH.

30 Step S340: Receive SC-MCCH information according to an indication of DCI on a first NPDCCH.

Finally, the method 300 ends at step S350.

FIG. 4 is a flowchart of a method executed by a base station according to an embodiment of the present application. As shown in FIG. 4, a method 400 starts at step
35 S410.

Step S420: Transmit downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH), wherein the DCI or a message indicated

16R00986/US

by the DCI includes an information change notification for a single-cell multicast control channel (SC-MCCH).

Step S430: Transmit DCI on a first NPDCCH to indicate transmission of SC-MCCH information.

- 5 Step S440: Transmit the SC-MCCH information according to the indication of the DCI on the first NPDCCH.

Finally, the method 400 ends at step S450.

- 10 The program running on the device according to the present invention may be a program that enables the computer to implement the functions of the embodiments of the present invention by controlling the central processing unit (CPU). The program or information processed by the program can be stored temporarily in volatile memory (e.g., random access memory RAM), hard disk drive (HDD), non-volatile memory (e.g., flash memory), or other memory systems.

- 15 The program for implementing the functions of the embodiments of the present invention may be recorded on a computer-readable recording medium. The corresponding functions can be achieved by reading programs recorded on the recording medium and executing them by the computer system. The so-called "computer system" may be a computer system embedded in the device, which may include operating systems or hardware (e.g., peripherals). The "computer-readable recording medium" may be a semiconductor recording medium, an optical recording medium, a magnetic recording medium, a short-time dynamic memory program, or any other recording medium readable by a computer.

- 20 Various features or functional modules of the device used in the above embodiments may be implemented or executed by circuits (e.g., monolithic or multi-chip integrated circuits). Circuits designed to execute the functions described in this description may include general-purpose processors, digital signal processors (DSPs), application specific integrated circuits (ASICs), field programmable gate arrays (FPGAs) or other programmable logic devices, discrete gates or transistor logic, or discrete hardware components, or any combination of the above. The general-purpose processor may be a microprocessor, or may be any existing processor, a controller, a microcontroller, or a state machine. The circuit may be a digital circuit or an analog circuit. When new integrated circuit technologies that replace existing integrated circuits emerge because of the advances in semiconductor technology, one or more embodiments of the present invention may also be implemented using these new integrated circuit technologies.

35 Furthermore, the present invention is not limited to the embodiments described above. Although various examples of the described embodiments have been described, the present invention is not limited thereto. Fixed or non-mobile electronic devices

installed indoors or outdoors, such as AV equipment, kitchen equipment, cleaning equipment, air conditioner, office equipment, vending machines, and other household appliances, may be used as terminal devices or communications devices.

- 5 The embodiments of the present invention have been described in detail above with reference to the accompanying drawings. However, the specific structures are not limited to the above embodiments, and the present invention also includes any design modifications that do not depart from the main idea of the present invention. In addition, various modifications can be made to the present invention within the scope of the claims, and embodiments resulting from the appropriate combination of the technical
- 10 means disclosed in different embodiments are also included within the technical scope of the present invention. In addition, components with the same effect described in the above embodiments may be replaced with one another.

Claims

[Claim 1]

A method executed by user equipment (UE), comprising:
receiving downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH);
receiving an information change notification for a single-cell multicast control channel (SC-MCCH) according to the information on the second NPDCCH; and
receiving SC-MCCH information according to an indication of DCI on a first NPDCCH, wherein
the SC-MCCH information change notification is comprised in the DCI of the second NPDCCH or a message indicated by the DCI of the second NPDCCH.

[Claim 2]

The method according to claim 1, further comprising:
receiving configuration information related to an SC-MCCH, wherein the configuration information comprises carrier related information or time related information for receiving the first NPDCCH or carrier related information or time related information for receiving the second NPDCCH.

[Claim 3]

The method according to claim 1 or 2, further comprising: receiving the first NPDCCH at a first time and receiving the second NPDCCH at a second time on a same carrier.

[Claim 4]

The method according to claim 1 or 2, further comprising: receiving the first NPDCCH on a first carrier and receiving the second NPDCCH on a second carrier.

[Claim 5]

The method according to claim 1 or 2, wherein the SC-MCCH information change notification is comprised in a direct indication information (DII) message, and the message is in an NPDCCH DCI format and scrambles a CRC check code by using a single cell radio access network temporary identifier (SC-RNTI) or a paging radio network temporary identifier (P-RNTI).

[Claim 6]

The method according to claim 1 or 2, wherein the SC-MCCH information change notification is comprised in a paging message, and DCI indicating transmission of the paging message is in an NPDCCH DCI format and scrambles a CRC check code by using a P-RNTI.

[Claim 7]

The method according to claim 1 or 6, wherein if the second NPDCCH indicates the transmission of the paging message, receiving the paging message according to the indication and checking the SC-MCCH information change notification comprised in the paging message.

[Claim 8]

The method according to claim 1, wherein the SC-MCCH information change notification is indicated by one bit.

[Claim 9]

The method according to claim 1, wherein the SC-MCCH information change notification is indicated by a plurality of bits.

[Claim 10]

A method executed by user equipment (UE), comprising:
receiving a narrow-band physical downlink control channel (NPDCCH); and
when an information change notification for a single-cell multicast control channel (SC-MCCH) is received in downlink control information (DCI) on the NPDCCH, receiving SC-MCCH information according to an indication of the DCI.

[Claim 11]

The method according to claim 10, further comprising: receiving configuration information related to an SC-MCCH, wherein the configuration information comprises carrier related information or time related information for receiving the NPDCCH.

[Claim 12]

User equipment (UE), comprising:
a first receiving unit, configured to receive downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH);
a monitoring unit, configured to receive an information change notification for a single-cell multicast control channel (SC-MCCH) according to the information on the second NPDCCH; and

a second receiving unit, configured to receive SC-MCCH information according to an indication of DCI on a first NPDCCH, wherein

the SC-MCCH information change notification is comprised in the DCI of the second NPDCCH or a message indicated by the DCI of the second NPDCCH.

[Claim 13]

The UE according to claim 12, further comprising receiving configuration information related to an SC-MCCH, wherein the configuration information comprises carrier related information or time related information for receiving the first NPDCCH or carrier related information or time related information for receiving the second NPDCCH.

[Claim 14]

The UE according to claim 12, further comprising: receiving the first NPDCCH at a first time and receiving the second NPDCCH at a second time on a same carrier.

[Claim 15]

The UE according to claim 12, further comprising: receiving the first NPDCCH on a first carrier and receiving the second NPDCCH on a second carrier.

[Claim 16]

The UE according to claim 12 or 13, wherein the SC-MCCH information change notification is comprised in a direct indication information (DII) message, and the message is in an NPDCCH DCI format and scrambles a CRC check code by using a single cell radio access network temporary identifier (SC-RNTI) or a paging radio network temporary identifier (P-RNTI).

[Claim 17]

The UE according to claim 12 or 13, wherein the SC-MCCH information change notification is comprised in a paging message, and DCI indicating transmission of the paging message is in an NPDCCH DCI format and scrambles a CRC check code by using a P-RNTI.

[Claim 18]

The UE according to claim 12 or 17, wherein if the second NPDCCH indicates the transmission of the paging message, receiving the paging message according to the indication and checking the SC-MCCH information change notification comprised in the paging message.

[Claim 19]

The UE according to claim 12, wherein the SC-MCCH information change notification is indicated by one bit.

[Claim 20]

The UE according to claim 12, wherein the SC-MCCH information change notification is indicated by a plurality of bits.

[Claim 21]

User equipment (UE), comprising: a first receiving unit, configured to receive a narrow-band physical downlink control channel (NPDCCH); and
a second receiving unit, configured to receive, when an information change notification for a single-cell multicast control channel (SC-MCCH) is received in downlink control information (DCI) on the NPDCCH, SC-MCCH information according to an indication of the DCI.

[Claim 22]

The UE according to claim 21, further comprising:
receiving configuration information related to an SC-MCCH, wherein the configuration information comprises carrier related information or time related information for receiving the NPDCCH.

[Claim 23]

A method executed by a base station, comprising:
sending downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH), wherein the DCI or a message indicated by the DCI comprises an information change notification for a single-cell multicast control channel (SC-MCCH); and
sending DCI on a first NPDCCH indicate transmission of SC-MCCH information, and sending the SC-MCCH information according to the indication of the DCI on the first NPDCCH.

[Claim 24]

The method according to claim 23, comprising sending configuration information related to an SC-MCCH, wherein the configuration information comprises carrier related information or time related information for receiving the first NPDCCH, or comprises

carrier related information or time related information for receiving the second NPDCCH.

[Claim 25]

The method according to claim 23, comprising sending the first NPDCCH at a first time and sending the second NPDCCH at a second time on a same carrier.

[Claim 26]

The method according to claim 23, comprising sending the first NPDCCH on a first carrier and sending the second NPDCCH on a second carrier.

[Claim 27]

The method according to claim 23, wherein the SC-MCCH information change notification is comprised in a direct indication information (DII) message, and the message is in an NPDCCH DCI format and scrambles a CRC check code by using a single cell radio access network temporary identifier (SC-RNTI) or a paging radio network temporary identifier (P-RNTI).

[Claim 28]

The method according to claim 23, wherein the SC-MCCH information change notification is comprised in a paging message, and DCI indicating transmission of the paging message is in an NPDCCH DCI format and scrambles a CRC check code by using a P-RNTI.

[Claim 29]

The method according to claim 23, further comprising sending a paging message comprising the SC-MCCH information change notification.

[Claim 30]

The method according to claim 23, wherein the SC-MCCH information change notification is indicated by one bit.

[Claim 31]

The method according to claim 23, wherein the SC-MCCH information change notification is indicated by a plurality of bits.

[Claim 32]

A method executed by a base station, comprising:

sending downlink control information (DCI) on a narrow-band physical downlink control channel (NPDCCH), wherein the DCI comprises an information change notification for a single-cell multicast control channel (SC-MCCH) and an indication of transmission of SC-MCCH information; and

sending the SC-MCCH information according to the indication of the DCI.

[Claim 33]

The method according to claim 32, further comprising:

sending configuration information related to an SC-MCCH, wherein the configuration information comprises carrier related information or time related information for receiving the NPDCCH.

[Claim 34]

A base station, comprising:

a first sending unit, configured to send downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH), wherein the DCI or a message indicated by the DCI comprises an information change notification for a single-cell multicast control channel (SC-MCCH); and

a second sending unit, configured to send DCI on a first NPDCCH to indicate transmission of SC-MCCH information, and send the SC-MCCH information according to the indication of the DCI on the first NPDCCH.

[Claim 35]

The base station according to claim 34, wherein configuration information related to an SC-MCCH is sent; the configuration information comprises carrier related information or time related information for receiving the first NPDCCH, or comprises carrier related information or time related information for receiving the second NPDCCH.

[Claim 36]

The base station according to claim 34, wherein the first NPDCCH is sent at a first time and the second NPDCCH is sent at a second time on a same carrier.

[Claim 37]

The base station according to claim 34, wherein the first NPDCCH is sent on a first carrier and the second NPDCCH is sent on a second carrier.

[Claim 38]

The base station according to claim 34, wherein the SC-MCCH information change notification is comprised in a direct indication information (DII) message, and the message is in an NPDCCH DCI format and scrambles a CRC check code by using a single cell radio access network temporary identifier (SC-RNTI) or a paging radio network temporary identifier (P-RNTI).

[Claim 39]

The base station according to claim 34, wherein the SC-MCCH information change notification is comprised in a paging message, and DCI indicating transmission of the paging message is in an NPDCCH DCI format and scrambles a CRC check code by using a P-RNTI.

[Claim 40]

The base station according to claim 34, wherein a paging message comprising the SC-MCCH information change notification is sent.

[Claim 41]

The base station according to claim 34, wherein the SC-MCCH information change notification is indicated by one bit.

[Claim 42]

The base station according to claim 34, wherein the SC-MCCH information change notification is indicated by a plurality of bits.

[Claim 43]

A base station, comprising:

a first sending unit, configured to send downlink control information (DCI) on a narrow-band physical downlink control channel (NPDCCH), wherein the DCI comprises an information change notification for a single-cell multicast control channel (SC-MCCH) and an indication of transmission of SC-MCCH information; and

a second sending unit, configured to send the SC-MCCH information according to the indication of the DCI.

[Claim 44]

The base station according to claim 43, further comprising:

sending configuration information related to an SC-MCCH, wherein the configuration information comprises carrier related information or time related information for receiving the NPDCCH.

Abstract

The present application provides an information change transmission method and device related to a single-cell multicast service. According to one aspect, a method executed by user equipment (UE) is provided, comprising: receiving downlink control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH); receiving an information change notification for a single-cell multicast control channel (SC-MCCH) according to the information on the second NPDCCH; and receiving SC-MCCH information according to an indication of DCI on a first NPDCCH. The SC-MCCH information change notification is comprised in the DCI of the second NPDCCH or a message indicated by the DCI of the second NPDCCH. The present application further provides a corresponding method executed by a base station, and corresponding user equipment (UE) and a base station.

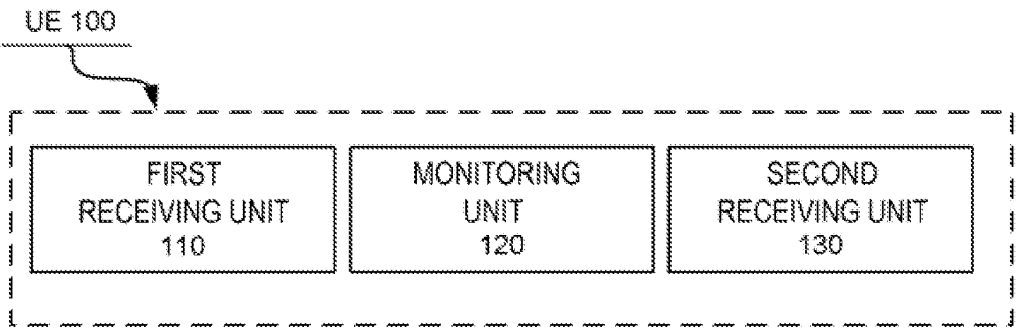


FIG. 1

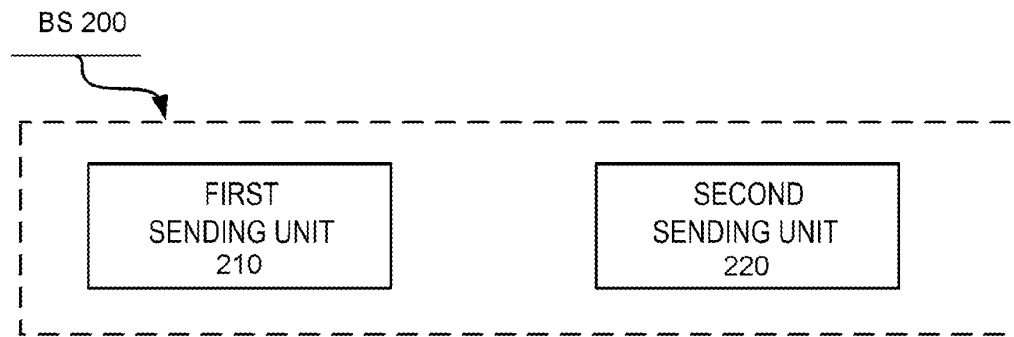
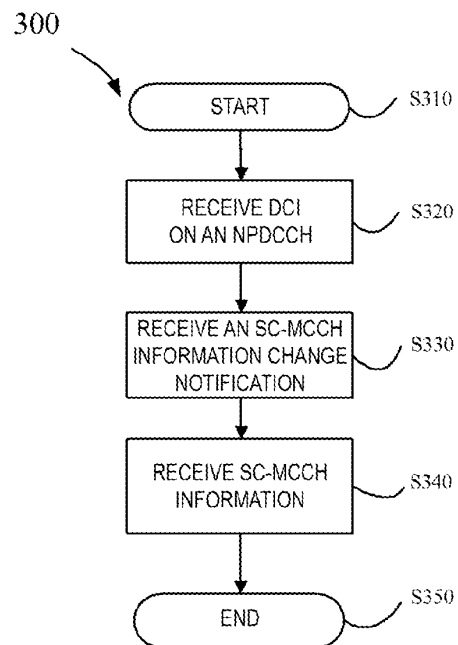
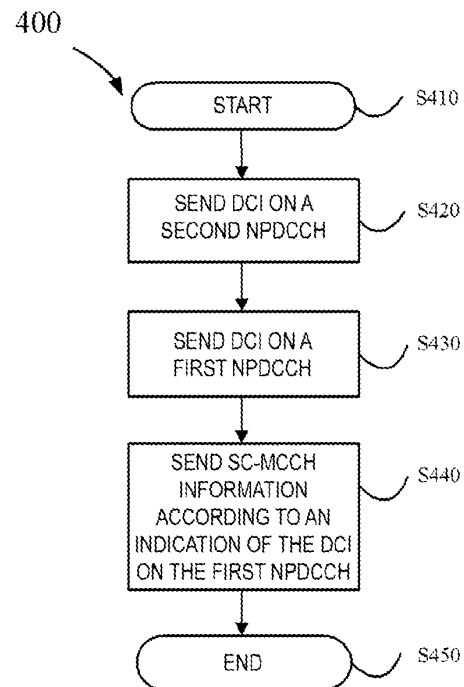


FIG. 2

**FIG. 3**

**FIG. 4**

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	
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	First Named Inventor	Chongming ZHANG
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	Filing Date		
	First Named Inventor	Chongming ZHANG	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	US76497	

1	3RD GENERATION PARTNERSHIP PROJECT (3GPP TM), Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding, (Release 13), 3GPP TS 36.212 V13.2.0, June 2016, Valbonne, France.
2	VODAFONE, HUAWEI, HISILICON, ERICSSON, QUALCOMM, New work item proposal: Enhancements of NB-IoT, 3GPP TSG RAN Meeting #72, RP-161324, Jun. 13-16, 2016, Busan, Korea.
3	QUALCOMM INCORPORATED, New Work Item: NarrowBand IOT (NB-IOT), 3GPP TSG RAN Meeting #69, RP-151621, Sep. 14-16, 2015, Phoenix, USA.

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Examiner Signature		Date Considered	
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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Tung-Yun McNally/	Date (YYYY-MM-DD)	2019-02-08
Name/Print	Tung-Yun McNally	Registration Number	66,725

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Bibliographic data: CN101998270 (A) — 2011-03-30

Method and device for notifying multimedia broadcast multicast service (MBMS)

Inventor(s): BIN YU; BIN WANG; ZIJIANG MA; BO DAI ± (YU BIN, ; WANG BIN, ; MA ZIJIANG, ; DAI BO)

Applicant(s): ZTE CORP ± (ZTE CORP)

Classification: - international: *H04W12/00; H04W4/06; H04W52/00*
- cooperative:

Application number: CN20091167585 20090827

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Also published as: CN101998270 (B)

Abstract of CN101998270 (A)

The invention provides a method and device for notifying multimedia broadcast multicast service (MBMS). The method comprises the following steps: an evolved Node B (eNB) configures a preset MCCH notification radio network temporary identity (M-RNTI) for user equipment (UE); and the eNB scrambles cyclic redundancy check (CRC), which carries downlink control information (DCI) format 3/3A of an MBMS control channel (MCCH) notification, by using the M-RNTI, and transmits the scrambled DCI format 3/3A to the UE. The invention has the advantages that the original system is slightly improved, the complexity of the MCCH notification is lowered, the utilization ratio of the public search space and channel resources is increased, therefore, the problem of low resource utilization ratio in the MBMS notification method in the correlation techniques is solved.



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(71) 申请人 中兴通讯股份有限公司

地址 518057 广东省深圳市南山区科技南路
55 号

(72) 发明人 喻斌 王斌 马子江 戴博

(74) 专利代理机构 北京康信知识产权代理有限
责任公司 11240

代理人 余刚 吴孟秋

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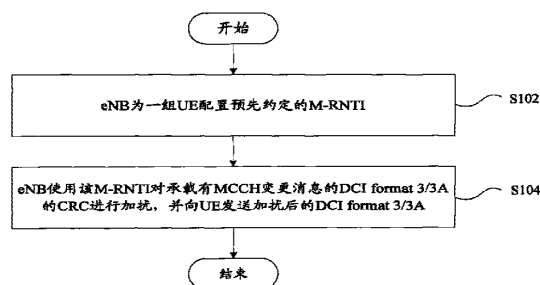
权利要求书 2 页 说明书 10 页 附图 2 页

(54) 发明名称

多媒体广播多播业务通知方法及装置

(57) 摘要

本发明提供了一种 MBMS 通知方法及装置，该方法包括：eNB 为一组 UE 配置预先约定的 M-RNTI；eNB 使用该 M-RNTI 对承载有 MCCH notification 的 DCI format 3/3A 的 CRC 进行加扰，并向 UE 发送加扰后的 DCI format 3/3A。本发明对原有系统的改动较小，降低了 MCCH 变更通知的复杂度，并且提高了公共搜索空间及信道资源的利用率，所以克服了相关技术中的 MBMS 通知方法资源利用率较低的问题。



1. 一种多媒体广播多播业务通知方法,其特征在于,包括以下步骤:

演进的节点B eNB为一组终端配置预先约定的多媒体广播多播业务控制信道变更消息无线网络临时标识M-RNTI;

所述eNB使用所述M-RNTI对承载有多媒体广播多播业务控制信道MCCH变更消息的下行控制信息DCI format 3/3A的循环冗余检验进行加扰,并向所述终端发送加扰后的DCI format 3/3A。

2. 根据权利要求1所述的通知方法,其特征在于,eNB为一组终端配置预先约定的M-RNTI具体包括:

所述eNB和所述终端固定设置一个RNTI值为所述M-RNTI,所述M-RNTI同时为DCI format 3/3A的功率控制无线网络临时标识TPC-RNTI所共享,所述TPC-RNTI包括物理上行控制信道功率控制无线网络临时标识TPC-PUCCH-RNTI和物理上行共享信道功率控制无线网络临时标识TPC-PUSCH-RNTI。

3. 根据权利要求1所述的通知方法,其特征在于,所述M-RNTI和所述DCI format 3/3A的TPC-RNTI共享为FFFDh。

4. 根据权利要求1所述的通知方法,其特征在于,所述M-RNTI和所述DCI format 3/3A的TPC-RNTI共享为FFF3h。

5. 根据权利要求1所述的通知方法,其特征在于,所述DCI format3/3A中的P个比特用于承载所述MCCH变更消息。

6. 根据权利要求1所述的通知方法,其特征在于,在所述eNB使用所述M-RNTI对承载有MCCH变更消息的DCI format3/3A的循环冗余检验进行加扰,并向所述终端发送加扰后的DCI format 3/3A之后,还包括:

所述终端根据所述M-RNTI获得所述DCI format 3/3A,并读取所述DCI format 3/3A中的P个比特,获取所述MCCH变更消息。

7. 根据权利要求1所述的通知方法,其特征在于,在向所述终端发送加扰后的DCI format 3/3A之前还包括:

所述eNB设置所述MCCH变更消息的比特参数为P,并将P值告知终端。

8. 一种多媒体广播多播业务通知装置,其特征在于,包括:

配置模块,用于演进的节点B eNB为一组终端配置预先约定的多媒体广播多播业务控制信道变更消息无线网络临时标M-RNTI;

发送模块,用于所述eNB使用所述M-RNTI对承载有所述多媒体广播多播业务控制信道MCCH变更消息的下行控制信息DCI format 3/3A的循环冗余检验进行加扰,并向所述终端发送加扰后的DCI format 3/3A。

9. 根据权利要求8所述的通知装置,其特征在于,所述配置模块具体包括:

M-RNTI配置模块,用于所述eNB和所述终端固定设置一个RNTI值为所述M-RNTI,所述M-RNTI同时为DCI format3/3A的功率控制无线网络临时标识TPC-RNTI所共享,所述TPC-RNTI包括物理上行控制信道功率控制无线网络临时标识TPC-PUCCH-RNTI和物理上行共享信道功率控制无线网络临时标识TPC-PUSCH-RNTI。

10. 根据权利要求8所述的通知装置,其特征在于,所述M-RNTI和所述DCI format 3/3A的TPC-RNTI共享为FFFDh。

11. 根据权利要求 8 所述的通知装置,其特征在于,所述 M-RNTI 和所述 DCI format 3/3A 的 TPC-RNTI 共享为 FFF3h。

12. 根据权利要求 8 所述的通知装置,其特征在于,所述 DCI format 3/3A 中的 P 个比特用于承载所述 MCCH 变更消息。

13. 根据权利要求 8 所述的通知装置,其特征在于,还包括:

读取模块,用于所述终端根据所述 RNTI 获得所述 DCI format 3/3A,并读取所述 DCI format 3/3A 中的所述 P 个比特,获取所述 MCCH 变更消息。

14. 根据权利要求 8 所述的通知装置,其特征在于,还包括:

P 值设置模块,用于所述 eNB 设置所述 MCCH 变更消息的比特参数为 P,并将 P 值告知终端。

多媒体广播多播业务通知方法及装置

技术领域

[0001] 本发明涉及通信领域,具体而言,涉及一种多媒体广播多播业务通知方法及装置。

背景技术

[0002] 随着 Internet 的迅猛发展和大屏幕多功能移动终端的普及,出现了大量移动数据多媒体业务和各种高带宽多媒体业务,如视频会议、电视广播、视频点播、广告、网上教育、互动游戏等,这一方面满足了移动用户多业务的需求,同时也为移动运营商带来了新的业务增长点。这些移动数据多媒体业务要求多个用户能够同时接收相同数据,与一般的数据业务相比,具有数据量大、持续时间长、时延敏感等特点。

[0003] 为了有效地利用移动网络资源,第三代合作伙伴计划 3GPP(3rd Generation Partnership Project)提出了 MBMS(Multimedia Broadcast Multicast Service,多媒体广播多播业务),该业务是一种从一个数据源向多个目标移动终端传送数据的技术,实现了网络(包括核心网和接入网)资源的共享,提高了网络资源(尤其是空中接口资源)的利用率。3GPP 定义的 MBMS 不仅能够实现纯文本低速率的消息类组播和广播,而且还能够实现高速多媒体业务的广播和组播,提供多种丰富的视频、音频和多媒体业务,这无疑顺应了未来移动数据发展的趋势,为 3G 的发展提供了更好的业务前景。

[0004] 在长期演进 LTE(Long Term Evolution)系统中,当 MCCH(MBMS Control Channel,多媒体广播多播业务控制信道)发生变更时,演进的节点 B(evolved Node B, eNB)需要通过通知机制来告知所有终端 UE(User Equipment)MCCH 已经发生变更,使 UE 更新其相应的 MCCH,保持 MCCH 的内容与 eNB 同步。

[0005] 3GPP LTE 系统中下行物理控制信令承载在物理下行控制信道 PDCCH(Physical Downlink Control Channel)上,PDCCH 所包含的下行符号数由物理控制格式指示信道 PCFICH(Physical control format indication channel)指示。PDCCH 用于传输 DCI,下行控制信息的格式 DCI format 包括 format 0、format 1、format 1A、format 1B、format 1C、format 1D、format 3、format 3A 等,用于传输不同类别的 DCI。每种 DCI 信令格式均附带有 16 比特的 CRC,每个 CRC 均会通过隐含编码方式对应一个无线网络临时标识 RNTI,也就是通过用 RNTI 对 CRC 进行加扰,然后终端根据 RNTI 对 CRC 进行盲检测,获取其的 DCI。

[0006] 相关技术中提供了一种 MBMS 通知方法,该方法通过重新定义 DCI(Downlink Control Information,下行控制信息)来实现通知终端 MCCH 已经发生变更的信息,具体可分为以下步骤:首先需要在物理层定义新的 DCI 消息,并给新定义的 DCI 消息中的 bit 赋予一定的含义;其次当 MCCH 发生变更时,在子帧的公共搜索空间发送该 DCI 消息,并将 M-RNTI(MCCH notification Radio Network Temporary Identity,多媒体广播多播业务控制信道变更消息无线网络临时标识)加扰到该 DCI 消息的 CRC(Cyclic Redundancy Check,循环冗余检验)上;再次 UE 通过接收该子帧的公共搜索空间,盲检该 DCI 消息,通过 M-RNTI 获知该 DCI 消息为通知 MCCH 变更消息(MCCH notification),并通过 DCI 消息中的具体内容获知更详细的 MCCH 变更信息;最后 UE 接收已经发生变更的 MCCH。

[0007] 相关技术中的 MBMS 通知方法需要重新在物理层定义 DCI 消息,对系统原有过程改动较大,且复杂度较高;新定义的 DCI 消息存在后向不兼容的缺点;对于在有限的公共搜索空间发送新定义的 DCI 消息会导致资源不足,影响原有在公共搜索空间上发送的 DCI 消息。

[0008] 有鉴于此,本发明给出一种 MBMS 通知方法及装置,通过沿用原有 DCI 消息 Format 3/3A 来实现 MCCH 变更通知。

发明内容

[0009] 本发明旨在提供一种 MBMS 通知方法及装置,能够解决相关技术中的 MBMS 通知方法需要重新在物理层定义 DCI 消息,对系统原有过程改动较大,且复杂度较高;新定义的 DCI 消息存在后向不兼容的缺点;对于在有限的公共搜索空间发送新定义的 DCI 消息会导致资源不足,影响原有在公共搜索空间上发送的 DCI 消息的问题。

[0010] 为了实现上述目的,根据本发明的一个方面,提供了一种多媒体广播多播业务通知方法,包括以下步骤:eNB 为一组终端配置预先约定的多媒体广播多播业务控制信道变更消息无线网络临时标识 M-RNTI;eNB 使用上述 M-RNTI 对承载有多媒体广播多播业务控制信道 MCCH 变更消息的下行控制信息 DCI format 3/3A 的循环冗余检验进行加扰,并向终端发送加扰后的 DCI format 3/3A。

[0011] 优选地,在上述的通知方法中,eNB 为一组终端配置与预先约定的 M-RNTI 具体包括:eNB 和终端固定设置一个 RNTI 值为 M-RNTI;上述 M-RNTI 同时为 DCI format 3/3A 的功率控制无线网络临时标识 TPC-RNTI 所共享,TPC-RNTI 包括物理上行控制信道功率控制无线网络临时标识 TPC-PUCCH-RNTI 和物理上行共享信道功率控制无线网络临时标识 TPC-PUSCH-RNTI。

[0012] 优选地,在上述的通知方法中,M-RNTI 和 DCI format 3/3A 的 TPC-RNTI 共享为 FFFDh。

[0013] 优选地,在上述的通知方法中,M-RNTI 和 DCI format 3/3A 的 TPC-RNTI 共享为 FFF3h。

[0014] 优选地,在上述的通知方法中,DCI format 3/3A 中的 P 个比特用于承载 MCCH 变更消息。

[0015] 优选地,在上述的通知方法中,在 eNB 使用上述 M-RNTI 对承载有 MCCH 变更消息的 DCI format 3/3A 的循环冗余检验进行加扰,并向终端发送加扰后的 DCI format 3/3A 之后,还包括:终端根据上述 M-RNTI 获得 DCI format 3/3A,并读取 DCI format 3/3A 中的 P 个比特,获取 MCCH 变更消息。

[0016] 优选地,在上述的通知方法中,在向终端发送加扰后的 DCI format 3/3A 之前还包括:eNB 设置 MCCH 变更消息的比特参数为 P,并将 P 值告知终端。

[0017] 为了实现上述目的,根据本发明的另一方面,提供了一种多媒体广播多播业务通知装置,包括:配置模块,用于 eNB 为一组终端配置预先约定的 M-RNTI;发送模块,用于 eNB 使用上述 M-RNTI 对承载有 MCCH 变更消息的下行控制信息 DCI format 3/3A 的进行循环冗余检验进行加扰,并向终端发送加扰后的 DCI format 3/3A。

[0018] 优选地,在上述的通知装置中,配置模块具体包括:M-RNTI 配置模块,用于 eNB 和终端固定设置一个 RNTI 值为 M-RNTI,该 M-RNTI 同时为 DCI format 3/3A 的功率控制无线

网络临时标识 TPC-RNTI 所共享, TPC-RNTI 包括物理上行控制信道功率控制无线网络临时标识 TPC-PUCCH-RNTI 和物理上行共享信道功率控制无线网络临时标识 TPC-PUSCH-RNTI。

[0019] 优选地,在上述的通知装置中, M-RNTI 和 DCI format 3/3A 的 TPC-RNTI 共享为 FFFDh。

[0020] 优选地,在上述的通知装置中, M-RNTI 和 DCI format 3/3A 的 TPC-RNTI 共享为 FFF3h。

[0021] 优选地,在上述的通知装置中, DCI format 3/3A 中的 P 个比特用于承载 MCCH 变更消息。

[0022] 优选地,上述的通知装置还包括:读取模块,用于终端根据上述 M-RNTI 获得 DCI format 3/3A,并读取 DCI format 3/3A 中的 P 个比特,获取 MCCH 变更消息。

[0023] 优选地,上述的通知装置还包括:P 值设置模块,用于 eNB 设置 MCCH 变更消息的比特参数为 P,并将 P 值告知终端。

[0024] 上述实施例沿用原有 DCI 消息 format 3/3A 来实现 MCCH 变更通知,由于无需在物理层重新定义新的 DCI 消息,也无需占用更多的公共搜索空间用以发送新定义的 DCI 消息,故对原有系统的改动较小,降低了复杂度,并且提高了公共搜索空间及信道资源的利用率,所以克服了相关技术中的 MBMS 通知方法需要重新在物理层定义 DCI 消息,对系统原有过程改动较大,且复杂度较高;新定义的 DCI 消息存在后向不兼容的缺点;对于在有限的公共搜索空间发送新定义的 DCI 消息会导致资源不足,影响原有在公共搜索空间上发送的 DCI 消息的问题。

附图说明

[0025] 此处所说明的附图用来提供对本发明的进一步理解,构成本申请的一部分,本发明的示意性实施例及其说明用于解释本发明,并不构成对本发明的不当限定。在附图中:

[0026] 图 1 示出了根据本发明第一实施例的通知方法的流程图;

[0027] 图 2 示出了 DCI format 3 的示意图;

[0028] 图 3 示出了 DCI format 3A 的示意图;

[0029] 图 4 示出了利用 DCI format 3 承载 MCCH notification 示意图;

[0030] 图 5 示出了利用 DCI format 3A 承载 MCCH notification 示意图;

[0031] 图 6 示出了根据本发明第四实施例的通知装置的结构图。

具体实施方式

[0032] 下面将参考附图并结合实施例,来详细说明本发明。

[0033] 第一实施例

[0034] 图 1 示出了根据本发明第一实施例的通知方法的流程图,该方法包括以下步骤:

[0035] 步骤 S102,演进的节点 B(evolved Node B,简称为 eNB) 为一组 UE 配置预先约定的 M-RNTI;

[0036] 步骤 S104,eNB 使用该 M-RNTI 对承载有 MCCH 变更消息的 DCI format 3/3A 的 CRC 进行加扰,并向 UE 发送加扰后的 DCI format 3/3A。

[0037] 3GPP LTE 系统中,DCI format 3 和 3A 的 DCI 用于 eNB 下发用于上行功率控制的群

组信令。具体而言,DCI format 3 用于传输一个群组的物理上行控制信道 PUCCH(Physical Uplink Control channel) 或物理上行共享信道 PUSCH(Physical Uplink Shared channel) 的功率控制 TPC(Transmit Power Control) 命令,该群组最大可包含 N 个 UE 的 TPC 命令,每个 UE 的 TPC 命令大小为 2 比特,终端个数 N 取决于 DCI format 3 的有效负载大小(Payload size),该有效负载为 DCI format 3 包含的总比特数减去 CRC 的比特数,DCI format 3 的命令格式相当于 {TPC_UE1, TPC_UE2, ..., TPC_UEM, CRC}, N 等于有效负载大小除以 2 所得数值的整数部分,如图 2 所示。DCI format 3A 也用于传输一个群组的 PUCCH 或 PUSCH 的 TPC 命令,该群组最大可包含 M 个 UE 的 TPC 命令,每个终端的 TPC 命令大小为 1 比特,终端个数 M 则取决于 DCI format 3A 的有效负载大小,该有效负载为 DCI format 3A 包含的总比特数减去 CRC 的比特数,DCI format 3A 的命令格式相当于 {TPC_UE1, TPC_UE2, ..., TPC_UEN, CRC}, M 等于有效负载的比特数,如图 3 所示。

[0038] 目前的 LTE 系统中,DCI format 3 和 format 3A 的有效负载大小相等,且有效负载大小均由 DCI format 0 的有效负载确定,即 DCI format 3/3A 的承载的最大 TPC 命令数分

别由 $N = \left\lfloor \frac{L_{\text{format 0}}}{2} \right\rfloor$ 和 $M = L_{\text{format 0}}$ 确定, $L_{\text{format 0}}$ 为 DCI format 0 除 CRC 外的有效负载。每个

DCI format 3/3A 的 CRC 通过一个 TPC-PUSCH-RNTI 或者 TPC-PUCCH-RNTI 进行加扰, eNB 通过高层信令通知 UE 用于接收承载在 DCI format 3/3A 中的 TPC 命令所需的 TPC-PUSCH-RNTI 或者 TPC-PUCCH-RNTI 及其一个 TPC 命令索引 (TPC-Index), 这个 TPC-Index 用于指示该 UE 的 TPC 命令是第几个, 对于 DCI format 3, TPC-Index 的取值可为 N-1, 对于 DCI format 3A, TPC-Index 的取值可为 M-1。对于接收端来说, UE 通过 TPC-PUSCH-RNTI 或者 TPC-PUCCH-RNTI 去盲检 DCI format 3/3A, 检测到后, 通过 TPC-Index 读取自己的 TPC 命令。此外, DCI format 3/3A 被置于 LTE 协议定义的公共搜索空间中发送, 搜索位置固定, 且各 LTE 终端搜索公共搜索空间去读取 DCI。

[0039] 鉴于上述 DCI format 3/3A 的特性, 本实施例中的 eNB 首先将与 UE 预先约定的 M-RNTI 配置给一组 UE, 即 eNB 根据小区支持 MBMS 的特性优先选择该 M-RNTI 配置给一组 UE 用于接收 DCI format 3/3A, 然后 eNB 使用该 M-RNTI 对承载有 MCCH notification 的 DCI format 3/3A 的 CRC 进行加扰, 并向 UE 发送该 DCI format 3/3A。由于本实施例沿用原有 DCI 消息 format 3/3A 来实现 MCCH 变更通知, 由于无需在物理层重新定义新的 DCI 消息, 也无需占用更多的公共搜索空间用以发送新定义的 DCI 消息, 故对原有系统的改动较小, 降低了 MCCH 变更通知的复杂度, 并且提高了公共搜索空间及信道资源的利用率, 所以克服了相关技术中的 MBMS 通知方法需要重新在物理层定义 DCI 消息, 对系统原有过程改动较大, 且复杂度较高; 新定义的 DCI 消息存在后向不兼容的缺点; 对于在有限的公共搜索空间发送新定义的 DCI 消息会导致资源不足, 影响原有在公共搜索空间上发送的 DCI 消息的问题。

[0040] 优选地, 在上述的通知方法中, 步骤 S102 具体包括: eNB 和 UE 固定设置一个 RNTI 值为 M-RNTI, 该 M-RNTI 同时为 DCI format 3/3A 的 TPC-RNTI 所共享, TPC-RNTI 包括 TPC-PUCCH-RNTI 和 TPC-PUSCH-RNTI。

[0041] 本实施例在系统的 RNTI 取值表中设置了 eNB 和终端都默认知道的一个 RNTI 的值为 M-RNTI, 该 RNTI 的值同时为 DCI format 3/3A 的 TPC-RNTI 共享, 即该值 eNB 可配置为 TPC-PUCCH-RNTI 或 TPC-PUSCH-RNTI。该 M-RNTI 可为 eNB 和 UE 预先约定的默认值, 也可由

eNB 设置后再将该 M-RNTI 通知给 UE,使得 UE 获知 M-RNTI 及其含义,进而根据该 M-RNTI 搜索得到 DCI。

[0042] 优选地,在上述的通知方法中, M-RNTI 和 DCI format 3/3A 的 TPC-RNTI 共享为 FFFDh,即 16 进制数 FFFD。在系统的 RNTI 取值表中,FFFDh 原本为保留比特,本实施例则对其赋予了特殊含义,即 FFFDh 同时为 DCI format 3/3A 的 TPC-RNTI 以及 M-RNTI 共享, eNB 可将其配置为 TPC-PUCCH-RNTI 或 TPC-PUSCH-RNTI,如表 1 所示。

[0043] 表 1 根据本发明第二实施例的 RNTI 取值表

[0044]

值 (16进制)	RNTI类型
0000	N/A
0001-003C	RA-RNTI, C-RNTI, Semi-Persistent Scheduling C-RNTI, Temporary C-RNTI, TPC-PUCCH-RNTI and TPC-PUSCH-RNTI
003D-FFF3	C-RNTI, Semi-Persistent Scheduling C-RNTI, Temporary C-RNTI, TPC-PUCCH-RNTI and TPC-PUSCH-RNTI
FFF4-FFFC	保留比特
FFFD	M-RNTI, TPC-PUCCH-RNTI and TPC-PUSCH-RNTI (此RNTI由M-RNTI, TPC-PUCCH-RNTI和 TPC-PUSCH-RNTI共享)
FFFE	P-RNTI
FFFF	SI-RNTI

[0045] 优选地,在上述的通知方法中, M-RNTI 和 DCI format 3/3A 的 TPC-RNTI 共享为 FFF3h,即 16 进制数 FFF3。在系统的 RNTI 取值表中, FFF3h 原本就有 TPC-PUCCH-RNTI and TPC-PUSCH-RNTI 的含义,本实施例将其赋予了 M-RNTI 的新含义,且 FFF3h 同时为 DCI format 3/3A 的 TPC-RNTI 共享, eNB 可将其配置为 TPC-PUCCH-RNTI 或 TPC-PUSCH-RNTI,如表 2 所示。

[0046] 表 2 根据本发明第三实施例的 RNTI 取值表

[0047]

值 (16进制)	RNTI类型
0000	N/A
0001-003C	RA-RNTI, C-RNTI, Semi-Persistent Scheduling C-RNTI, Temporary C-RNTI, TPC-PUCCH-RNTI and TPC-PUSCH-RNTI
003D-FFF2	C-RNTI, Semi-Persistent Scheduling C-RNTI, Temporary C-RNTI, TPC-PUCCH-RNTI and TPC-PUSCH-RNTI
FFF3	M-RNTI, TPC-PUCCH-RNTI and TPC-PUSCH-RNTI (此RNTI由M-RNTI, TPC-PUCCH-RNTI和 TPC-PUSCH-RNTI共享)
FFF4-FFFD	保留比特
FFFE	P-RNTI
FFFF	SI-RNTI

[0048] 优选地,在上述的通知方法中, DCI format 3/3A 中的 P 个比特用于承载 MCCH notification。

[0049] 本实施例中当 eNB 需要发送 MCCH notification 时, eNB 利用 DCI format 3/3A 中的 P 个比特发送 MCCH notification 给 UE, 且该 P 个比特在 M-RNTI 对应的 DCI format 3/3A 中的比特位置为 UE 所知, 即需要接收 MCCH notification 消息的 UE 知道 DCI format 3/3A 中哪些比特承载的是 MCCH notification 而不是承载的任何 UE 的 TPC 命令。这样做, 使得接收到 DCI 的 UE 易于从中读取到 MCCH notification。

[0050] 优选地, 在上述的通知方法中, 若格式为 DCI format 3, 则 TPC-Index 为 $1 \sim \lceil P/2 \rceil$ 的 TPC 命令用于发送 MCCH notification, 其中 $\lceil P/2 \rceil$ 表示对 $P/2$ 进行向上取整。

[0051] 本实施例为采用 DCI format 3 发送 MCCH notification 的情况, 由于 DCI format 3 中每个 UE 的 TPC 命令大小为 2 比特, 故被 MCCH notification 占用的前 P 个比特对应于 $\lceil P/2 \rceil$ 个 TPC 命令, DCI format 3 中除被 P 个比特 MCCH notification 消息占用的 TPC 命令 (TPC 命令 #1 ~ TPC 命令 # $\lceil P/2 \rceil$) 不能被 eNB 用于发送任何 UE 的 TPC 命令外, 其它 TPC 命令 (TPC 命令 # $(\lceil P/2 \rceil + 1) \sim$ TPC 命令 #N) eNB 者可用于承载 TPC-PUCCH-RNTI 或 TPC-PUSCH-RNTI 的值配置为 M-RNTI 的那些 UE 的 TPC 命令。

[0052] 优选地, 在上述的通知方法中, 若格式为 DCI format 3A, 则 TPC-Index 为 $1 \sim P$ 的 TPC 命令用于发送 MCCH notification。

[0053] 本实施例为采用 DCI format 3A 发送 MCCH notification 的情况, 由于 DCI format 3A 中每个 UE 的 TPC 命令大小为 1 比特, 故被 MCCH notification 占用的前 P 个比特对应于 P 个 TPC 命令, DCI format 3A 中除被 P 个比特 MCCH notification 消息占用的 TPC 命令 (TPC 命令 #1 ~ TPC 命令 #P) 不能被 eNB 用于发送任何 UE 的 TPC 命令外, 其它 TPC 命令 (TPC 命令 # $(P+1) \sim$ TPC 命令 #M) eNB 都可用于承载 TPC-PUCCH-RNTI 或 TPC-PUSCH-RNTI 的值配置为 M-RNTI 的那些 UE 的 TPC 命令。

[0054] 优选地, 在上述的通知方法中, 在步骤 S104 之后包括: UE 根据上述 M-RNTI 获得 DCI format 3/3A, 并读取 DCI format 3/3A 中的 P 个比特, 获取 MCCH notification。由于 eNB 设置 DCI format 3/3A 中的 P 个比特专门用于承载 MCCH notification, 故 UE 在搜索到 DCI format 3/3A 后, 即根据这一约定直接对 DCI 进行读取, 从而获取 MCCH notification。

[0055] 优选地, 在上述的通知方法中, 在步骤 S102 之前还包括: eNB 设置 MCCH notification 的比特参数为 P, 并将 P 值告知 UE。

[0056] 本实施例中 P 值可由 eNB 灵活配置的, 在 eNB 设置 M-RNTI 之前, eNB 通过高层信令向 UE 配置 P 值, P 的可能取值有 1, 2, 3, 等; 若 eNB 不对 P 值进行特殊配置, 即 UE 未收到用于配置 P 值的高层信令, 则认为 P 为默认值 2, 即 $P = 2$ 。本实施例支持对 P 值进行灵活配置, 从而提高了 MCCH notification 通知机制的灵活性和扩展性。

[0057] 第二实施例

[0058] 本实施例中 eNB 未对 P 值进行特殊配置, 即 UE 未收到用于配置 P 值的高层信令, 此时认为 P 为默认值, 即 $P = 2$; 此外, 本实施例采用如表 1 所示的 RNTI 取值表对 M-RNTI 进行配置, 即 $M-RNTI = FFFDh$ 。

[0059] 当 MCCH 发生变更时, 系统需要固定发送 P 个比特的 MCCH notification 消息给 UE, 每个 MCCH notification 为 1 比特, 则本实施例的通知方法包括以下步骤:

[0060] 步骤一, eNB 利用 DCI format 3 或者 3A 中固定的前 2 个比特承载 MCCH

notification 消息,并使用 $M-RNTI = FFFDh$,参见表 1,对该承载有 MCCH notification 的 DCI format 3/3A 的 CRC 进行加扰,则 UE 预先知道该 $M-RNTI$ 对应的 DCI format 3/3A 上的前 2 个比特是承载的 MCCH notification 消息而不是任何 UE 的 TPC 命令;eNB 对于分配了 TPC-PUSCH-RNTI 或者 TPC-PUCCH-RNTI (统称为 TPC-RNTI) 为跟 $M-RNTI$ 一样值 ($FFFDh$) 的一组 UE:

[0061] 若 eNB 配置该组所有 UE 采用的是 DCI format 3 用于传输该组 UE 的 TPC 命令,那么 eNB 不会分配该组 UE 中的任何一个 UE 的 TPC-Index 为 1,如图 4 所示, $M-RNTI$ 加扰的 DCI format 3 的第一个 TPC 命令所占的 2 比特用于传输 MCCH notification 而不能作为任何 UE 的 TPC 命令,而该 DCI format 3 中 TPC-Index 为 2 ~ N 的那些 TPC 命令可承载 N-1 个 TPC-RNTI 为 $FFFDh$ 的 UE 的 TPC 命令,所以 eNB 可分配最大 N-1 个 UE 的 TPC-RNTI 为 $FFFDh$ (也就是同 $M-RNTI$ 相等),然后通过配置 UE TPC-Index 为 2 ~ N 指示来这些 UE 各自的 TPC 命令;

[0062] 若 eNB 配置该组所有 UE 采用的是 DCI format 3A 用于传输该组 UE 的 TPC 命令,那么 eNB 不会分配该组 UE 中的任何一个 UE 的 TPC-Index 为 1 和 2,如图 5 所示, $M-RNTI$ 加扰的 DCI format 3 的第一个和第二个 TPC 命令所占的 2 比特用于传输 MCCH notification 而不能作为任何 UE 的 TPC 命令,而该 DCI format 3A 中 TPC-Index 为 3 到 M 的那些 TPC 命令可承载 M-2 个 TPC-RNTI 为 $FFFDh$ 的 UE 的 TPC 命令,所以 eNB 可分配最大 M-2 个 UE 的 TPC-RNTI 为 $FFFDh$ (也就是同 $M-RNTI$ 相等),然后通过配置 UE TPC-Index 为 3 ~ M 来指示这些 UE 各自的 TPC 命令;

[0063] 步骤二,需要监听 MCCH 变更消息的 UE 通过 $M-RNTI$ 搜索承载有 MCCH notification 的 DCI format 3/3A, eNB 发生 MCCH 变更并通过 $M-RNTI$ 加扰的 DCI format 3/3A 发送了 MCCH notification 消息,所述终端通过 $M-RNTI$ 检测到该 DCI format 3/3A 后读取上述的前 2 个比特获取对应的 MCCH 变更消息,那些配置了 TPC-RNTI 为 $M-RNTI$ 的 UE 通过配置的 TPC-Index 读取各自的 TPC 命令。

[0064] 通过本实施例可知,有 MBMS 业务需求终端的 MCCH notification 消息同其它终端的 TPC 命令可置于一个 DCI format 3/3A 中进行发送,避免了专门为 MCCH notification 发送一个新的 DCI,从而降低了增加盲检次数,减轻了 PDCCH 公共搜索空间及信道资源的负载,从而提高了资源利用率。

[0065] 第三实施例

[0066] 本实施例中 eNB 对 P 值进行特殊配置,即 UE 收到用于配置 P 值的高层信令,此时认为 P 为 eNB 在高层信令中配置的值,比如 P 为 1,2,3;此外,本实施例采用如表 2 所示的 RNTI 取值表对 $M-RNTI$ 进行配置,即 $M-RNTI = FFF3h$ 。

[0067] 当 MCCH 发生变更时,系统需要发送 P 个比特的 MCCH notification 消息给 UE,每个 MCCH notification 为 1 比特,则本实施例的通知方法包括以下步骤:

[0068] 步骤一, eNB 通过广播消息广播配置的 P 取值, $P = 1, 2, 3$, 则所有 MBMS 终端均可知有多个 MCCH notification 消息;

[0069] 步骤二, eNB 利用 DCI format 3 或者 3A 中固定的前 P 个比特承载 MCCH notification 消息并使用 $M-RNTI = FFF3h$,参见表 2,对该承载有 MCCH notification 的 DCI format 3/3A 的 CRC 进行加扰,则 MBMS UE 预先知道该 $M-RNTI$ 对应的 DCI format 3/3A

上的前 P 个比特是承载的 MCCH notification 消息而不是任何 UE 的 TPC 命令 ;eNB 对于分配了 TPC-PUSCH-RNTI 或者 TPC-PUCCH-RNTI (统称为 TPC-RNTI) 为跟 M-RNTI 一样值 (FFF3h) 的一组 UE :

[0070] 若 eNB 配置该组所有 UE 采用的是 DCI format 3 用于传输该组 UE 的 TPC 命令,那么 eNB 不会分配该组 UE 中的任何一个 UE 的 TPC-Index 为 1 到 $\lceil P/2 \rceil$,这前 $\lceil P/2 \rceil * 2$ 个比特都为 MCCH notification 占用哪怕空着也不能作为任何 UE 的 TPC 命令, 而该 DCI format 3 中 TPC-Index 为 $\lceil P/2 \rceil + 1$ 到 N 的那些 TPC 命令可承载 c 个 TPC-RNTI 为 FFF3h 的 UE 的 TPC 命令,所以 eNB 可分配最大 $N - \lceil P/2 \rceil$ 个 UE 的 TPC-RNTI 为 FFF3h (也就是同 M-RNTI 相等),然后通过配置 UE TPC-Index 为 $\lceil P/2 \rceil + 1$ 到 N 指示来这些 UE 各自的 TPC 命令 ;

[0071] 若 eNB 配置该组所有 UE 采用的是 DCI format 3A 用于传输该组 UE 的 TPC 命令,那么 eNB 不会分配该组 UE 中的任何一个 UE 的 TPC-Index 为 1 到 P ,前 P 个 TPC 命令所占的 P 比特用于传输 MCCH notification 而不能作为任何 UE 的 TPC 命令,而该 DCI format 3A 中 TPC-Index 为 $P+1$ 到 M 的那些 TPC 命令可承载 $M-P$ 个 TPC-RNTI 为 FFF3h 的 UE 的 TPC 命令,所以 eNB 可分配最大 $M-P$ 个 UE 的 TPC-RNTI 为 FFF3h (也就是同 M-RNTI 相等),然后通过配置 UE TPC-Index 为 $P+1$ 到 M 来指示这些 UE 各自的 TPC 命令 ;

[0072] 步骤三,需要监听 MCCH 变更消息的 UE 通过 M-RNTI 搜索承载有 MCCH notification 的 DCI format 3/3A, eNB 发生 MCCH 变更并通过 M-RNTI 加扰的 DCI format 3/3A 发送了 MCCH notification 消息,所述终端通过 M-RNTI 检测到该 DCI format 3/3A 后读取上述的前 P 个比特获取对应的 MCCH 变更消息,那些配置了 TPC-RNTI 为 M-RNTI 的 UE 通过配置的 TPC-Index 读取各自的 TPC 命令。

[0073] 本实施例由于采用了 eNB 对 P 值进行配置,支持 eNB 根据实际情况对 P 值进行调整,从而提高了 MCCH 变更通知的扩展性。

[0074] 第四实施例

[0075] 图 6 示出了根据本发明第四实施例的通知装置的结构图,该装置包括 :

[0076] 配置模块 602,用于 eNB 为一组 UE 配置预先约定的 M-RNTI ;

[0077] 发送模块 604,用于 eNB 使用上述 M-RNTI 对承载有 MCCH notification 的 DCI format 3/3A 的 CRC 进行加扰,并向 UE 发送加扰后的 DCI format 3/3A。

[0078] 本实施例首先采用配置模块 602 用于 eNB 为一组 UE 配置预先约定的 M-RNTI,即 eNB 根据小区支持 MBMS 的特性优先选择该 M-RNTI 配置给一组 UE 用于接收 DCI format 3/3A,然后采用发送模块 604 使用与上述 UE 约定好的 M-RNTI 对承载有 MCCH notification 的 DCI format 3/3A 的 CRC 进行加扰,并向 UE 发送该 DCI format 3/3A。由于本实施例沿用原有 DCI 消息 format 3/3A 来实现 MCCH 变更通知,由于无需在物理层重新定义新的 DCI 消息,也无需占用更多的公共搜索空间用以发送新定义的 DCI 消息,故对原有系统的改动较小,降低了 MCCH 变更通知的复杂度,并且提高了公共搜索空间及信道资源的利用率,所以克服了相关技术中的 MBMS 通知方法需要重新在物理层定义 DCI 消息,对系统原有过程改动较大,且复杂度较高 ;新定义的 DCI 消息存在后向不兼容的缺点 ;对于在有限的公共搜索空间发送新定义的 DCI 消息会导致资源不足,影响原有在公共搜索空间上发送的 DCI 消息的问题。

[0079] 优选地,在上述的通知装置中,配置模块具体包括:M-RNTI 配置模块,用于 eNB 和 UE 固定设置一个 RNTI 值为 M-RNTI,该 M-RNTI 同时为 DCI format 3/3A 的 TPC-RNTI 所共享,TPC-RNTI 包括 TPC-PUCCH-RNTI 和 TPC-PUSCH-RNTI。

[0080] 本实施例采用 M-RNTI 配置模块在系统的 RNTI 取值表中设置了 eNB 和终端都默认知道的一个 RNTI 的值为 M-RNTI,该 RNTI 的值同时为 DCI format 3/3A 的 TPC-RNTI 共享,即采用 TPC-RNTI 配置模块配置该 M-RNTI 为 TPC-PUCCH-RNTI 或 TPC-PUSCH-RNTI。该 M-RNTI 可为 eNB 和 UE 预先约定的默认值,也可由 eNB 设置后再将该 M-RNTI 通知给 UE,使得 UE 获知 M-RNTI 及其含义,进而根据该 M-RNTI 搜索得到 DCI。

[0081] 优选地,在上述的通知装置中,M-RNTI 和 DCI format 3/3A 的 TPC-RNTI 共享为 FFFDh,即 16 进制数 FFFDh。在系统的 RNTI 取值表中,FFFDh 原本为保留比特,本实施例则对其赋予了特殊含义,即 FFFDh 同时为 DCI format 3/3A 的 TPC-RNTI 共享,eNB 可将其配置为 TPC-PUCCH-RNTI 或 TPC-PUSCH-RNTI,如表 1 所示。

[0082] 优选地,在上述的通知装置中,M-RNTI 和 DCI format 3/3A 的 TPC-RNTI 共享为 FFF3h,即 16 进制数 FFF3h。在系统的 RNTI 取值表中,FFF3h 原本就有 TPC-PUCCH-RNTI and TPC-PUSCH-RNTI 的含义,本实施例将其赋予了 M-RNTI 的新含义,即 FFF3h 同时为 DCI format 3/3A 的 TPC-RNTI 共享,eNB 可将其配置为 TPC-PUCCH-RNTI 或 TPC-PUSCH-RNTI,如表 2 所示。

[0083] 优选地,在上述的通知装置中,DCI format 3/3A 的 P 个比特用于承载 MCCH notification。

[0084] 本实施例中当 eNB 需要发送 MCCH notification 时,eNB 利用 DCI format 3/3A 的前 P 个比特发送 MCCH notification 给 UE,且该 P 个比特在 M-RNTI 对应的 DCI format 3/3A 中的比特位置为 UE 所知,即需要接收 MCCH notification 消息的 UE 知道 DCI format 3/3A 中哪些比特承载的是 MCCH notification 而不是承载的任何 UE 的 TPC 命令。这样做,使得接收到 DCI 的 UE 易于从中读取到 MCCH notification。

[0085] 优选地,上述的通知装置还包括:读取模块,用于 UE 根据上述 M-RNTI 获得 DCI format 3/3A,并读取 DCI format 3/3A 中的 P 个比特,获取 MCCH 变更消息。由于 eNB 设置 DCI format 3/3A 中的 P 个比特专门用于承载 MCCH notification,故 UE 在搜索到 DCI format 3/3A 后,即根据这一约定直接对 DCI 进行读取,从而获取 MCCH notification。

[0086] 优选地,上述的通知装置还包括:P 值设置模块,用于 eNB 设置 MCCH notification 的比特参数为 P,并将 P 值告知 UE。

[0087] 本实施例采用 P 值设置模块,故支持 eNB 对 P 值进行灵活配置,在 eNB 设置 M-RNTI 之前,eNB 通过向 UE 广播高层信令来配置 P 值,P 的可能取值有 1,2,3;若 eNB 不对 P 值进行特殊配置,即 UE 未收到用于配置 P 值的高层信令,则认为 P 为默认值,即 $P = 2$ 。本实施例了支持对 P 值进行灵活配置,从而提高了 MCCH notification 通知机制的灵活性和扩展性。

[0088] 从以上的描述中,可以看出,本发明上述的实施例对原有系统的改动较小,降低了 MCCH 变更通知的复杂度,并且提高了公共搜索空间及信道资源的利用率。

[0089] 显然,本领域的技术人员应该明白,上述的本发明的各模块或各步骤可以用通用的计算装置来实现,它们可以集中在单个的计算装置上,或者分布在多个计算装置所组成

的网络上,可选地,它们可以用计算装置可执行的程序代码来实现,从而,可以将它们存储在存储装置中由计算装置来执行,或者将它们分别制作成各个集成电路模块,或者将它们中的多个模块或步骤制作成单个集成电路模块来实现。这样,本发明不限制于任何特定的硬件和软件结合。

[0090] 以上所述仅为本发明的优选实施例而已,并不用于限制本发明,对于本领域的技术人员来说,本发明可以有各种更改和变化。凡在本发明的精神和原则之内,所作的任何修改、等同替换、改进等,均应包含在本发明的保护范围之内。

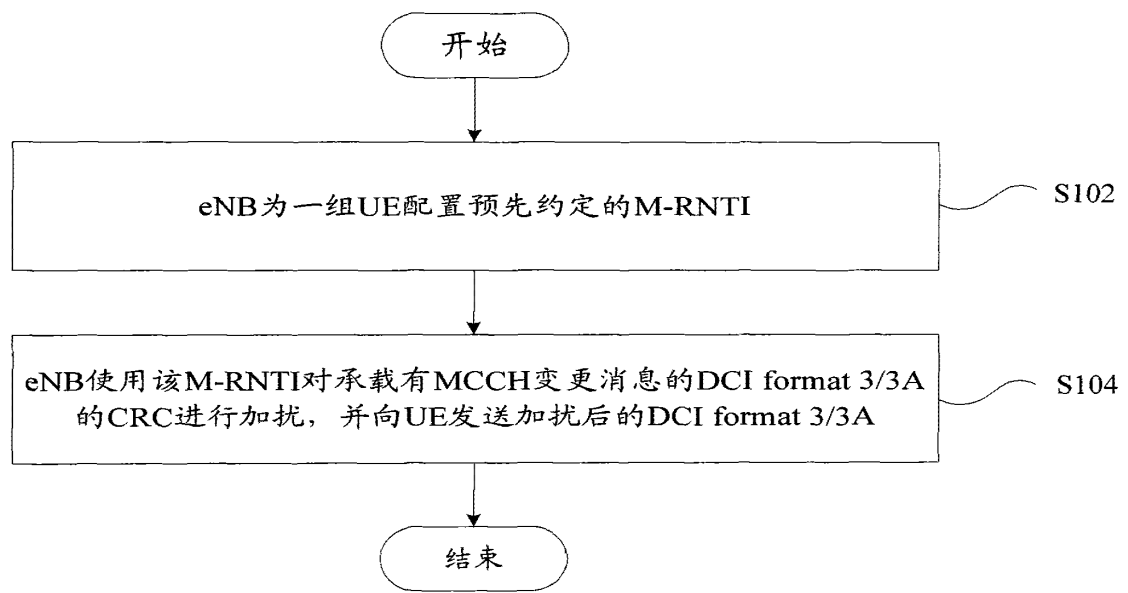


图 1

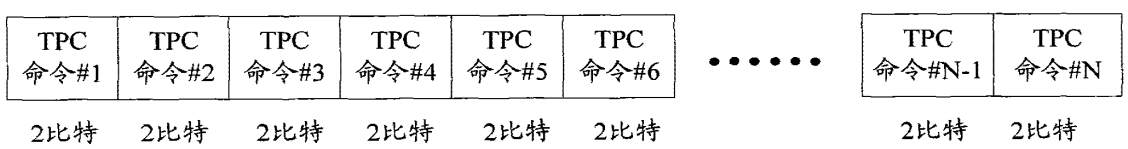


图 2

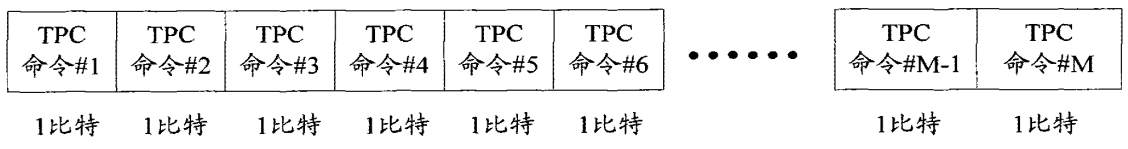


图 3

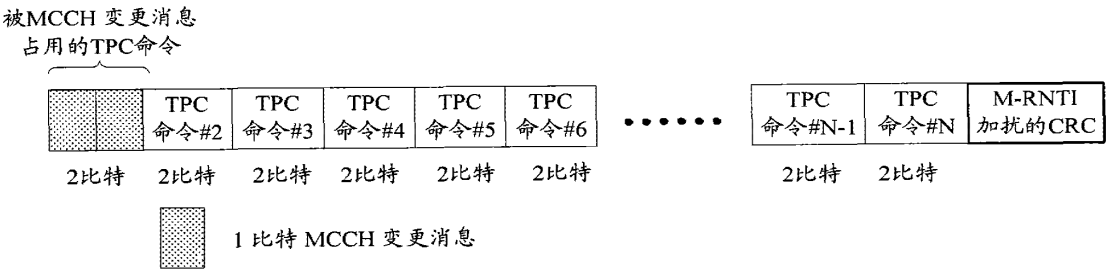


图 4

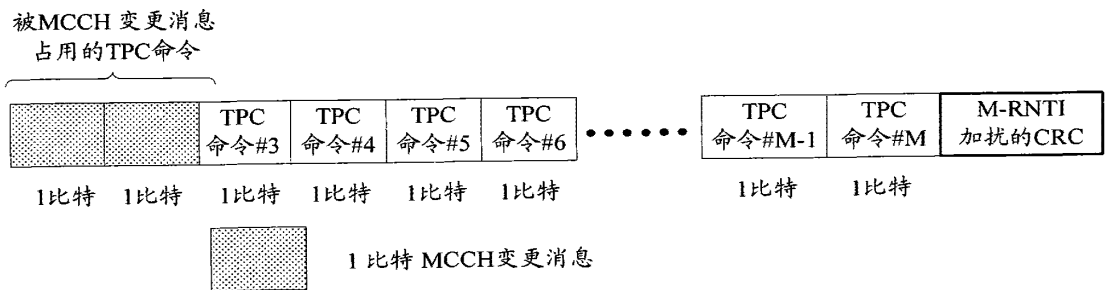


图 5

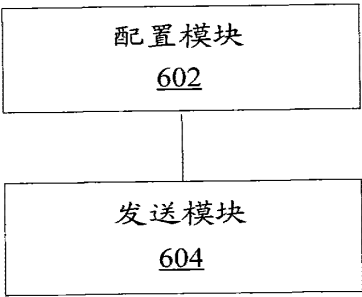


图 6

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

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Prefix	Given Name	Middle Name	Family Name	Suffix
	Shohei		YAMADA	
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service				
City	Sakai City		Country of Residence ⁱ	JP
Mailing Address of Inventor:				
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Address 2	1, Takumi-cho, Sakai-ku,			
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Title of the Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
Attorney Docket Number	US76497	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	1

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

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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:

☐ 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	145688		

Domestic Benefit/National Stage Information:

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

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	a 371 of international	PCT/CN2017/096794	2017-08-10
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

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
201610658544.6	CN	2016-08-11		

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



This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

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	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant	1		Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
☒ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	Sharp Kabushiki Kaisha		
Mailing Address Information For Applicant:			
Address 1	1, Takumi-cho, Sakai-ku,		
Address 2			
City	Sakai City, Osaka	State/Province	
Country	JP	Postal Code	590-8522
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

Applicant	2			Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.				
Clear				
☒ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor	
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest		
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
Name of the Deceased or Legally Incapacitated Inventor:				
If the Applicant is an Organization check here. ☒				
Organization Name	FG Innovation Company Limited			
Mailing Address Information For Applicant:				
Address 1	Flat 2623, 26/F Tuen Mun Central Square			
Address 2	22 Hoi Wing Road, New Territories, HK			
City	Tuen Mun	State/Province		
Country	CN	Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Applicant Data may be generated within this form by selecting the Add button. Add				

Assignee Information including Non-Applicant Assignee Information:

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

Assignee	1	Remove
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.		
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐		

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	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

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

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

Signature:

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	/Tung-Yun McNally/		Date (YYYY-MM-DD)	2019-02-08	
First Name	Tung-Yun	Last Name	McNally	Registration Number	66,725

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

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	TBD
Application Filing Date	:	TBD
Examiner	:	TBD
Art Unit	:	TBD
Confirmation No.	:	TBD
Attorney Docket No.	:	US76497
First Inventor	:	Chongming ZHANG
Customer No.	:	145688

PRELIMINARY AMENDMENT

A Listing of Claims begins on page **2** of this paper. This listing of claims will replace all prior versions, and listings, of claims in the application.

Remarks begin on page **4** of this paper.

Listing of Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-44 (Canceled).

Claim 45 (New):

A User Equipment (UE) comprising:

receiving circuitry configured to receive downlink control information (DCI) on a narrowband physical downlink control channel (NPDCCH) after receiving Single-Cell Multicast Control Channel (SC-MCCH) information; and

processing circuitry configured to acquire, in a case that the DCI includes (a) a first field indicating an SC-MCCH information change notification and (b) a second field indicating a resource for a transmission of another SC-MCCH information, the another SC-MCCH information based on the first field and the second field.

Claim 46 (New):

A base station comprising:

transmitting circuitry configured to transmit Single-Cell Multicast Control Channel (SC-MCCH) information; and

generating circuitry configured to generate downlink control information (DCI) which includes (a) a first field indicating an SC-MCCH information change notification and (b) a second field indicating a resource for a transmission of another SC-MCCH information; wherein

the transmitting circuitry is configured to transmit the DCI on a narrowband physical downlink control channel (NPDCCH), and

the transmitting circuitry is configured to transmit the another SC-MCCH information using the resource indicated by the second field.

Claim 47 (New):

A method performed by a User Equipment (UE) comprising:

receiving Single-Cell Multicast Control Channel (SC-MCCH) information;

receiving downlink control information (DCI) on a narrowband physical downlink control channel (NPDCCH);

acquiring, in a case that the DCI includes (a) a first field indicating an SC-MCCH information change notification and (b) a second field indicating a resource for a transmission of another SC-MCCH information, the another SC-MCCH information based on the first field and the second field.

Claim 48 (New):

A method performed by a base station comprising:
transmitting Single-Cell Multicast Control Channel (SC-MCCH) information;
generating downlink control information (DCI) which includes (a) a first field indicating an SC-MCCH information change notification and (b) a second field indicating a resource for a transmission of another SC-MCCH information;
transmitting the DCI on a narrowband physical downlink control channel (NPDCCH);
and
transmitting the another SC-MCCH information using the resource indicated by the second field.

REMARKS

Claims 1-44 are cancelled, claims 45-48 are newly added. Support for the newly added claims can be found in at least paragraph 11, line 33 to paragraph 12, line 12; and paragraph 13, line 37 to paragraph 14, line 25. No new matter is added by this Preliminary Amendment.

CONCLUSION

If the Examiner believes that there are any issues that can be resolved by a telephone conference, or that there are any informalities that can be corrected by an Examiner's amendment, please call the undersigned representative at the number given below.

The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 505142, referencing Attorney Docket No.: US76497

Respectfully submitted,

By / Tung-Yun McNally /

Tung-Yun McNally
Registration No.: 66,725
ScienBiziP, P.C.
550 S. Hope Street, Suite 2825
Los Angeles, CA 90071
Phone: (213) 426-1771
Fax: (213) 426-1788

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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： 201610658544.6

申 请 类 型： 发明专利

发 明 创 造 名 称： 单小区多播业务的信息变更传输方法和设备

申 请 日： 2016.08.11

申 请 人： 夏普株式会社

发明人或设计人： 张崇铭、刘仁茂、山田升平

局长
申长雨

2017 年 09 月 06 日



IA166161

权 利 要 求 书

1. 一种由用户设备 UE 执行的方法，包括：

接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI；

根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知；以及

根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息；

其中，所述 SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

2. 根据权利要求 1 所述的方法，还包括：

接收与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息，或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。

3. 根据权利要求 1 或者 2 所述的方法，还包括，在相同的载波上，在第一时刻接收第一 NPDCCH 信道，以及在第二时刻接收第二 NPDCCH 信道。

4. 根据权利要求 1 或者 2 所述的方法，还包括，在第一载波上接收第一 NPDCCH 信道，以及在第二载波上接收第二 NPDCCH 信道。

5. 根据权利要求 1 或者 2 所述的方法，其中，所述 SC-MCCH 信息变更通知包含在直接指示信息 DII 消息中，该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

6. 根据权利要求 1 或者 2 所述的方法，其中，所述 SC-MCCH 信息变更通知包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

7. 根据权利要求 1 或者 6 所述的方法，其中，如果第二 NPDCCH 指示寻呼消息的传输，则根据所述指示来接收寻呼消息，并查看包含在所述寻呼消息中的 SC-MCCH 信息变更通知。





IA166161

8. 根据权利要求 1 所述的方法, 其中, 所述 SC-MCCH 信息变更通知由一个比特来指示。

9. 根据权利要求 1 所述的方法, 其中, 所述 SC-MCCH 信息变更通知由多个比特来指示。

10. 一种由用户设备 UE 执行的方法, 包括:

接收窄带物理下行控制信道 NPDCCH;

当在所述 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时, 根据所述 DCI 的指示接收 SC-MCCH 信息。

11. 根据权利要求 10 所述的方法, 还包括:

接收与单小区多播控制信道 SC-MCCH 有关的配置信息, 所述配置信息中包括用于接收所述 NPDCCH 的载波相关信息或者时间相关信息。

12. 一种用户设备 UE, 包括:

第一接收单元, 被配置为接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI;

监听单元, 被配置为根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知; 以及

第二接收单元, 被配置为根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息;

其中, 所述 SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

13. 根据权利要求 12 所述的 UE, 还包括, 接收与单小区多播控制信道 SC-MCCH 有关的配置信息, 所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息, 或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。

14. 根据权利要求 12 所述的 UE, 还包括, 在相同载波上, 在第一时刻接收第一 NPDCCH 信道, 在第二时刻接收第二 NPDCCH 信道。

15. 根据权利要求 12 所述的 UE, 还包括, 在第一载波上接收第一 NPDCCH 信道, 以及在第二载波上接收第二 NPDCCH 信道。

16. 根据权利要求 12 或 13 所述的 UE, 其中, 所述 SC-MCCH 信息变更通知包含在直接指示信息 DII 消息中, 该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校





IA166161

验码进行加扰。

17. 根据权利要求 12 或 13 所述的 UE，其中，所述 SC-MCCH 信息变更通知包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

18. 根据权利要求 12 或 17 所述的 UE，其中，如果第二 NPDCCH 指示寻呼消息的传输，则根据所述指示来接收寻呼消息，并查看包含在所述寻呼消息中的 SC-MCCH 信息变更通知。

19. 根据权利要求 12 所述的 UE，其中，所述 SC-MCCH 信息变更通知由一个比特来指示。

20. 根据权利要求 12 所述的 UE，其中，所述 SC-MCCH 信息变更通知由多个比特来指示。

21. 一种用户设备 UE，包括：

第一接收单元，被配置为接收窄带物理下行控制信道 NPDCCH 信道；以及

第二接收单元，被配置为当在所述 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时，根据所述 DCI 的指示接收 SC-MCCH 信息。

22. 根据权利要求 21 所述的 UE，还包括：

接收与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述 NPDCCH 的载波相关信息或者时间相关信息。

23. 一种由基站执行的方法，包括：

在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知；以及

在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

24. 根据权利要求 23 所述的方法，其中，发送与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息，或者包括用于接收所述第





IA166161

二 NPDCCH 的载波相关信息或者时间相关信息。

25. 根据权利要求 23 所述的方法，其中，在相同的载波上在第一时刻发送第一 NPDCCH 信道，以及在第二时刻发送第二 NPDCCH 信道。

26. 根据权利要求 23 所述的方法，其中，在第一载波上发送第一 NPDCCH 信道，以及在第二载波上发送第二 NPDCCH 信道。

27. 根据权利要求 23 所述的方法，其中，所述 SC-MCCH 信息变更通知包含在直接指示信息 DII 消息中，该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

28. 根据权利要求 23 所述的方法，其中，所述 SC-MCCH 信息变更通知包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

29. 根据权利要求 23 所述的方法，其中，发送包含 SC-MCCH 信息变更通知的寻呼消息。

30. 根据权利要求 23 所述的方法，其中，所述 SC-MCCH 信息变更通知由一个比特来指示。

31. 根据权利要求 23 所述的方法，其中，所述 SC-MCCH 信息变更通知由多个比特来指示。

32. 一种由基站执行的方法，包括：

在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知，以及指示 SC-MCCH 信息的传输；

根据所述 DCI 的指示发送 SC-MCCH 信息。

33. 根据权利要求 32 所述的方法，还包括：

发送与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述 NPDCCH 的载波相关信息或者时间相关信息。

34. 一种基站，包括：

第一发送单元，被配置为在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含





IA166161

单小区多播控制信道 SC-MCCH 信息变更通知；以及

第二发送单元，被配置为在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输，以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

35. 根据权利要求 34 所述的基站，其中，发送与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息，或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。

36. 根据权利要求 34 所述的基站，其中，在相同的载波上在第一时刻发送第一 NPDCCH 信道，以及在第二时刻发送第二 NPDCCH 信道。

37. 根据权利要求 34 所述的基站，其中，在第一载波上发送第一 NPDCCH 信道，以及在第二载波上发送第二 NPDCCH 信道。

38. 根据权利要求 34 所述的基站，其中，所述 SC-MCCH 信息变更通知包含在直接指示信息 DII 消息中，该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

39. 根据权利要求 34 所述的基站，其中，所述 SC-MCCH 信息变更通知包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

40. 根据权利要求 34 所述的基站，其中，发送包含 SC-MCCH 信息变更通知的寻呼消息。

41. 根据权利要求 34 所述的基站，其中，所述 SC-MCCH 信息变更通知由一个比特来指示。

42. 根据权利要求 34 所述的基站，其中，所述 SC-MCCH 信息变更通知由多个比特来指示。

43. 一种基站，包括：

第一发送单元，被配置为在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知，以及指示 SC-MCCH 信息的传输；以及

第二发送单元，被配置为根据所述 DCI 的指示发送 SC-MCCH 信息。





IA166161

44. 根据权利要求 43 所述的基站，还包括：

发送与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述 NPDCCH 的载波相关信息或者时间相关信息。



说明书

单小区多播业务的信息变更传输方法和设备

技术领域

本发明涉及无线通信技术领域。更具体地，涉及单小区多播业务的信息变更传输方法和设备。

背景技术

随着移动通信的快速增长和技术的巨大进步，世界将走向一个完全互联互通的网络社会，即任何人或任何东西在任何时间和任何地方都可以获得信息和共享数据。预计到 2020 年，互联设备的数量将达到 500 亿部，其中仅有 100 亿部左右可能是手机和平板电脑，其它的则不是与人对话的机器，而是彼此对话的机器。因此，如何设计系统以更好地支持万物互联是一项需要深入研究的课题。

为了更好地实现万物互联，在 2015 年 9 月举行的 3GPP RAN#69 全会上，第三代合作伙伴计划(3GPP) 的长期演进项目 (LTE) 的标准中提出了一个新的工作项目 (参见非专利文献：RP-151621 New Work Item: NarrowBand IOT (NB-IoT))，其可被称之为窄带物联网 (NB-IoT)。在该项目的描述中，为了实现物联网终端的低功耗、长待机、降成本、广覆盖等要求，NB-IoT 被设置为工作在上下行 180KHz 的窄带系统。第一阶段的 NB-IoT 系统已完成了基本的功能设计，包括系统信息的广播通知、点对点的单播上行数据发送和下行数据接收等。考虑到未来物联网中存在软件下载、终端系统升级以及分组信息的传递等多播需求，在 2016 年 6 月举行的 3GPP RAN#72 全会上确定了以增强 NB-IoT、实现多播为目的的新的工作项目 (参见非专利文献：RP-161324 New work item proposal: Enhancements of NB-IoT)，明确指出在现有的 13 版本的 LTE SC-PTM 特性的基础上实现 NB-IoT 系统中的多播传输。

在现有的 LTE 系统中，SC-PTM (single-cell point-to-multipoint: 单小区点对多点) 是指在单小区内进行的多媒体广播业务的多播传输。

IA166161

该特性引入了两条逻辑信道 SC-MCCH 和 SC-MTCH，它们复用在 DL-SCH 传输层信道上。其中，SC-MCCH（Single Cell Multicast Control Channel，单小区多播控制信道）为控制信道，携带的信息包括：当前小区进行的多播业务类型，以及该业务工作的业务信道 SC-MTCH 的调度和接收配置；SC-MTCH（Single-Cell Multicast Traffic Channel，单小区多播业务信道）为业务信道，携带具体的业务内容。

对多播业务感兴趣的终端首先通过系统消息块 SIB20 上广播的内容，获知 SC-MCCH 信道的调度和配置，进而获取在该控制信道上携带的信息。如果当前小区其中存在终端感兴趣的业务，则终端根据 SC-MCCH 上携带的、与该业务对应的 SC-MTCH 的调度和接收配置建立相应的无线承载 S-MRB(Single Cell Multimedia Broadcast Multicast Service Point to Multipoint Radio Bearer 单小区多媒体广播多播业务点对多点无线承载)，包括配置 RLC（Radio Link Control，无线链路层控制）层、MAC（Media Access Control，介质访问控制）层以及物理层，然后开始接收业务信息。

与此同时，终端还需要周期性的监听 SC-MCCH 信道上的信息是否有变化，以便及时获取更新的 SC-MCCH 信道上的信息。变更通知

（change notification）只发生在变更周期内。在一个变更周期内，网络侧会重复发布相同的 SC-MCCH 信息，一旦有新的业务开始或者结束，需要变更相应的 SC-MCCH 信息，网络侧会在下一个变更周期同时发布变更指示和指示新的 SC-MCCH 信息传输的信息：当下一个变更周期到来时，网络侧在物理下行控制信道（PDCCH）上发布下行控制信息

（Downlink Control information），该 PDCCH 由 SC-N-RNTI 加扰，其中携带的 DCI 包含 8 比特信息为，其中末位比特置‘1’表示 SC-MCCH 上的信息发生变更。用户收到该指示后，需要在同一子帧上接收调度 SC-MCCH 传输的 PDCCH，该 PDCCH 由 SC-RNTI 加扰，其中的 DCI 指示了 SC-MCCH 传输的信息，用户根据该信息，即可在相应的时频资源上接收变更后的 SC-MCCH 信息。

然而，在 NB-IoT 系统中，为了节约成本，系统基于窄带设计，无法支持在同一子帧内既发布变更指示又指示新的 SC-MCCH 信息传输的



IA166161

信息，因此，当为 NB-IoT 系统引入 SC-PTM 特性时，需要寻求新的变更机制以用于 NB-IoT 系统。

此外，现有的 SC-PTM 仅仅用 1bit 指示 SC-MCCH 信息变更，而 SC-MCCH 信息的变更通常是由于一个或者若干个业务信息发生变更引起的，但是由于指示的信息有限，所有的终端在收到变更指示的时候，都去接收 SC-MCCH 信息。如果终端所关注的业务信息并没有发生变更，那么对这部分终端来说，此类的接收带来了额外的耗电，考虑到 NB-IoT 的设计目标，应该尽量避免终端无用的功耗。

发明内容

为了解决上述技术问题，本申请提供了一种涉及单小区多播业务的信息变更传输方法和设备。

具体地，根据本发明的一个方面，提供了一种由用户设备 UE 执行的方法，包括：接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI；根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知；以及根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。其中，SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

根据本发明的另一个方面，提供了一种由用户设备 UE 执行的方法，包括：接收窄带物理下行控制信道 NPDCCH 信道；以及当在所述 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时，根据所述 DCI 的指示接收 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种用户设备 UE，包括：第一接收单元，被配置为接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI；监听单元，被配置为根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知；以及第二接收单元，被配置为根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。其中，SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

根据本发明的另一个方面，提供了一种用户设备 UE，包括：第一接收单元，被配置为接收窄带物理下行控制信道 NPDCCH 信道；以及



IA166161

第二接收单元，被配置为当在所述 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时，根据所述 DCI 的指示接收 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种由基站执行的方法，包括：在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知；以及在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输，以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种由基站执行的方法，包括：在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知，以及指示 SC-MCCH 信息的传输；根据所述 DCI 的指示发送 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种基站，包括：第一发送单元，被配置为在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知；以及第二发送单元，被配置为在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种基站，包括：第一发送单元，被配置为在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知，以及指示 SC-MCCH 信息的传输；以及第二发送单元，被配置为根据所述 DCI 的指示发送 SC-MCCH 信息。

附图说明

通过下文结合附图的详细描述，本申请的上述和其它特征将会变得更加明显，其中：

图 1 是示出了根据本申请一个实施例的用户设备的框图。

图 2 是示出了根据本申请一个实施例的基站的框图。



IA166161

图 3 是示出了根据本申请一个实施例的由用户设备执行的方法的流程图。

图 4 是示出了根据本申请一个实施例的由基站执行的方法的流程图。

具体实施方式

下面结合附图和具体实施方式对本发明进行详细阐述。应当注意，本发明不应局限于下文所述的具体实施方式。另外，为了简便起见，省略了对与本发明没有直接关联的公知技术的详细描述，以防止对本发明的理解造成混淆。

下文以 LTE 移动通信系统及其后续的演进版本作为示例应用环境，以支持 NB-IoT 的基站和终端设备为例，具体描述了根据本发明的多个实施方式。然而，需要指出的是，本发明不限于以下实施方式，而是可适用于更多其它的无线通信系统，例如今后的 5G 蜂窝通信系统，而且可以适用于其他基站和终端设备，例如支持 eMTC、MMTC 等的基站和终端设备。

在具体描述之前，先对本发明中提到的若干术语简写做如下说明。除非另有指出，本发明中涉及的术语简写具有下文的含义：

SC-MTCH	（单小区多播业务信道）
NPDCCH	（窄带物理下行控制信道）
DCI	（下行控制信息）
SC-RNTI	（单小区无线接入网临时标识）
SC-N-RNTI	（单小区通知无线接入网临时标识）
P-RNTI	（寻呼无线接入网临时标识）
DII	（直接指示信息）
CRC	（循环冗余校验）
TMGI	（临时移动组标识）
MBMS	（多媒体广播多播业务）

图 1 是示出了根据本申请一个实施例的用户设备 UE（下文也称为终端）的框图。如图 1 所示，UE 100 包括第一接收单元 110、监听单元





IA166161

120 和第二接收单元 130。

在一个实施例中，第一接收单元 110 被配置为接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI。监听单元 120 被配置为根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知。在本实施例中，SC-MCCH 信息变更通知可以包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。第二接收单元 130 被配置为根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。

可选的，UE 100 还可以接收与单小区多播控制信道 SC-MCCH 有关的配置信息。该配置信息中包括用于接收第一 NPDCCH 的载波相关信息或者时间相关信息，或者包括用于接收第二 NPDCCH 的载波相关信息或者时间相关信息。

可选的，当第一 NPDCCH 信道和第二 NPDCCH 信道位于相同的载波上时，第一 NPDCCH 信道和第二 NPDCCH 信道不在相同的子帧内。而当第一 NPDCCH 信道和第二 NPDCCH 信道位于不同的载波上时，第一 NPDCCH 信道和第二 NPDCCH 信道在相同的子帧内或在不同的子帧内。

可选的，SC-MCCH 信息变更通知可以包含在直接指示信息 DII 消息中，该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。此外，SC-MCCH 信息变更通知还可以包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

可选的，如果第二 NPDCCH 指示寻呼消息的传输，则根据所述指示来接收寻呼消息，并查看包含在所述寻呼消息中的 SC-MCCH 信息变更通知。

可选的，SC-MCCH 信息变更通知由一个比特来指示，也可以由多个比特来指示。

在另一实施例中，第一接收单元 110 可以被配置为接收窄带物理下行控制信道 NPDCCH 信道。第二接收单元 130 被配置为当在 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时，





IA166161

根据该 DCI 的指示接收 SC-MCCH 信息。

图 2 是示出了根据本申请一个实施例的基站 BS 的框图。如图 2 所示, BS 200 包括第一发送单元 210 和第二发送单元 220。

在一个实施例中, 第一发送单元 210 被配置为在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI, 所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知。第二发送单元 220 被配置为在第一 NPDCCH 上发送下行链路控制信息 DCI, 指示 SC-MCCH 信息的传输以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

可选的, BS 200 发送与单小区多播控制信道 SC-MCCH 有关的配置信息, 所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息, 或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。

可选的, 当第一 NPDCCH 信道和第二 NPDCCH 信道位于相同的载波上时, 第一 NPDCCH 信道和第二 NPDCCH 信道不在相同的子帧内。而当第一 NPDCCH 信道和第二 NPDCCH 信道位于不同的载波上时, 第一 NPDCCH 信道和第二 NPDCCH 信道在相同的子帧内或在不同的子帧内。

可选的, SC-MCCH 信息变更通知可以包含在直接指示信息 DII 消息中, 该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

可选的, SC-MCCH 信息变更通知可以包含在寻呼消息中, 指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

可选的, BS 200 发送包含 SC-MCCH 信息变更通知的寻呼消息。

可选的, 所述 SC-MCCH 信息变更通知由一个比特来指示, 或者由多个比特来指示。

在另一个实施例中, 第一发送单元 210 被配置为在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI, 所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知, 以及指示 SC-MCCH 信息的传输。第二发送单元 220 被配置为根据所述 DCI 的指示发送 SC-MCCH 信





IA166161

息。

以下，详细描述根据本发明的若干操作示例。

示例 1

终端接收 SC-PTM 控制信道 SC-MCCH 的配置信息，该配置信息可以是由系统消息广播的，或者是由专有信令通知终端的。

该配置信息用于接收 SC-MCCH 信息，其中，可以包括接收 SC-MCCH 信道的载波信息，或者接收 SC-MCCH 信道的子帧偏移量，可用于下述第一 NPDCCH 的接收；此外，还可以包括接收 SC-MCCH 信息变更通知的载波信息，或者接收 SC-MCCH 信息变更通知的子帧偏移量，可用于下述第二 NPDCCH 的接收等。

SC-MCCH 信息是指在 SC-MCCH 信道上传播的信息/消息，在 NB-IoT 系统下，它的传输可以由 NPDCCH 来指示的，这里称为第一 NPDCCH，在第一 NPDCCH 信道上携带的 DCI 指示了 SC-MCCH 传输的时频资源、编码信息，以及可选的，SC-MCCH 传输的重复次数等等，终端可以根据该 DCI 的指示来接收 SC-MCCH 信息。

终端根据配置信息，首次接收 SC-MCCH 信道上传输的信息/消息之后，开始监听第二 NPDCCH 信道。当根据第二 NPDCCH 信道上携带的 DCI 的信息收到了 SC-MCCH 信息的变更指示，则根据第一 NPDCCH 上的 DCI 的指示去重新接收 SC-MCCH 信息。具体包括：

方案一：根据配置信息，如果配置信息中仅包含了第一 NPDCCH 的相关信息，可以认为第一 NPDCCH 和第二 NPDCCH 可能出现的位置相同，需要终端这些位置上进行检测。检测过程包括：

首先，为了区分第一 NPDCCH 和第二 NPDCCH，网络侧对第一 NPDCCH 和第二 NPDCCH 上的 DCI 采用不同的 RNTI 对其 CRC 校验码进行加扰，具体的可以是对第一 NPDCCH 上的 DCI 采用现有的 SC-RNTI 或者是新设计的 RNTI 对其 CRC 校验码进行加扰，对第二 NPDCCH 上的 DCI 采用现有的 SC-N-RNTI 或者 P-RNTI 或者是新设计的、与第一 NPDCCH 信道不同的 RNTI 对其 CRC 校验码进行加扰。

基于不同的 RNTI，在特定位置，如果终端检测到的 DCI 是由 SC-N-RNTI 加扰的，则表明此刻出现的是第二 NPDCCH，进而读取其中的变更通知，并在下一位置继续检测，如果检测到的是 SC-RNTI，则表





IA166161

明此刻出现的是第一 NPDCCH，进而读取其中的 SC-MCCH 传输信息，从而获取 SC-MCCH 信息。

上述情况优选的，网络侧和终端事先约定或者通知第二 NPDCCH 可能出现的位置，例如 SC-MCCH 在一个变更周期内周期性传输，如果有变更信息出现，网络侧会在一个变更周期内的 SC-MCCH 传输的第奇数个（或者第偶数个）周期所在位置发布变更信息，例如，一个变更周期内包含 6 个 SC-MCCH 的传输时刻，未发生变更时，这个 6 个传输时刻上传的 SC-MCCH 信息是相同的，但是终端在接收时，有选择的仅在该变更周期的第 1,3,5 个传输时刻进行 RNTI 检测，判断此时出现的是 SC-RNTI 还是 SC-N-RNTI，如果是 SC-RNTI，则表示信息未变更，如果出现的是 SC-N-RNTI，则表示信息发生了变更，则在下一时刻例如 2,4,6 时刻接收 SC-MCCH 信息。

方案二：第一 NPDCCH 和第二 NPDCCH 包含在同一公共搜索空间中，可以采用现有的 Type2-NPDCCH common search space（公共搜索空间）设计或者类似的公共搜索空间的设计，该公共搜索空间由多个子帧构成，可以包括多个 NPDCCH。终端需要对同一公共搜索空间中的不同 NPDCCH 进行检测。检测过程包括：

首先，为了区分第一 NPDCCH 和第二 NPDCCH，网络侧对第一 NPDCCH 和第二 NPDCCH 上的 DCI 采用不同的 RNTI 对其 CRC 校验码进行加扰，具体的可以是对第一 NPDCCH 上的 DCI 采用现有的 SC-RNTI 或者是新设计的 RNTI 对其 CRC 校验码进行加扰，对第二 NPDCCH 上的 DCI 采用现有的 SC-N-RNTI 或者 P-RNTI 或者是新设计的、与第一 NPDCCH 信道不同的 RNTI 对其 CRC 校验码进行加扰。

终端从该公共搜索空间的起始位置开始，依次搜索空间内可能包含的 NPDCCH，并检测是否存在由 SC-N-RNTI 加扰的 DCI。例如，公共搜索空间包含 10 个子帧，0 号-3 号子帧为一号 NPDCCH 所在的位置，4 号-6 号子帧为二号 NPDCCH 所在位置，7 号-9 号子帧为三号 NPDCCH 所在位置。终端在对应子帧上分别接收一号到三号 NPDCCH，并检测它们的 CRC 是否有 SC-N-RNTI 加扰，从而判断是否存在第二 NPDCCH，如果存在，且指示信息变更，则终端在同一公共搜索空间内搜索以 SC-RNTI 加扰的 DCI，即第一 NPDCCH，从而获取 SC-MCCH





IA166161

信息。

方案三：携带变更通知的 DCI 由 P-RNTI 加扰，则终端首先接收第二 NPDCCH。

如果第二 NPDCCH 指示了寻呼消息的传输，则终端根据指示，接收寻呼消息，并查看包含在寻呼消息中的信息变更通知，

- 如果指示信息变更，则终端在第一 NPDCCH 上接收 SC-MCCH 传输信息，从而获取 SC-MCCH 信息；
- 如果指示信息未变更，则终端无需更新 SC-MCCH 信息。

如果第二 NPDCCH 携带了 Direct Indication information 消息（即不指示寻呼消息的传输），则终端查看包含在 DCI 中的信息变更通知，

- 如果指示信息变更，则终端在第一 NPDCCH 上接收 SC-MCCH 传输信息，从而获取 SC-MCCH 信息；
- 如果指示信息未变更，则终端无需更新 SC-MCCH 信息。

方案四：配置信息中分别包含了接收第一 NPDCCH 的位置（例如载波或者时间）相关信息和接收第二 NPDCCH 的位置（例如载波或者时间）相关信息，则终端首先在第二 NPDCCH 的位置进行接收，如果终端接收到了指示变更的 DCI，则相应的在第一 NPDCCH 上接收 SC-MCCH 传输信息，从而获取 SC-MCCH 信息。如果没有收到，则表示 SC-MCCH 信息没有变更，终端无需到第一 NPDCCH 的位置接收 SC-MCCH 传输信息。

可选的，当所述第一 NPDCCH 信道和所述第二 NPDCCH 信道在相同的载波上时，第一 NPDCCH 信道和第二 NPDCCH 信道不存在于相同的子帧内。

可选的，当所述第一 NPDCCH 信道和所述第二 NPDCCH 信道在不同的载波上时，第一 NPDCCH 信道和第二 NPDCCH 信道可以存在于相同的子帧内也可以存在于不同的子帧内。

上述所有方案中，可选的，第一 NPDCCH 上的 DCI 可以采用现有的 NB-IoT 的 DCI 格式 NPDCCH DCI format N1 或者 N2（定义可见 TS 36.212）或者是新设计的 NPDCCH DCI format，同时可以采用现有的 SC-RNTI 或者是新设计的 RNTI 对其 CRC 校验码进行加扰。

SC-MCCH 信息的变更通知可以包含在第二 NPDCCH 携带的 DCI





IA166161

中。可选的，第二 NPDCCH 上的 DCI 可以采用格式现有的 NB-Iot 的 DCI 格式 NPDCCH DCI format N1 或者 N2（定义可见 TS 36.212）或者是新设计的 NPDCCH DCI format，并采用现有的 SC-N-RNTI 或者是新设计的 RNTI（该 RNTI 可以与第一 NPDCCH 上的 RNTI 相同或者不同）对其 CRC 校验码进行加扰。

可选的，当 SC-MCCH 信息变更通知包含在 Direct Indication information 消息中，该消息可采用现有的 NB-Iot 的 DCI 格式 NPDCCH DCI format N1 或者 N2（定义可见 TS 36.212）或者是新设计的 NPDCCH DCI format，同时可以采用现有的 SC-RNTI 或者是新设计的 RNTI，或者可以采用现有的用于寻呼的 P-RNTI 或者新设计的用于寻呼的 RNTI 对其 CRC 校验码进行加扰。。

可选的，该 SC-MCCH 信息变更通知可以包含在寻呼消息中，指示寻呼消息传输的 DCI 可以采用现有的 NB-Iot 的 DCI 格式 NPDCCH DCI format N1 或者 N2（定义可见 TS 36.212）或者是新设计的 NPDCCH DCI format，或者可以采用现有的用于寻呼的 P-RNTI 或者新设计的用于寻呼的 RNTI 对其 CRC 校验码进行加扰。

示例 2

终端接收 SC-PTM 控制信道 SC-MCCH 的配置信息，该配置信息可以是由系统消息广播的，或者是由专有信令通知终端的。

该配置信息用于接收 SC-MCCH 信息，其中，配置信息中可以包括接收 SC-MCCH 信道的载波信息，或者接收 SC-MCCH 信道的子帧偏移量,或者 NPDCCH 的重复次数等等，可用于下述第一 NPDCCH 的接收。

SC-MCCH 信息是指在 SC-MCCH 信道上传播的信息/消息，它的传输是由一个 NPDCCH 来指示的，这里称为第一 NPDCCH，在第一 NPDCCH 信道上携带的 DCI 指示了 SC-MCCH 传输的时频资源以及编码信息，还有重复次数等等，终端可以根据该 DCI 的指示接收 SC-MCCH 信息。可选的，第一 NPDCCH 上的 DCI 可以采用格式 NPDCCH DCI format N1 或者 N2 或者新设计的格式，并采用现有的 SC-RNTI 或者新设计的 RNTI 对其 CRC 校验码进行加扰。

SC-MCCH 信息变更通知可以同时包含在第一 NPDCCH 携带的 DCI 中。





IA166161

当终端接收到变更通知时，根据变更通知中携带的序列号，首先判断发生变更的业务信息是否是其关注的，或则是其感兴趣的；如果是，则终端继续接收 SC-MCCH 信息，如果不是，终端可以忽略本次变更通知，不去接收 SC-MCCH 信息。

图 3 是示出了根据本申请一个实施例的由用户设备执行的方法的流程图。如图 3 所示，方法 300 在步骤 S310 处开始。

在步骤 S320，接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI。

在步骤 S330，根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知。例如，SC-MCCH 信息变更通知可以包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

在步骤 S340，根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。

最后，方法 300 在步骤 S350 处结束。

图 4 是示出了根据本申请一个实施例的由基站执行的方法的流程图。如图 4 所示，方法 400 在步骤 S410 处开始。

在步骤 S420，在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知。

在步骤 S430，在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输。

在步骤 S440，根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

最后，方法 400 在步骤 S450 处结束。

运行在根据本发明的设备上的程序可以通过控制中央处理单元（CPU）来使计算机实现本发明的实施例功能的程序。该程序或由该程序处理的信息可以临时存储在易失性存储器（如随机存取存储器 RAM）、硬盘驱动器（HDD）、非易失性存储器（如闪存存储器）、或其他存储器系统中。

用于实现本发明各实施例功能的程序可以记录在计算机可读记录





IA166161

介质上。可以通过使计算机系统读取记录在所述记录介质上的程序并执行这些程序来实现相应的功能。此处的所谓“计算机系统”可以是嵌入在该设备中的计算机系统，可以包括操作系统或硬件（如外围设备）。“计算机可读记录介质”可以是半导体记录介质、光学记录介质、磁性记录介质、短时动态存储程序的记录介质、或计算机可读的任何其他记录介质。

用在上述实施例中的设备的各种特征或功能模块可以通过电路（例如，单片或多片集成电路）来实现或执行。设计用于执行本说明书所描述的功能的电路可以包括通用处理器、数字信号处理器（DSP）、专用集成电路（ASIC）、现场可编程门阵列（FPGA）、或其他可编程逻辑器件、分立的门或晶体管逻辑、分立的硬件组件、或上述器件的任意组合。通用处理器可以是微处理器，也可以是任何现有的处理器、控制器、微控制器、或状态机。上述电路可以是数字电路，也可以是模拟电路。因半导体技术的进步而出现了替代现有集成电路的新的集成电路技术的情况下，本发明的一个或多个实施例也可以使用这些新的集成电路技术来实现。

此外，本发明并不局限于上述实施例。尽管已经描述了所述实施例的各种示例，但本发明并不局限于此。安装在室内或室外的固定或非移动电子设备可以用作终端设备或通信设备，如 AV 设备、厨房设备、清洁设备、空调、办公设备、自动贩售机、以及其他家用电器等。

如上，已经参考附图对本发明的实施例进行了详细描述。但是，具体的结构并不局限于上述实施例，本发明也包括不偏离本发明主旨的任何设计改动。另外，可以在权利要求的范围内对本发明进行多种改动，通过适当地组合不同实施例所公开的技术手段所得到的实施例也包含在本发明的技术范围内。此外，上述实施例中所描述的具有相同效果的组件可以相互替代。



说明书附图

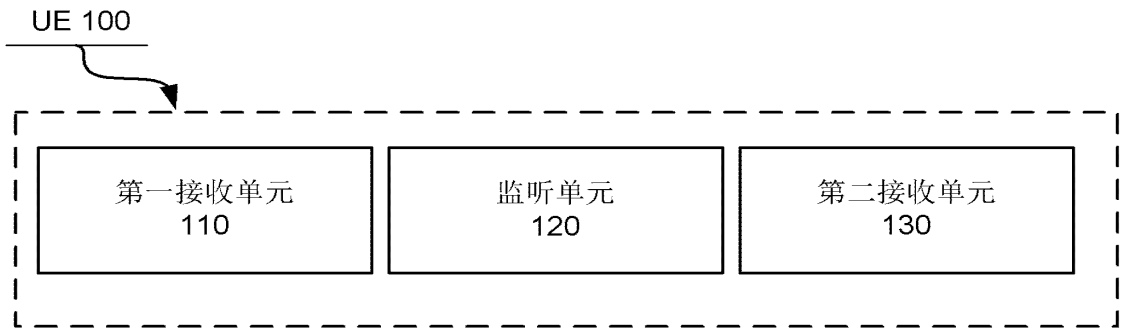


图 1

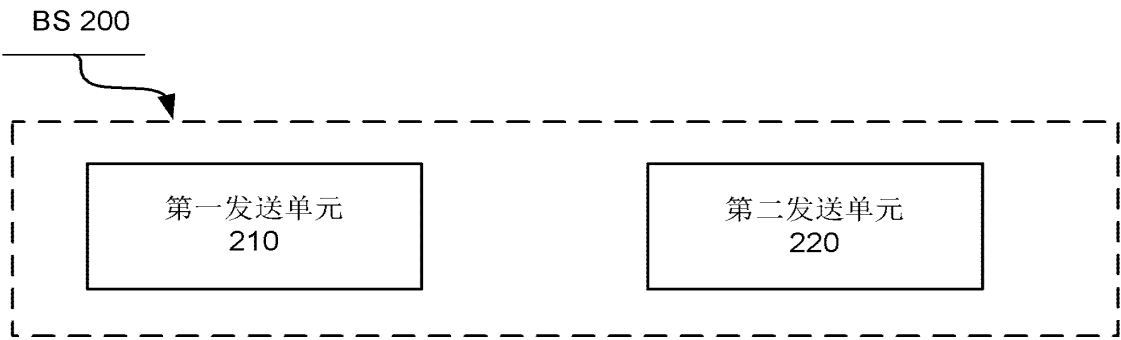


图 2



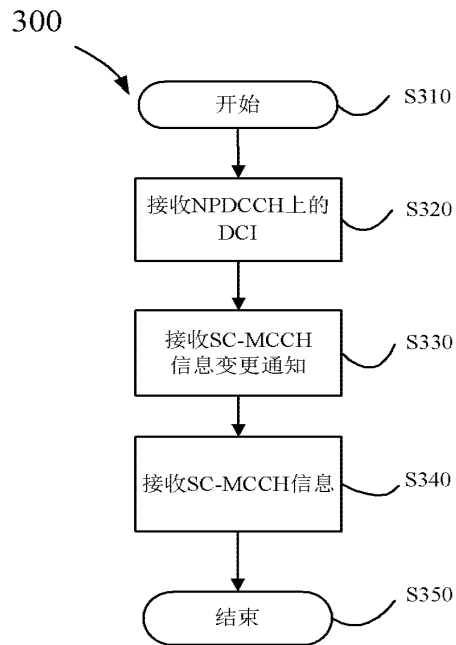


图 3

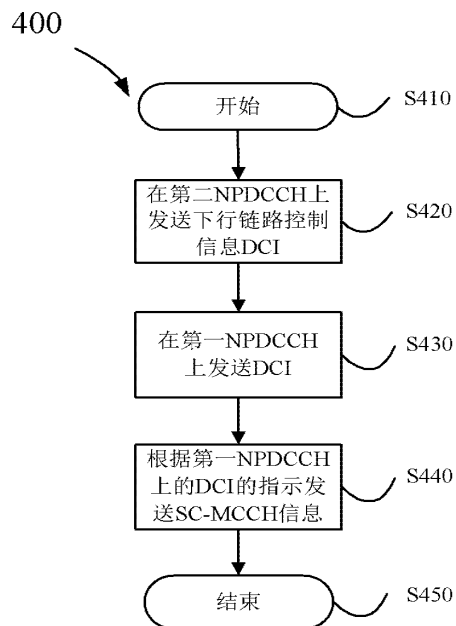


图 4



**DOCUMENT MADE AVAILABLE UNDER THE
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PCT请求书

打印件(原件为电子形式)

0	由受理局填写	
0-1	国际申请号	PCT/CN2017/096794
0-2	国际申请日	2017年 8月 10日 (10. 08. 2017)
0-3	受理局名称和“PCT国际申请”	RO/CN
0-4	PCT/RO/101表 PCT请求书	
0-4-1	软件版本	CEPCT 版本 1. 01. 00 MT/FOP 20140331/0. 20. 5. 21
0-5	请求 下列签字人请求按照专利合作条约的规定 处理本国际申请	
0-6	申请人指定的受理局	中华人民共和国国家知识产权局 (RO/CN)
0-7	申请人或代理人的档案号	IP170184
I	发明名称	单小区多播业务的信息变更传输方法和设备
II	申请人	申请人 (applicant only)
II-1	该人是	所有指定国 (all designated States)
II-2	是对下列国家的申请人	夏普株式会社
II-4zh	名称	SHARP KABUSHIKI KAISHA
II-4en	Name:	日本大阪府堺市
II-5zh	地址	堺区匠町1番地
II-5en	Address	590-8522 , 1 Takumi-cho, Sakai-ku, Sakai City, Osaka 590-8522 Japan
II-6	国籍	日本 JP
II-7	居所	日本 JP
II-8	电话号码	
II-9	传真号码	
II-11	申请人在专利局的登记号	

PCT请求书

打印件(原件为电子形式)

III-1 III-1-1 III-1-2 III-1-4 zh III-1-4 en III-1-5 zh	申请人和/或发明人 该人是 是对下列国家的申请人 姓名: Name (LAST, First): 地址	申请人和发明人 (applicant and inventor) SC 张 崇铭 ZHANG, Chongming 中国上海市 浦东新区金海路1111号 201206 No. 1111, Jinhai Rd., Pudong Shanghai 201206 China 中国 CN 中国 CN
III-1-5 en III-1-6 III-1-7 III-1-1 1	Address 国籍 居所 申请人在专利局的登记号	
III-2 III-2-1 III-2-3 III-2-4 zh III-2-4 en III-2-5 zh	申请人和/或发明人 该人是 对下列国家的发明人 姓名: Name (LAST, First): 地址	发明人 (inventor only) 刘 仁茂 LIU, Renmao 中国上海市 浦东新区金海路1111号 201206 No. 1111, Jinhai Rd., Pudong Shanghai 201206 China
III-2-5 en	Address	
III-3 III-3-1 III-3-3 III-3-4 zh III-3-4 en III-3-5 zh	申请人和/或发明人 该人是 对下列国家的发明人 姓名: Name (LAST, First): 地址	发明人 (inventor only) 山田 升平 YAMADA, Shohei 日本大阪府堺市 堺区匠町1番地 590-8522
III-3-5 en	Address	, 1 Takumi-cho, Sakai-ku, , Sakai City, Osaka 590-8522 Japan

PCT请求书

打印件(原件为电子形式)

IV-1	代理人, 共同代表或通信地址	代理人 (agent)
IV-1-1zh	下列人员被委托/已经被委托为代表申请人在主管国际单位办理事务的名称	中科专利商标代理有限责任公司
IV-1-1en	Name:	CHINA SCIENCE PATENT & TRADEMARK AGENT LTD.
IV-1-2zh	地址	中国北京市 海淀区西三环北路87号4-1105室 100089
IV-1-2en	Address:	Suite 4-1105, No. 87, West 3rd Ring North Rd., Haidian District Beijing 100089 China
IV-1-3	电话号码	86-10-68619696
IV-1-4	传真号码	86-10-82378400
IV-1-5	电子邮箱址	csptal@csptal.com
IV-1-5(a)	电子邮件授权 授权受理局、国际检索单位、国际局和国际初步审查单位, 如果其愿意, 使用本电子邮件地址发送有关本国际申请的通知书:	作为随后纸件通知书的预送本
IV-1-6	代理人登记号	11021
V	国家的指定	
V-1	根据细则4.9(a), 提交本请求书即为, 指定在国际申请日受PCT约束的所有成员国, 以要求获得可以获得的所有保护类型, 适用情况下, 要求获得地区专利和国家专利。	
V-2	V-2栏只可用于(不可悔改地)排除对有关国家的指定, 如果本国际申请在提交时或者在根据细则26之二.1的后续程序中, 第VI栏包含有对在该有关国家提出的在先国家申请的优先权要求, 以避免被要求优先权的该在先国家申请因国家法律而停止效力。	
VI-1	要求在先国家申请的优先权	
VI-1-1	申请日	2016年 8月 11日 (11. 08. 2016)
VI-1-2	号码	201610658544. 6
VI-1-3	国家	中国 CN
VI-2	优先权文件请求	
	请受理局准备并向国际局送交上述在先申请中标号如下的在先申请的证明副本:	VI-1
VI-3	援引加入: 如果条约11(1)(iii)(d)或(e)规定的国际申请的某一项目, 或者细则20.5(a)规定的说明书, 权利要求书或附图的某一部分不包含在本国际申请中, 但是全部包含在一个在先申请中, 并且在受理局首次收到条约11(1)(iii)规定的一个或多个项目之日要求了该在先申请的优先权, 则该项目或该部分可以依据细则20.6确认, 为细则20.6的目的援引加入到该国际申请中。	
VII-1	选定的国际检索单位	中华人民共和国国家知识产权局 (ISA/CN)

PCT请求书

打印件(原件为电子形式)

VIII	声明	声明数目	
VIII-1	关于发明人身份的声明	—	
VIII-2	关于申请人在国际申请日有权申请和被授予专利的声明	—	
VIII-3	关于申请人在国际申请日有权要求在先申请的优先权的说明	—	
VIII-4	发明人资格声明(仅为指定美国目的)	—	
VIII-5	关于不影响新颖性的公开或缺乏新颖性的例外的声明	—	
IX	清单	页数	附以电子文档
IX-1	请求书(包括声明页)	4	✓
IX-2	说明书	14	✓
IX-3	权利要求	5	✓
IX-4	摘要	1	✓
IX-5	附图	2	✓
IX-7	共计	26	
	附件	附以纸件	附以电子文档
IX-8	费用计算页	—	✓
IX-11	总委托书副本	—	✓
IX-18	PCT-SAFE 物理载体	—	—
IX-20	应与摘要一起公布的附图图号	1	
IX-21	国际申请所用语言	中文	
X-1	申请人, 代理人或共同代表的签字	/中科专利商标代理有限公司 /	
X-1-1	名称	中科专利商标代理有限公司 中科专利商标代理有限公司 代理人	
X-1-2	签字人姓名		
X-1-3	还要注明此人是以什么名义签字的		

由受理局填写

10-1	据称的国际申请文件的实际收到日期	2017年 8月 10日 (10. 08. 2017)
10-2	附图:	
10-2-1	收到	
10-2-2	未收到	
10-3	由于随后在期限内收到补充国际申请的文件或附图, 更改的实际收到日期	
10-4	在期限内收到根据PCT第11(2)条所进行的改正的日期	
10-5	国际检索单位	ISA/CN
10-6	检索本的传送推迟到缴纳检索费后	

由国际局填写

11-1	国际局收到登记本日期	
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(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国际局

(43) 国际公布日
2018 年 2 月 15 日 (15.02.2018)



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- (30) 优先权:
201610658544.6 2016 年 8 月 11 日 (11.08.2016) CN
- (71) 申请人: 夏普株式会社 (SHARP KABUSHIKI KAISHA) [JP/JP]; 日本大阪府堺市堺区匠町 1 番地, Osaka 〒590-8522 (JP)。
- (72) 发明人: 及
- (71) 申请人 (仅对 SC): 张崇铭 (ZHANG, Chongming) [CN/CN]; 中国上海市浦东新区金海路 1111 号, Shanghai 201206 (CN)。
- (72) 发明人: 刘仁茂 (LIU, Renmao); 中国上海市浦东新区金海路 1111 号, Shanghai 201206 (CN)。 山田升平 (YAMADA, Shohei); 日本大阪府堺市堺区匠町 1 番地, Osaka 〒590-8522 (JP)。
- (74) 代理人: 中科专利商标代理有限责任公司 (CHINA SCIENCE PATENT & TRADEMARK AGENT LTD.); 中国北京市海淀区西三环北路 87 号 4-1105 室, Beijing 100089 (CN)。
- (81) 指定国 (除另有指明, 要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG,

(54) Title: INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE

(54) 发明名称: 单小区多播业务的信息变更传输方法和设备

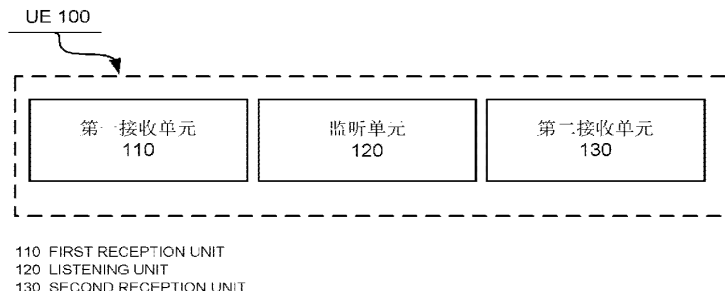


图 1

(57) Abstract: The present invention provides an information change transmission method and device related to a single-cell multicast service. In one aspect, a method executed by a user equipment (UE) comprises: receiving downlink link control information (DCI) on a second narrow-band physical downlink control channel (NPDCCH); receiving a single-cell multicast control channel (SC-MCCH) information change notification according to information on the second NPDCCH; and receiving the SC-MCCH information according to an indication of the DCI on a first NPDCCH, the NPDCCH information change notification being comprised in the DCI of the second NPDCCH or in a message indicated by the DCI of the second NPDCCH. Also provided are a corresponding method executed by a base station, a corresponding user equipment (UE), and the base station.

(57) 摘要: 本申请提供了一种涉及单小区多播业务的信息变更传输方法和设备。根据一个方面, 提供了一种由用户设备 UE 执行的方法, 包括: 接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI; 根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知; 以及根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。其中, SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。还提供了由基站执行的相应方法以及相应的用户设备 UE 和基站。图 1

[见续页]

BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW。

(84) 指定国(除另有指明, 要求每一种可提供的地区保护): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG)。

本国际公布:

— 包括国际检索报告(条约第21条(3))。

单小区多播业务的信息变更传输方法和设备

技术领域

本发明涉及无线通信技术领域。更具体地，涉及单小区多播业务的信息变更传输方法和设备。

背景技术

随着移动通信的快速增长和技术的巨大进步，世界将走向一个完全互联互通的网络社会，即任何人或任何东西在任何时间和任何地方都可以获得信息和共享数据。预计到 2020 年，互联设备的数量将达到 500 亿部，其中仅有 100 亿部左右可能是手机和平板电脑，其它的则不是与人对话的机器，而是彼此对话的机器。因此，如何设计系统以更好地支持万物互联是一项需要深入研究的课题。

为了更好地实现万物互联，在 2015 年 9 月举行的 3GPP RAN#69 全会上，第三代合作伙伴计划(3GPP) 的长期演进项目 (LTE) 的标准中提出了一个新的工作项目 (参见非专利文献：RP-151621 New Work Item: NarrowBand IOT (NB-IoT))，其可被称之为窄带物联网 (NB-IoT)。在该项目的描述中，为了实现物联网终端的低功耗、长待机、降成本、广覆盖等要求，NB-IoT 被设置为工作在上下行 180KHz 的窄带系统。第一阶段的 NB-IoT 系统已完成了基本的功能设计，包括系统信息的广播通知、点对点的单播上行数据发送和下行数据接收等。考虑到未来物联网中存在软件下载、终端系统升级以及分组信息的传递等多播需求，在 2016 年 6 月举行的 3GPP RAN#72 全会上确定了以增强 NB-IoT、实现多播为目的的新的工作项目 (参见非专利文献：RP-161324 New work item proposal: Enhancements of NB-IoT)，明确指出在现有的 13 版本的 LTE SC-PTM 特性的基础上实现 NB-IoT 系统中的多播传输。

在现有的 LTE 系统中，SC-PTM (single-cell point-to-multipoint: 单小区点对多点) 是指在单小区内的进行的多媒体广播业务的多播传输。该特性引入了两条逻辑信道 SC-MCCH 和 SC-MTCH, 它们复用在 DL-SCH 传输

层信道上。其中，SC-MCCH (Single Cell Multicast Control Channel, 单小区多播控制信道) 为控制信道，携带的信息包括：当前小区进行的多播业务类型，以及该业务工作的业务信道 SC-MTCH 的调度和接收配置；SC-MTCH (Single-Cell Multicast Traffic Channel, 单小区多播业务信道) 为业务信道，携带具体的业务内容。

对多播业务感兴趣的终端首先通过系统消息块 SIB20 上广播的内容，获知 SC-MCCH 信道的调度和配置，进而获取在该控制信道上携带的信息。如果当前小区其中存在终端感兴趣的业务，则终端根据 SC-MCCH 上携带的、与该业务对应的 SC-MTCH 的调度和接收配置建立相应的无线承载 S-MRB (Single Cell Multimedia Broadcast Multicast Service Point to Multipoint Radio Bearer 单小区多媒体广播多播业务点对多点无线承载)，包括配置 RLC (Radio Link Control, 无线链路层控制) 层、MAC (Media Access Control, 介质访问控制) 层以及物理层，然后开始接收业务信息。

与此同时，终端还需要周期性的监听 SC-MCCH 信道上的信息是否有变化，以便及时获取更新的 SC-MCCH 信道上的信息。变更通知 (change notification) 只发生在变更周期内。在一个变更周期内，网络侧会重复发布相同的 SC-MCCH 信息，一旦有新的业务开始或者结束，需要变更相应的 SC-MCCH 信息，网络侧会在下一个变更周期同时发布变更指示和指示新的 SC-MCCH 信息传输的信息：当下一个变更周期到来时，网络侧在物理下行控制信道 (PDCCH) 上发布下行控制信息 (Downlink Control information)，该 PDCCH 由 SC-N-RNTI 加扰，其中携带的 DCI 包含 8 比特信息为，其中末位比特置 '1' 表示 SC-MCCH 上的信息发生变更。用户收到该指示后，需要在同一子帧上接收调度 SC-MCCH 传输的 PDCCH，该 PDCCH 由 SC-RNTI 加扰，其中的 DCI 指示了 SC-MCCH 传输的信息，用户根据该信息，即可在相应的时频资源上接收变更后的 SC-MCCH 信息。

然而，在 NB-IoT 系统中，为了节约成本，系统基于窄带设计，无法支持在同一子帧内既发布变更指示又指示新的 SC-MCCH 信息传输的信息，因此，当为 NB-IoT 系统引入 SC-PTM 特性时，需要寻求新的变更机制以用于 NB-IoT 系统。

此外，现有的 SC-PTM 仅仅用 1bit 指示 SC-MCCH 信息变更，而 SC-MCCH 信息的变更通常是由于一个或者若干个业务信息发生变更引起的，但是由于指示的信息有限，所有的终端在收到变更指示的时候，都去接收 SC-MCCH 信息。如果终端所关注的业务信息并没有发生变更，那么对这部分终端来说，此类的接收带来了额外的耗电，考虑到 NB-IoT 的设计目标，应该尽量避免终端无用的功耗。

发明内容

为了解决上述技术问题，本申请提供了一种涉及单小区多播业务的信息变更传输方法和设备。

具体地，根据本发明的一个方面，提供了一种由用户设备 UE 执行的方法，包括：接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI；根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知；以及根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。其中，SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

根据本发明的另一个方面，提供了一种由用户设备 UE 执行的方法，包括：接收窄带物理下行控制信道 NPDCCH 信道；以及当在所述 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时，根据所述 DCI 的指示接收 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种用户设备 UE，包括：第一接收单元，被配置为接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI；监听单元，被配置为根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知；以及第二接收单元，被配置为根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。其中，SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

根据本发明的另一个方面，提供了一种用户设备 UE，包括：第一接收单元，被配置为接收窄带物理下行控制信道 NPDCCH 信道；以及第二接收单元，被配置为当在所述 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时，根据所述 DCI 的指示接收 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种由基站执行的方法，包括：在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知；以及在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输，以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种由基站执行的方法，包括：在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知，以及指示 SC-MCCH 信息的传输；根据所述 DCI 的指示发送 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种基站，包括：第一发送单元，被配置为在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知；以及第二发送单元，被配置为在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

根据本发明的另一个方面，提供了一种基站，包括：第一发送单元，被配置为在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知，以及指示 SC-MCCH 信息的传输；以及第二发送单元，被配置为根据所述 DCI 的指示发送 SC-MCCH 信息。

附图说明

通过下文结合附图的详细描述，本申请的上述和其它特征将会变得更加明显，其中：

图 1 是示出了根据本申请一个实施例的用户设备的框图。

图 2 是示出了根据本申请一个实施例的基站的框图。

图 3 是示出了根据本申请一个实施例的由用户设备执行的方法的流程图。

图 4 是示出了根据本申请一个实施例的由基站执行的方法的流程图。

具体实施方式

下面结合附图和具体实施方式对本发明进行详细阐述。应当注意，本发明不应局限于下文所述的具体实施方式。另外，为了简便起见，省略了对与本发明没有直接关联的公知技术的详细描述，以防止对本发明的理解造成混淆。

下文以 LTE 移动通信系统及其后续的演进版本作为示例应用环境，以支持 NB-IoT 的基站和终端设备为例，具体描述了根据本发明的多个实施方式。然而，需要指出的是，本发明不限于以下实施方式，而是可适用于更多其它的无线通信系统，例如今后的 5G 蜂窝通信系统，而且可以适用于其他基站和终端设备，例如支持 eMTC、MMTC 等的基站和终端设备。

在具体描述之前，先对本发明中提到的若干术语简写做如下说明。除非另有指出，本发明中涉及的术语简写具有下文的含义：

SC-MTCH	（单小区多播业务信道）
NPDCCH	（窄带物理下行控制信道）
DCI	（下行控制信息）
SC-RNTI	（单小区无线接入网临时标识）
SC-N-RNTI	（单小区通知无线接入网临时标识）
P-RNTI	（寻呼无线接入网临时标识）
DII	（直接指示信息）
CRC	（循环冗余校验）
TMGI	（临时移动组标识）
MBMS	（多媒体广播多播业务）

图 1 是示出了根据本申请一个实施例的用户设备 UE(下文也称为终端)的框图。如图 1 所示，UE 100 包括第一接收单元 110、监听单元 120 和第二接收单元 130。

在一个实施例中，第一接收单元 110 被配置为接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI。监听单元 120 被配置为根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知。在本实施例中，SC-MCCH 信息变更通知可以包含在第二 NPDCCH

的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。第二接收单元 130 被配置为根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。

可选的, UE 100 还可以接收与单小区多播控制信道 SC-MCCH 有关的配置信息。该配置信息中包括用于接收第一 NPDCCH 的载波相关信息或者时间相关信息, 或者包括用于接收第二 NPDCCH 的载波相关信息或者时间相关信息。

可选的, 当第一 NPDCCH 信道和第二 NPDCCH 信道位于相同的载波上时, 第一 NPDCCH 信道和第二 NPDCCH 信道不在相同的子帧内。而当第一 NPDCCH 信道和第二 NPDCCH 信道位于不同的载波上时, 第一 NPDCCH 信道和第二 NPDCCH 信道在相同的子帧内或在不同的子帧内。

可选的, SC-MCCH 信息变更通知可以包含在直接指示信息 DII 消息中, 该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。此外, SC-MCCH 信息变更通知还可以包含在寻呼消息中, 指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

可选的, 如果第二 NPDCCH 指示寻呼消息的传输, 则根据所述指示来接收寻呼消息, 并查看包含在所述寻呼消息中的 SC-MCCH 信息变更通知。

可选的, SC-MCCH 信息变更通知由一个比特来指示, 也可以由多个比特来指示。

在另一实施例中, 第一接收单元 110 可以被配置为接收窄带物理下行控制信道 NPDCCH 信道。第二接收单元 130 被配置为当在 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时, 根据该 DCI 的指示接收 SC-MCCH 信息。

图 2 是示出了根据本申请一个实施例的基站 BS 的框图。如图 2 所示, BS 200 包括第一发送单元 210 和第二发送单元 220。

在一个实施例中, 第一发送单元 210 被配置为在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI, 所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知。第二发送单元 220 被配置为在第一 NPDCCH 上发送下行链路控制信息 DCI, 指示 SC-MCCH 信息的传输以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

可选的, BS 200 发送与单小区多播控制信道 SC-MCCH 有关的配置信息, 所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息, 或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。

可选的, 当第一 NPDCCH 信道和第二 NPDCCH 信道位于相同的载波上时, 第一 NPDCCH 信道和第二 NPDCCH 信道不在相同的子帧内。而当第一 NPDCCH 信道和第二 NPDCCH 信道位于不同的载波上时, 第一 NPDCCH 信道和第二 NPDCCH 信道在相同的子帧内或在不同的子帧内。

可选的, SC-MCCH 信息变更通知可以包含在直接指示信息 DII 消息中, 该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

可选的, SC-MCCH 信息变更通知可以包含在寻呼消息中, 指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

可选的, BS 200 发送包含 SC-MCCH 信息变更通知的寻呼消息。

可选的, 所述 SC-MCCH 信息变更通知由一个比特来指示, 或者由多个比特来指示。

在另一个实施例中, 第一发送单元 210 被配置为在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI, 所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知, 以及指示 SC-MCCH 信息的传输。第二发送单元 220 被配置为根据所述 DCI 的指示发送 SC-MCCH 信息。

以下, 详细描述根据本发明的若干操作示例。

示例 1

终端接收 SC-PTM 控制信道 SC-MCCH 的配置信息, 该配置信息可以由系统消息广播的, 或者是由专有信令通知终端的。

该配置信息用于接收 SC-MCCH 信息, 其中, 可以包括接收 SC-MCCH 信道的载波信息, 或者接收 SC-MCCH 信道的子帧偏移量, 可用于下述第一 NPDCCH 的接收; 此外, 还可以包括接收 SC-MCCH 信息变更通知的载波信息, 或者接收 SC-MCCH 信息变更通知的子帧偏移量, 可用于下述第二 NPDCCH 的接收等。

SC-MCCH 信息是指在 SC-MCCH 信道上传播的信息/消息, 在 NB-IoT

系统下，它的传输可以由 NPDCCH 来指示的，这里称为第一 NPDCCH，在第一 NPDCCH 信道上携带的 DCI 指示了 SC-MCCH 传输的时频资源、编码信息，以及可选的，SC-MCCH 传输的重复次数等等，终端可以根据该 DCI 的指示来接收 SC-MCCH 信息。

终端根据配置信息，首次接收 SC-MCCH 信道上传输的信息/消息之后，开始监听第二 NPDCCH 信道。当根据第二 NPDCCH 信道上携带的 DCI 的信息收到了 SC-MCCH 信息的变更指示，则根据第一 NPDCCH 上的 DCI 的指示去重新接收 SC-MCCH 信息。具体包括：

方案一：根据配置信息，如果配置信息中仅包含了第一 NPDCCH 的相关信息，可以认为第一 NPDCCH 和第二 NPDCCH 可能出现的位置相同，需要终端这些位置上进行检测。检测过程包括：

首先，为了区分第一 NPDCCH 和第二 NPDCCH，网络侧对第一 NPDCCH 和第二 NPDCCH 上的 DCI 采用不同的 RNTI 对其 CRC 校验码进行加扰，具体的可以是对第一 NPDCCH 上的 DCI 采用现有的 SC-RNTI 或者是新设计的 RNTI 对其 CRC 校验码进行加扰，对第二 NPDCCH 上的 DCI 采用现有的 SC-N-RNTI 或者 P-RNTI 或者是新设计的、与第一 NPDCCH 信道不同的 RNTI 对其 CRC 校验码进行加扰。

基于不同的 RNTI，在特定位置，如果终端检测到的 DCI 是由 SC-N-RNTI 加扰的，则表明此刻出现的是第二 NPDCCH，进而读取其中的变更通知，并在下一位置继续检测，如果检测到的是 SC-RNTI，则表明此刻出现的是第一 NPDCCH，进而读取其中的 SC-MCCH 传输信息，从而获取 SC-MCCH 信息。

上述情况优选的，网络侧和终端事先约定或者通知第二 NPDCCH 可能出现的位置，例如 SC-MCCH 在一个变更周期内周期性传输，如果有变更信息出现，网络侧会在一个变更周期内的 SC-MCCH 传输的第奇数个（或者第偶数个）周期所在位置发布变更信息，例如，一个变更周期内包含 6 个 SC-MCCH 的传输时刻，未发生变更时，这个 6 个传输时刻上传输的 SC-MCCH 信息是相同的，但是终端在接收时，有选择的仅在该变更周期的第 1,3,5 个传输时刻进行 RNTI 检测，判断此时出现的是 SC-RNTI 还是 SC-N-RNTI，如果是 SC-RNTI，则表示信息未变更，如果出现的是 SC-N-RNTI，则表示信息发生了变更，则在下一时刻例如 2,4,6 时刻接收

SC-MCCH 信息。

方案二：第一 NPDCCH 和第二 NPDCCH 包含在同一公共搜索空间中，可以采用现有的 Type2-NPDCCH common search space（公共搜索空间）设计或者类似的公共搜索空间的设计，该公共搜索空间由多个子帧构成，可以包括多个 NPDCCH。终端需要对同一公共搜索空间中的不同 NPDCCH 进行检测。检测过程包括：

首先，为了区分第一 NPDCCH 和第二 NPDCCH，网络侧对第一 NPDCCH 和第二 NPDCCH 上的 DCI 采用不同的 RNTI 对其 CRC 校验码进行加扰，具体的可以是对第一 NPDCCH 上的 DCI 采用现有的 SC-RNTI 或者是新设计的 RNTI 对其 CRC 校验码进行加扰，对第二 NPDCCH 上的 DCI 采用现有的 SC-N-RNTI 或者 P-RNTI 或者是新设计的、与第一 NPDCCH 信道不同的 RNTI 对其 CRC 校验码进行加扰。

终端从该公共搜索空间的起始位置开始，依次搜索空间内可能包含的 NPDCCH，并检测是否存在由 SC-N-RNTI 加扰的 DCI。例如，公共搜索空间包含 10 个子帧，0 号-3 号子帧为一号 NPDCCH 所在的位置，4 号-6 号子帧为二号 NPDCCH 所在位置，7 号-9 号子帧为三号 NPDCCH 所在位置。终端在对应子帧上分别接收一号到三号 NPDCCH，并检测它们的 CRC 是否有 SC-N-RNTI 加扰，从而判断是否存在第二 NPDCCH，如果存在，且指示信息变更，则终端在同一公共搜索空间内搜索以 SC-RNTI 加扰的 DCI，即第一 NPDCCH，从而获取 SC-MCCH 信息。

方案三：携带变更通知的 DCI 由 P-RNTI 加扰，则终端首先接收第二 NPDCCH。

如果第二 NPDCCH 指示了寻呼消息的传输，则终端根据指示，接收寻呼消息，并查看包含在寻呼消息中的信息变更通知，

- 如果指示信息变更，则终端在第一 NPDCCH 上接收 SC-MCCH 传输信息，从而获取 SC-MCCH 信息；
- 如果指示信息未变更，则终端无需更新 SC-MCCH 信息。

如果第二 NPDCCH 携带了 Direct Indication information 消息（即不指示寻呼消息的传输），则终端查看包含在 DCI 中的信息变更通知，

- 如果指示信息变更，则终端在第一 NPDCCH 上接收 SC-MCCH 传输信息，从而获取 SC-MCCH 信息；

- 如果指示信息未变更，则终端无需更新 SC-MCCH 信息。

方案四：配置信息中分别包含了接收第一 NPDCCH 的位置（例如载波或者时间）相关信息和接收第二 NPDCCH 的位置（例如载波或者时间）相关信息，则终端首先在第二 NPDCCH 的位置进行接收，如果终端接收到了指示变更的 DCI，则相应的在第一 NPDCCH 上接收 SC-MCCH 传输信息，从而获取 SC-MCCH 信息。如果没有收到，则表示 SC-MCCH 信息没有变更，终端无需到第一 NPDCCH 的位置接收 SC-MCCH 传输信息。

可选的，当所述第一 NPDCCH 信道和所述第二 NPDCCH 信道在相同的载波上时，第一 NPDCCH 信道和第二 NPDCCH 信道不存在于相同的子帧内。

可选的，当所述第一 NPDCCH 信道和所述第二 NPDCCH 信道在不同的载波上时，第一 NPDCCH 信道和第二 NPDCCH 信道可以存在于相同的子帧内也可以存在于不同的子帧内。

上述所有方案中，可选的，第一 NPDCCH 上的 DCI 可以采用现有的 NB-Iot 的 DCI 格式 NPDCCH DCI format N1 或者 N2（定义可见 TS 36.212）或者是新设计的 NPDCCH DCI format，同时可以采用现有的 SC-RNTI 或者是新设计的 RNTI 对其 CRC 校验码进行加扰。

SC-MCCH 信息的变更通知可以包含在第二 NPDCCH 携带的 DCI 中。可选的，第二 NPDCCH 上的 DCI 可以采用格式现有的 NB-Iot 的 DCI 格式 NPDCCH DCI format N1 或者 N2（定义可见 TS 36.212）或者是新设计的 NPDCCH DCI format，并采用现有的 SC-N-RNTI 或者是新设计的 RNTI（该 RNTI 可以与第一 NPDCCH 上的 RNTI 相同或者不同）对其 CRC 校验码进行加扰。

可选的，当 SC-MCCH 信息变更通知包含在 Direct Indication information 消息中，该消息可采用现有的 NB-Iot 的 DCI 格式 NPDCCH DCI format N1 或者 N2（定义可见 TS 36.212）或者是新设计的 NPDCCH DCI format，同时可以采用现有的 SC-RNTI 或者是新设计的 RNTI，或者可以采用现有的用于寻呼的 P-RNTI 或者新设计的用于寻呼的 RNTI 对其 CRC 校验码进行加扰。。

可选的，该 SC-MCCH 信息变更通知可以包含在寻呼消息中，指示寻呼消息传输的 DCI 可以采用现有的 NB-Iot 的 DCI 格式 NPDCCH DCI format

N1 或者 N2 (定义可见 TS 36.212)或者是新设计的 NPDCCH DCI format, 或者可以采用现有的用于寻呼的 P-RNTI 或者新设计的用于寻呼的 RNTI 对其 CRC 校验码进行加扰。

示例 2

终端接收 SC-PTM 控制信道 SC-MCCH 的配置信息, 该配置信息可以由系统消息广播的, 或者是由专有信令通知终端的。

该配置信息用于接收 SC-MCCH 信息, 其中, 配置信息中可以包括接收 SC-MCCH 信道的载波信息, 或者接收 SC-MCCH 信道的子帧偏移量, 或者 NPDCCH 的重复次数等等, 可用于下述第一 NPDCCH 的接收。

SC-MCCH 信息是指在 SC-MCCH 信道上传播的信息/消息, 它的传输是由一个 NPDCCH 来指示的, 这里称为第一 NPDCCH, 在第一 NPDCCH 信道上携带的 DCI 指示了 SC-MCCH 传输的时频资源以及编码信息, 还有重复次数等等, 终端可以根据该 DCI 的指示接收 SC-MCCH 信息。可选的, 第一 NPDCCH 上的 DCI 可以采用格式 NPDCCH DCI format N1 或者 N2 或者新设计的格式, 并采用现有的 SC-RNTI 或者新设计的 RNTI 对其 CRC 校验码进行加扰。

SC-MCCH 信息变更通知可以同时包含在第一 NPDCCH 携带的 DCI 中。

终端根据配置信息, 首次接收 SC-MCCH 信道上传输的信息/消息之后, 开始监听第一 NPDCCH 信道。

如果在第一 NPDCCH 信道上携带的 DCI 中收到了 SC-MCCH 信息的变更指示, 指示信息变更, 则根据第一 NPDCCH 上的 DCI 的指示去接收 SC-MCCH 信息。如果变更指示指示信息未变更, 则终端无需接收 SC-MCCH 信息。

示例 3

如示例 1 和示例 2 所述, SC-MCCH 信息变更通知可以由 1 比特位来指示。当该比特位置‘1’时, 表示 SC-MCCH 信息发生变更。

当该比特位置‘0’时, 表示 SC-MCCH 信息未发生变更; 或者当变更通知不出现时, 可以是对应的比特位不出现, 或者是第二 NPDCCH 信道不出现, 或者是终端在第二 NPDCCH 信道上检测不到 SC-N-RNTI 加扰的 DCI, 都可以表示 SC-MCCH 信息未发生变更。

示例 4

如示例 1 和示例 2 所述, SC-MCCH 信息变更通知可以由多个比特位来指示。终端首先接收小区广播的接收业务列表, 在该列表中指示了本小区支持的 MBMS 业务, 每个业务由其对应的业务信息来表征, 其中业务信息可以包括分配给特定 MBMS 业务的 TMGI, 以及用来表征特定 MBMS 业务的 MBMS Session Identity:。

在业务列表中, 终端可以根据每个业务在列表中的先后顺序, 或者根据 TMGI 取值的大小, 或者根据 MBMS Session Identity 取值大小等, 进行排序, 从而获得每个业务的序列号。

SC-MCCH 信息变更通知中包含的多个比特位可以用来指示发生变更的业务对应的序列号, 从而指示发生变更的业务。

具体的指示方法可以为取值法, 例如 SC-MCCH 信息变更通知中包含的多个比特位指示的值为 3 (011), 表示业务列表中的序列号为 3 的业务信息发生变更, 当取值为 0 (000) 时, 表示没有任何业务发生变更。或者还采用 bitmap 的方式指示, 例如 SC-MCCH 信息变更通知中包含的 8 个比特位, 则从低到高对应着业务列表中序列号从 1 到 8 的 8 种业务。当对应序列号 3 的比特位置‘1’时, 表示序列号为 1 的业务信息发生变更; 而置‘0’则表示无变更。

当终端接收到变更通知时, 根据变更通知中携带的序列号, 首先判断发生变更的业务信息是否是其关注的, 或则是其感兴趣的; 如果是, 则终端继续接收 SC-MCCH 信息, 如果不是, 终端可以忽略本次变更通知, 不去接收 SC-MCCH 信息。

图 3 是示出了根据本申请一个实施例的由用户设备执行的方法的流程图。如图 3 所示, 方法 300 在步骤 S310 处开始。

在步骤 S320, 接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI。

在步骤 S330, 根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知。例如, SC-MCCH 信息变更通知可以包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

在步骤 S340, 根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息。

最后, 方法 300 在步骤 S350 处结束。

图 4 是示出了根据本申请一个实施例的由基站执行的方法的流程图。如图 4 所示, 方法 400 在步骤 S410 处开始。

在步骤 S420, 在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI, 所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知。

在步骤 S430, 在第一 NPDCCH 上发送下行链路控制信息 DCI, 指示 SC-MCCH 信息的传输。

在步骤 S440, 根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

最后, 方法 400 在步骤 S450 处结束。

运行在根据本发明的设备上的程序可以通过控制中央处理单元 (CPU) 来使计算机实现本发明的实施例功能的程序。该程序或由该程序处理的信息可以临时存储在易失性存储器 (如随机存取存储器 RAM)、硬盘驱动器 (HDD)、非易失性存储器 (如闪存存储器)、或其他存储器系统中。

用于实现本发明各实施例功能的程序可以记录在计算机可读记录介质上。可以通过使计算机系统读取记录在所述记录介质上的程序并执行这些程序来实现相应的功能。此处的所谓“计算机系统”可以是嵌入在该设备中的计算机系统, 可以包括操作系统或硬件 (如外围设备)。“计算机可读记录介质”可以是半导体记录介质、光学记录介质、磁性记录介质、短时动态存储程序的记录介质、或计算机可读的任何其他记录介质。

用在上述实施例中的设备的各种特征或功能模块可以通过电路 (例如, 单片或多片集成电路) 来实现或执行。设计用于执行本说明书所描述的功能的电路可以包括通用处理器、数字信号处理器 (DSP)、专用集成电路 (ASIC)、现场可编程门阵列 (FPGA)、或其他可编程逻辑器件、分立的门或晶体管逻辑、分立的硬件组件、或上述器件的任意组合。通用处理器可以是微处理器, 也可以是任何现有的处理器、控制器、微控制器、或状态机。上述电路可以是数字电路, 也可以是模拟电路。因半导体技术的进步而出现了替代现有集成电路的新的集成电路技术的情况下, 本发明的一个或多个实施例也可以使用这些新的集成电路技术来实现。

此外，本发明并不局限于上述实施例。尽管已经描述了所述实施例的各种示例，但本发明并不局限于此。安装在室内或室外的固定或非移动电子设备可以用作终端设备或通信设备，如 AV 设备、厨房设备、清洁设备、空调、办公设备、自动贩售机、以及其他家用电器等。

如上，已经参考附图对本发明的实施例进行了详细描述。但是，具体的结构并不局限于上述实施例，本发明也包括不偏离本发明主旨的任何设计改动。另外，可以在权利要求的范围内对本发明进行多种改动，通过适当地组合不同实施例所公开的技术手段所得到的实施例也包含在本发明的技术范围内。此外，上述实施例中所描述的具有相同效果的组件可以相互替代。

权 利 要 求

1. 一种由用户设备 UE 执行的方法，包括：
接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI；
根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知；以及
根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息；
其中，所述 SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。
2. 根据权利要求 1 所述的方法，还包括：
接收与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息，或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。
3. 根据权利要求 1 或者 2 所述的方法，还包括，在相同的载波上，在第一时刻接收第一 NPDCCH 信道，以及在第二时刻接收第二 NPDCCH 信道。
4. 根据权利要求 1 或者 2 所述的方法，还包括，在第一载波上接收第一 NPDCCH 信道，以及在第二载波上接收第二 NPDCCH 信道。
5. 根据权利要求 1 或者 2 所述的方法，其中，所述 SC-MCCH 信息变更通知包含在直接指示信息 DII 消息中，该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。
6. 根据权利要求 1 或者 2 所述的方法，其中，所述 SC-MCCH 信息变更通知包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。
7. 根据权利要求 1 或者 6 所述的方法，其中，如果第二 NPDCCH 指示寻呼消息的传输，则根据所述指示来接收寻呼消息，并查看包含在所述寻呼消息中的 SC-MCCH 信息变更通知。
8. 根据权利要求 1 所述的方法，其中，所述 SC-MCCH 信息变更通知

由一个比特来指示。

9. 根据权利要求 1 所述的方法，其中，所述 SC-MCCH 信息变更通知由多个比特来指示。

10. 一种由用户设备 UE 执行的方法，包括：

接收窄带物理下行控制信道 NPDCCH；

当在所述 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时，根据所述 DCI 的指示接收 SC-MCCH 信息。

11. 根据权利要求 10 所述的方法，还包括：

接收与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述 NPDCCH 的载波相关信息或者时间相关信息。

12. 一种用户设备 UE，包括：

第一接收单元，被配置为接收第二窄带物理下行控制信道 NPDCCH 上的下行链路控制信息 DCI；

监听单元，被配置为根据第二 NPDCCH 信道上的信息接收单小区多播控制信道 SC-MCCH 信息变更通知；以及

第二接收单元，被配置为根据第一 NPDCCH 上的 DCI 的指示接收 SC-MCCH 信息；

其中，所述 SC-MCCH 信息变更通知包含在第二 NPDCCH 的 DCI 中或者第二 NPDCCH 的 DCI 指示的消息中。

13. 根据权利要求 12 所述的 UE，还包括，接收与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息，或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。

14. 根据权利要求 12 所述的 UE，还包括，在相同载波上，在第一时刻接收第一 NPDCCH 信道，在第二时刻接收第二 NPDCCH 信道。

15. 根据权利要求 12 所述的 UE，还包括，在第一载波上接收第一 NPDCCH 信道，以及在第二载波上接收第二 NPDCCH 信道。

16. 根据权利要求 12 或 13 所述的 UE，其中，所述 SC-MCCH 信息变更通知包含在直接指示信息 DII 消息中，该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

17. 根据权利要求 12 或 13 所述的 UE，其中，所述 SC-MCCH 信息变更通知包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

18. 根据权利要求 12 或 17 所述的 UE，其中，如果第二 NPDCCH 指示寻呼消息的传输，则根据所述指示来接收寻呼消息，并查看包含在所述寻呼消息中的 SC-MCCH 信息变更通知。

19. 根据权利要求 12 所述的 UE，其中，所述 SC-MCCH 信息变更通知由一个比特来指示。

20. 根据权利要求 12 所述的 UE，其中，所述 SC-MCCH 信息变更通知由多个比特来指示。

21. 一种用户设备 UE，包括：

第一接收单元，被配置为接收窄带物理下行控制信道 NPDCCH 信道；以及

第二接收单元，被配置为当在所述 NPDCCH 信道上的下行链路控制信息 DCI 中接收到 SC-MCCH 信息变更通知时，根据所述 DCI 的指示接收 SC-MCCH 信息。

22. 根据权利要求 21 所述的 UE，还包括：

接收与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述 NPDCCH 的载波相关信息或者时间相关信息。

23. 一种由基站执行的方法，包括：

在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含单小区多播控制信道 SC-MCCH 信息变更通知；以及

在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

24. 根据权利要求 23 所述的方法，其中，发送与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息，或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。

25. 根据权利要求 23 所述的方法，其中，在相同的载波上在第一时刻

发送第一 NPDCCH 信道，以及在第二时刻发送第二 NPDCCH 信道。

26. 根据权利要求 23 所述的方法，其中，在第一载波上发送第一 NPDCCH 信道，以及在第二载波上发送第二 NPDCCH 信道。

27. 根据权利要求 23 所述的方法，其中，所述 SC-MCCH 信息变更通知包含在直接指示信息 DII 消息中，该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

28. 根据权利要求 23 所述的方法，其中，所述 SC-MCCH 信息变更通知包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

29. 根据权利要求 23 所述的方法，其中，发送包含 SC-MCCH 信息变更通知的寻呼消息。

30. 根据权利要求 23 所述的方法，其中，所述 SC-MCCH 信息变更通知由一个比特来指示。

31. 根据权利要求 23 所述的方法，其中，所述 SC-MCCH 信息变更通知由多个比特来指示。

32. 一种由基站执行的方法，包括：

在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知，以及指示 SC-MCCH 信息的传输；

根据所述 DCI 的指示发送 SC-MCCH 信息。

33. 根据权利要求 32 所述的方法，还包括：

发送与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述 NPDCCH 的载波相关信息或者时间相关信息。

34. 一种基站，包括：

第一发送单元，被配置为在第二窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 或者所述 DCI 指示的消息中包含

单小区多播控制信道 SC-MCCH 信息变更通知；以及

第二发送单元，被配置为在第一 NPDCCH 上发送下行链路控制信息 DCI，指示 SC-MCCH 信息的传输，以及根据所述第一 NPDCCH 上的 DCI 的指示发送 SC-MCCH 信息。

35. 根据权利要求 34 所述的基站，其中，发送与单小区多播控制信道

SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述第一 NPDCCH 的载波相关信息或者时间相关信息，或者包括用于接收所述第二 NPDCCH 的载波相关信息或者时间相关信息。

36. 根据权利要求 34 所述的基站，其中，在相同的载波上在第一时刻发送第一 NPDCCH 信道，以及在第二时刻发送第二 NPDCCH 信道。

37. 根据权利要求 34 所述的基站，其中，在第一载波上发送第一 NPDCCH 信道，以及在第二载波上发送第二 NPDCCH 信道。

38. 根据权利要求 34 所述的基站，其中，所述 SC-MCCH 信息变更通知包含在直接指示信息 DII 消息中，该消息采用 NPDCCH DCI 格式并且采用 SC-RNTI 或寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

39. 根据权利要求 34 所述的基站，其中，所述 SC-MCCH 信息变更通知包含在寻呼消息中，指示寻呼消息传输的 DCI 采用格式 NPDCCH DCI 格式并且采用寻呼无线接入网临时标识 P-RNTI 对 CRC 校验码进行加扰。

40. 根据权利要求 34 所述的基站，其中，发送包含 SC-MCCH 信息变更通知的寻呼消息。

41. 根据权利要求 34 所述的基站，其中，所述 SC-MCCH 信息变更通知由一个比特来指示。

42. 根据权利要求 34 所述的基站，其中，所述 SC-MCCH 信息变更通知由多个比特来指示。

43. 一种基站，包括：

第一发送单元，被配置为在窄带物理下行控制信道 NPDCCH 上发送下行链路控制信息 DCI，所述 DCI 中包含单小区多播控制信道 SC-MCCH 信息变更通知，以及指示 SC-MCCH 信息的传输；以及

第二发送单元，被配置为根据所述 DCI 的指示发送 SC-MCCH 信息。

44. 根据权利要求 43 所述的基站，还包括：

发送与单小区多播控制信道 SC-MCCH 有关的配置信息，所述配置信息中包括用于接收所述 NPDCCH 的载波相关信息或者时间相关信息。

1/2

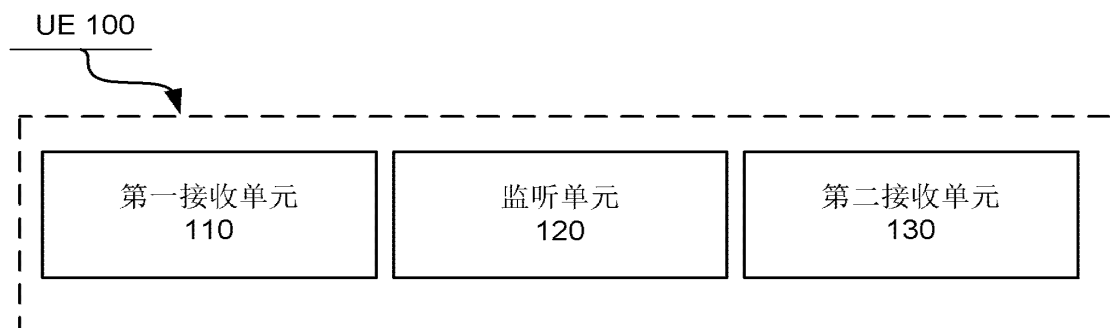


图 1

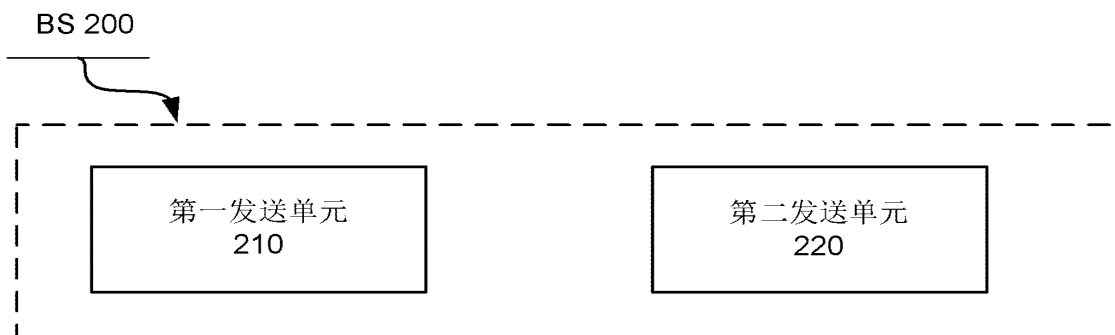


图 2

2/2

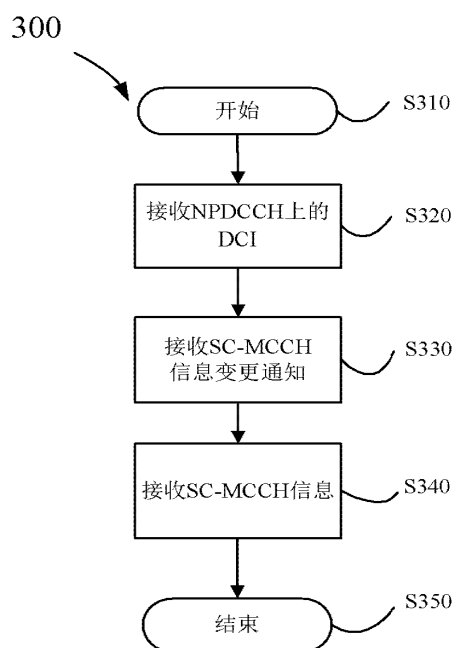


图 3

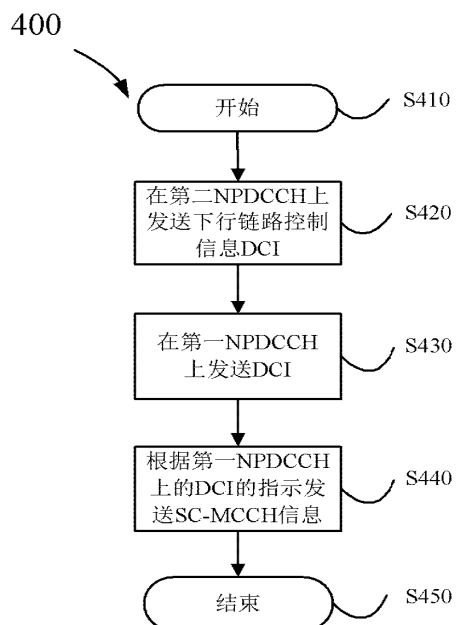


图 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/096794

A. CLASSIFICATION OF SUBJECT MATTER														
H04W 4/06 (2009.01) i														
According to International Patent Classification (IPC) or to both national classification and IPC														
B. FIELDS SEARCHED														
Minimum documentation searched (classification system followed by classification symbols)														
H04W														
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched														
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)														
WPI; EPODOC; CNKI; CNPAT: 多播控制信道, 单小区多播控制信道, 窄带, 变更, 通知, 告知, 指示, 载波, 无线接入网临时标识, 加扰, NPDCCH, SC-MCCH, DCI, scramble, notification, RNTI														
C. DOCUMENTS CONSIDERED TO BE RELEVANT														
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.												
X	CN 101998270 A (ZTE CORP.), 30 March 2011 (30.03.2011), description, paragraphs [0005]-[0024]	1-44												
A	CN 102083003 A (DATANG MOBILE COMMUNICATIONS EQUIPMENT CO., LTD.), 01 June 2011 (01.06.2011), entire document	1-44												
A	CN 102695129 A (ZTE CORP.), 26 September 2012 (26.09.2012), entire document	1-44												
A	CN 101883323 A (CHINA MOBILE COMMUNICATIONS CORPORATION), 10 November 2010 (10.11.2010), entire document	1-44												
A	US 2014044071 A1 (SCA IPLA HOLDINGS INC.), 13 February 2014 (13.02.2014), entire document	1-44												
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.														
<table border="0"> <tr> <td>* Special categories of cited documents:</td> <td>“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>“A” document defining the general state of the art which is not considered to be of particular relevance</td> <td>“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>“E” earlier application or patent but published on or after the international filing date</td> <td>“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>“&” document member of the same patent family</td> </tr> <tr> <td>“O” document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>“P” document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			* Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	“A” document defining the general state of the art which is not considered to be of particular relevance	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	“E” earlier application or patent but published on or after the international filing date	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	“&” document member of the same patent family	“O” document referring to an oral disclosure, use, exhibition or other means		“P” document published prior to the international filing date but later than the priority date claimed	
* Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention													
“A” document defining the general state of the art which is not considered to be of particular relevance	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone													
“E” earlier application or patent but published on or after the international filing date	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art													
“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	“&” document member of the same patent family													
“O” document referring to an oral disclosure, use, exhibition or other means														
“P” document published prior to the international filing date but later than the priority date claimed														
Date of the actual completion of the international search 11 October 2017		Date of mailing of the international search report 26 October 2017												
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451		Authorized officer LV, Yuan Telephone No.: (86-10) 62413388												

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/096794

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101998270 A	30 March 2011	CN 101998270 B	10 December 2014
CN 102083003 A	01 June 2011	US 2013176923 A1	11 July 2013
		KR 101500474 B1	09 March 2015
		EP 2568727 A1	13 March 2013
		US 8908713 B2	09 December 2014
		EP 2568727 A4	24 September 2014
		KR 20130014596 A	07 February 2013
		WO 2012041193 A1	05 April 2012
CN 102695129 A	26 September 2012	EP 2690894 A1	29 January 2014
		US 2013215761 A1	22 August 2013
		WO 2012126210 A1	27 September 2012
		EP 2690894 A4	11 February 2015
		EP 2690894 B1	26 July 2017
		US 9491644 B2	08 November 2016
CN 101883323 A	10 November 2010	CN 101883323 B	26 December 2012
US 2014044071 A1	13 February 2014	CN 103380649 A	30 October 2013
		GB 2488608 A	05 September 2012
		GB 201102893 D0	06 April 2011
		GB 2488608 B	06 November 2013
		WO 2012110829 A1	23 August 2012
		GB 2488971 A	19 September 2012
		GB 2488971 B	24 June 2015
		EP 2676503 A1	25 December 2013
		GB 201109488 D0	20 July 2011
		CN 103380649 B	01 March 2017
		US 9094182 B2	28 July 2015

Form PCT/ISA/210 (patent family annex) (July 2009)

国际检索报告

国际申请号

PCT/CN2017/096794

A. 主题的分类

H04W 4/06 (2009.01) i

按照国际专利分类 (IPC) 或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献 (标明分类系统和分类号)

H04W

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库 (数据库的名称, 和使用的检索词 (如使用))

WPI; EPDOC; CNKI; CNPAT: 多播控制信道, 单小区多播控制信道, 窄带, 变更, 通知, 告知, 指示, 载波, 无线接入网临时标识, 加扰, NPDCCH, SC-MCCH, DCI, scramble, notification, RNTI

C. 相关文件

类 型*	引用文件, 必要时, 指明相关段落	相关的权利要求
X	CN 101998270 A (中兴通讯股份有限公司) 2011年 3月 30日 (2011 - 03 - 30) 说明书第[0005]-[0024]段	1-44
A	CN 102083003 A (大唐移动通信设备有限公司) 2011年 6月 1日 (2011 - 06 - 01) 全文	1-44
A	CN 102695129 A (中兴通讯股份有限公司) 2012年 9月 26日 (2012 - 09 - 26) 全文	1-44
A	CN 101883323 A (中国移动通信集团公司) 2010年 11月 10日 (2010 - 11 - 10) 全文	1-44
A	US 2014044071 A1 (SCA 艾普拉控股有限公司) 2014年 2月 13日 (2014 - 02 - 13) 全文	1-44

☐ 其余文件在C栏的续页中列出。☒ 见同族专利附件。

* 引用文件的具体类型:

“A” 认为不特别相关的表示了现有技术一般状态的文件

“E” 在国际申请日的当天或之后公布的在先申请或专利

“L” 可能对优先权要求构成怀疑的文件, 或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件 (如具体说明的)

“Q” 涉及口头公开、使用、展览或其他方式公开的文件

“P” 公布日先于国际申请日但迟于所要求的优先权日的文件

“T” 在申请日或优先权日之后公布, 与申请不相抵触, 但为了理解发明之理论或原理的在后文件

“X” 特别相关的文件, 单独考虑该文件, 认定要求保护的发明不是新颖的或不具有创造性

“Y” 特别相关的文件, 当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时, 要求保护的发明不具有创造性

“&” 同族专利的文件

国际检索实际完成的日期

2017年 10月 11日

国际检索报告邮寄日期

2017年 10月 26日

ISA/CN的名称和邮寄地址

中华人民共和国国家知识产权局 (ISA/CN)
中国北京市海淀区蓟门桥西土城路6号 100088

受权官员

吕源

传真号 (86-10) 62019451

电话号码 (86-10) 62413388

表 PCT/ISA/210 (第2页) (2009年7月)

国际检索报告
关于同族专利的信息

国际申请号
PCT/CN2017/096794

检索报告引用的专利文件			公布日 (年/月/日)	同族专利			公布日 (年/月/日)
CN	101998270	A	2011年 3月 30日	CN	101998270	B	2014年 12月 10日
CN	102083003	A	2011年 6月 1日	US	2013176923	A1	2013年 7月 11日
				KR	101500474	B1	2015年 3月 9日
				EP	2568727	A1	2013年 3月 13日
				US	8908713	B2	2014年 12月 9日
				EP	2568727	A4	2014年 9月 24日
				KR	20130014596	A	2013年 2月 7日
				WO	2012041193	A1	2012年 4月 5日
CN	102695129	A	2012年 9月 26日	EP	2690894	A1	2014年 1月 29日
				US	2013215761	A1	2013年 8月 22日
				WO	2012126210	A1	2012年 9月 27日
				EP	2690894	A4	2015年 2月 11日
				EP	2690894	B1	2017年 7月 26日
				US	9491644	B2	2016年 11月 8日
CN	101883323	A	2010年 11月 10日	CN	101883323	B	2012年 12月 26日
US	2014044071	A1	2014年 2月 13日	CN	103380649	A	2013年 10月 30日
				GB	2488608	A	2012年 9月 5日
				GB	201102893	D0	2011年 4月 6日
				GB	2488608	B	2013年 11月 6日
				WO	2012110829	A1	2012年 8月 23日
				GB	2488971	A	2012年 9月 19日
				GB	2488971	B	2015年 6月 24日
				EP	2676503	A1	2013年 12月 25日
				GB	201109488	D0	2011年 7月 20日
				CN	103380649	B	2017年 3月 1日
				US	9094182	B2	2015年 7月 28日

表 PCT/ISA/210 (同族专利附件) (2009年7月)

ADVANCE E-MAIL

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

CHINA SCIENCE PATENT & TRADEMARK AGENT
LTD.
Suite 4-1105, No. 87, West 3rd Ring North Rd.,
Haidian District
Beijing 100089
CHINE

Date of mailing (day/month/year) 16 January 2019 (16.01.2019)	
Applicant's or agent's file reference IP170184	IMPORTANT NOTIFICATION
International application No. PCT/CN2017/096794	International filing date (day/month/year) 10 August 2017 (10.08.2017)

1. The following indications appeared on record concerning:		
☒ the applicant	☐ the inventor	☐ the agent
☐ the common representative		
Name and Address	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	E-mail address	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
☒ the person	☐ the name	☐ the address
☐ the nationality		
☐ the residence		
Name and Address	State of Nationality	State of Residence
FG INNOVATION COMPANY LIMITED	CN	CN
Flat 2623, 26/F Tuen Mun Central Square, 22 Hoi Wing Road, Tuen Mun, New Territories	Telephone No.	
Hong Kong	Facsimile No.	
China	E-mail address	
	☐ Notifications by e-mail authorized	
3. Further observations, if necessary: The person identified in Box 2 has been added as applicant for all designated States.		
4. A copy of this notification has been sent to:		
☒ the receiving Office	☐ the International Preliminary Examining Authority	
☐ the International Searching Authority	☒ the designated Offices concerned	
☐ the Authority(ies) specified for supplementary search	☐ the elected Offices concerned	
	☐ other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Yuan Zhiyong e-mail pct.team2@wipo.int Telephone No. +41 22 338 74 02
Facsimile No. +41 22 338 89 65	



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/324,359	02/08/2019		2180	US76497	4	4

CONFIRMATION NO. 1032

FILING RECEIPT



0000000106213023

145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

Date Mailed: 03/01/2019

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)

Chongming ZHANG, Pudong, Shanghai, CHINA;
Renmao LIU, Pudong, Shanghai, CHINA;
Shohei YAMADA, Sakai City, JAPAN;

Applicant(s)

Sharp Kabushiki Kaisha, Sakai City, Osaka, JAPAN;
FG Innovation Company Limited, Tuen Mun, CHINA;
Chongming Zhang, Pudong, Shanghai, CHINA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/CN2017/096794 08/10/2017

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 201610658544.6 08/11/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 02/27/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/324,359**

Projected Publication Date: 06/06/2019

Non-Publication Request: No

Early Publication Request: No
Title

INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL
MULTICAST SERVICE

Preliminary Class

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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

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

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

NOT GRANTED

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

SelectUSA

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 16/324,359	
APPLICATION AS FILED - PART I						
(Column 1)		(Column 2)		SMALL ENTITY		OR
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)	OTHER THAN SMALL ENTITY	
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A		N/A	300
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A		N/A	520
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A		N/A	760
TOTAL CLAIMS (37 CFR 1.16(j))	4	minus 20 = *			OR	x 100 = 0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4	minus 3 = *	1		OR	x 460 = 460
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).					0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))						0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL		TOTAL	2040
APPLICATION AS AMENDED - PART II						
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OTHER THAN SMALL ENTITY
	Total (37 CFR 1.16(i))	*	Minus	**	=	RATE(\$)
	Independent (37 CFR 1.16(h))	*	Minus	***	=	ADDITIONAL FEE(\$)
	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				TOTAL ADD'L FEE		
AMENDMENT B						
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OTHER THAN SMALL ENTITY
	Total (37 CFR 1.16(i))	*	Minus	**	=	RATE(\$)
	Independent (37 CFR 1.16(h))	*	Minus	***	=	ADDITIONAL FEE(\$)
	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				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.						

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET Substitute for Form PTO-1360 (For use with Form PTO/SB/06)							Application Number 16324359		Filing Date				
							Applicant(s) Chongming ZHANG						
							* May be used for additional claims or amendments						
CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT			*		*		*	
	Indep	Depend	Indep	Depend	Indep	Depend		Indep	Depend	Indep	Depend	Indep	Depend
1	1		---	---									
2		1	---	---									
3		2	---	---									
4		2	---	---									
5		2	---	---									
6		2	---	---									
7		(1)	---	---									
8		1	---	---									
9		1	---	---									
10	1		---	---									
11		1	---	---									
12	1		---	---									
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Total Indep	8		4		0								
Total Depend	42	↙	0	↙	0	↙							
Total Claims	50		4		0								
51													
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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

U.S. APPLICATION NUMBER NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
16/324,359	Chongming ZHANG	US76497
145688		
SBPJ/ScienBiziP, P.C.		
550 South Hope Street		
Suite 2825		
Los Angeles, CA 90071		
INTERNATIONAL APPLICATION NO.		
PCT/CN2017/096794		
I.A. FILING DATE	PRIORITY DATE	
08/10/2017	08/11/2016	

CONFIRMATION NO. 1032
371 ACCEPTANCE LETTER



Date Mailed: 03/01/2019

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

02/08/2019

DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Copy of the International Application filed on 02/08/2019
- English Translation of the IA filed on 02/08/2019
- Copy of the International Search Report filed on 02/08/2019
- Preliminary Amendments filed on 02/08/2019
- Information Disclosure Statements filed on 02/08/2019
- Request for Immediate Examination filed on 02/08/2019
- U.S. Basic National Fees filed on 02/08/2019
- Authorize Access to Search Results filed on 02/08/2019
- Priority Documents filed on 02/08/2019
- Non-English Language Application filed on 02/08/2019
- Authorization to Permit Access filed on 02/08/2019
- Application Data Sheet (37 CFR 1.76) filed on 02/08/2019

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.495(c).

- Properly executed inventor's oath or declaration for the following inventor(s) has not been submitted:
Chongming ZHANG, Renmao LIU, and Shohei YAMADA

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

FREDERICK SMITH

Telephone: (571) 272-8679

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

PTO/AIA/82A (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

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

Application Number	16/324,359		
Filing Date	2019-02-08		
First Named Inventor	CHONGMING ZHANG		
Title	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
Art Unit			
Examiner Name			
Attorney Docket Number	US76497		
SIGNATURE of Applicant or Patent Practitioner			
Signature	/Calvin H Chai/	Date (Optional)	2019-03-20
Name	Calvin H Chai	Registration Number	68009
Title (if Applicant is a juristic entity)	Patent Practitioner		
Applicant Name (if Applicant is a juristic entity)	SHARP KABUSHIKI KAISHA,FG Innovation Company Limited		
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☐ *Total of _____ forms are submitted.			

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

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

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

PTO/AIA/82B (07-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY BY APPLICANT

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

Application Number	Filing Date

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



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

145688

OR



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

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



The address associated with the above-mentioned Customer Number

OR



The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

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

SHARP KABUSHIKI KAISHA



Inventor or Joint Inventor (title not required below)



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



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



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

SIGNATURE of Applicant for Patent

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

Signature	/Mototaka Taneya/	Date (Optional)	
Name	Mototaka Taneya		
Title	MANAGING OFFICER BU PRESIDENT CORPORATE RESEARCH & DEVELOPMENT		

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 2 forms are submitted.

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

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

Doc Code: PA...

Document Description: Power of Attorney

PTO/AIA/82B (07-13)

Approved for use through 01/31/2018, OMB 0651-0036
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

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POWER OF ATTORNEY BY APPLICANT

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

Application Number	Filing Date

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

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

54000

OR

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

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

☒ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

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

FG Innovation Company Limited

☐ Inventor or Joint Inventor (title not required below)

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

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

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

SIGNATURE of Applicant for Patent

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

Signature

Chie-Ming Chou

Date (Optional)

2018-11-29

Name

CHIE-MING CHOU

Title

CEO

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

☒ Total of 2 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.31 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 1480, Alexandria, VA 22313-1480. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1480, Alexandria, VA 22313-1480.

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

Electronic Acknowledgement Receipt	
EFS ID:	35486277
Application Number:	16324359
International Application Number:	
Confirmation Number:	1032
Title of Invention:	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
First Named Inventor/Applicant Name:	Chongming ZHANG
Customer Number:	145688
Filer:	Calvin H Chai
Filer Authorized By:	
Attorney Docket Number:	US76497
Receipt Date:	21-MAR-2019
Filing Date:	08-FEB-2019
Time Stamp:	07:10:22
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	US76497190320POA.pdf	1318384	no	3
			2972a00916996d9c04599b3d48b563b859f626e4		
Warnings:					

Information:	
Total Files Size (in bytes):	1318384
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. <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. <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. <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.	

Appl. No. 16/324,359
Request for Corrected Filing Receipt
Attorney Docket No. US76497

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	16/324,359
Confirmation No.	:	1032
Applicant	:	Sharp Kabushiki Kaisha, et al.
Attorney Docket No.	:	US76497
Customer No.	:	145688
Application Filing Date	:	February 8, 2019
Examiner	:	TBD
Art Unit	:	TBD

Mail Stop OIPE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

REQUEST FOR CORRECTED FILING RECEIPT

Sir/Madam:

In the filing receipt, mailed on 03/01/2019, of the subject application, the first named inventor, Chongming Zhang, is erroneously listed as one of the Applicants. The Application Data Sheet (ADS) concurrently filed with the subject application listed the Applicants as follows:

Sharp Kabushiki Kaisha of Sakai City, Osaka, Japan

FG Innovation Company Limited, of Tuen Mun, China

Applicants hereby respectfully request a corrected filing receipt be issued to correctly reflect the Applicants of the subject application as listed in the ADS as originally filed.

Attachments:

1. A copy of the filing receipt dated 03/01/2019 with mark up; and
2. A copy of the ADS filed on 02/08/2019.

Appl. No. 16/324,359
Request for Corrected Filing Receipt
Attorney Docket No. US76497

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 505142, referencing Attorney Docket No.: US76497.

Respectfully,

By /Tung-Yun McNally/

Tung-Yun McNally

Registration No.: 66,725

Please recognize the application with Customer No. 145688

ScienBiziP, P.C.

550 S. Hope Street, Suite 2825,

Los Angeles, CA 90071

Tel No. : (213) 426-1771

Fax No.: (213) 426-1788



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/324,359	02/08/2019		2180	US76497	4	4

CONFIRMATION NO. 1032

FILING RECEIPT



0000000106213023

145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

Date Mailed: 03/01/2019

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)

Chongming ZHANG, Pudong, Shanghai, CHINA;
Renmao LIU, Pudong, Shanghai, CHINA;
Shohei YAMADA, Sakai City, JAPAN;

Applicant(s)

Sharp Kabushiki Kaisha, Sakai City, Osaka, JAPAN;
FG Innovation Company Limited, Tuen Mun, CHINA;
~~Chongming Zhang, Pudong, Shanghai, CHINA~~

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/CN2017/096794 08/10/2017

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 201610658544.6 08/11/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 02/27/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/324,359**

Projected Publication Date: 06/06/2019

Non-Publication Request: No

Early Publication Request: No
Title

INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL
MULTICAST SERVICE

Preliminary Class

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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

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

NOT GRANTED

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

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Chongming		ZHANG		
Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	Pudong, Shanghai		Country of Residence ⁱ	CN	
Mailing Address of Inventor:					
Address 1	No. 1111, Jinhai Rd				
Address 2					
City	Pudong, Shanghai		State/Province		
Postal Code	201206		Country ⁱ	CN	
Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Renmao		LIU		
Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	Pudong, Shanghai		Country of Residence ⁱ	CN	
Mailing Address of Inventor:					
Address 1	No. 1111, Jinhai Rd				
Address 2					
City	Pudong, Shanghai		State/Province		
Postal Code	201206		Country ⁱ	CN	
Inventor	3				Remove
Legal Name					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Shohei		YAMADA	

Residence Information (Select One)		US Residency	☒ Non US Residency	Active US Military Service
City	Sakai City	Country of Residence ⁱ	JP	

Mailing Address of Inventor:

Address 1	c/o SHARP KABUSHIKI KAISHA			
Address 2	1, Takumi-cho, Sakai-ku,			
City	Sakai City, Osaka	State/Province		
Postal Code	590-8522	Country ⁱ	JP	
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	145688		
Email Address	eo-a-proce@scienbizip.com	Add Email	Remove Email
Email Address	eo-a-cbd@scienbizip.com	Add Email	Remove Email
Email Address	eo-a-procc@sbp-us.com		Remove Email

Application Information:

Title of the Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
Attorney Docket Number	US76497	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	1

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

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	145688		

Domestic Benefit/National Stage Information:

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

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	a 371 of international	PCT/CN2017/096794	2017-08-10
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

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
201610658544.6	CN	2016-08-11		

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

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

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	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant		1 Remove	
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear			
☐ Assignee		Legal Representative under 35 U.S.C. 117	
Person to whom the inventor is obligated to assign.		Joint Inventor	
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name		Sharp Kabushiki Kaisha	
Mailing Address Information For Applicant:			
Address 1		1, Takumi-cho, Sakai-ku,	
Address 2			
City		Sakai City, Osaka	State/Province
Country	JP	Postal Code	590-8522
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

Applicant	2			Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.				
Clear				
☒ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor	
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest		
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
Name of the Deceased or Legally Incapacitated Inventor:				
If the Applicant is an Organization check here. ☒				
Organization Name	FG Innovation Company Limited			
Mailing Address Information For Applicant:				
Address 1	Flat 2623, 26/F Tuen Mun Central Square			
Address 2	22 Hoi Wing Road, New Territories, HK			
City	Tuen Mun	State/Province		
Country	CN	Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Applicant Data may be generated within this form by selecting the Add button.				
Add				

Assignee Information including Non-Applicant Assignee Information:

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

Assignee	1	Remove
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.		
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	US76497
		Application Number	
Title of Invention	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

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

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

[Add](#)**Signature:**[Remove](#)

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

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

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

Signature	/Tung-Yun McNally/		Date (YYYY-MM-DD)	2019-02-08	
First Name	Tung-Yun	Last Name	McNally	Registration Number	66,725

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

[Add](#)

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

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent 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.

Electronic Acknowledgement Receipt	
EFS ID:	35489765
Application Number:	16324359
International Application Number:	
Confirmation Number:	1032
Title of Invention:	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
First Named Inventor/Applicant Name:	Chongming ZHANG
Customer Number:	145688
Filer:	Tung-Yun McNally
Filer Authorized By:	
Attorney Docket Number:	US76497
Receipt Date:	21-MAR-2019
Filing Date:	08-FEB-2019
Time Stamp:	12:52:54
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	US76497190320MIL.pdf	585109	no	14
			14c0f0c504cf7d38e19486d43d81d85e219a5355		

Warnings:

Information:	
Total Files Size (in bytes):	585109
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. <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. <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. <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.	



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/324,359	02/08/2019	Chongming ZHANG	US76497

CONFIRMATION NO. 1032

145688
 SBPJ/ScienBiziP, P.C.
 550 South Hope Street
 Suite 2825
 Los Angeles, CA 90071



OC000000106871843

Cc: SCIENBIZIP, PC
 550 SOUTH HOPE STREET
 SUITE 2825
 LOS ANGELES, CA 90071

Mailed: **03/27/2019**

DENIAL OF REQUEST FOR POWER OF ATTORNEY

The request for Power of Attorney filed **03/21/2019** is acknowledged. However, the request cannot be granted at this time for the reason stated below.

- ☐ The Power of Attorney you provided did not comply with the new Power of Attorney rules that became effective on June 25, 2004. See 37 CFR 1.32.
- ☐ The revocation is not signed by the applicant, the assignee of the entire interest, or one particular principal attorney having the authority to revoke.
- ☐ The Power of Attorney is from an assignee and the Certificate required by 37 CFR 3.73(c) has not been received.
- ☐ The person signing for the assignee has omitted their empowerment to sign on behalf of the assignee.
- ☐ The inventor(s) is without authority to appoint attorneys since the assignee has intervened as provided by 37 CFR 3.71.
- ☐ The signature(s) of _____, a co-inventor in this application, has been omitted. The Power of Attorney will be entered upon receipt of confirmation signed by said co-inventor(s).
- ☐ The person(s) appointed in the Power of Attorney is not registered to practice before the U.S. Patent and Trademark Office.
- ☒ Only one Customer Number can be designated for the Power of Attorney in an application. The Customer Number that was captured is the first Customer Number provided on the Power of Attorney document.
- ☐ A request under 37 CFR 1.48 to add an inventor was granted in this application, however, no power of attorney consistent with the power of attorney granted by the originally named inventive entity has been



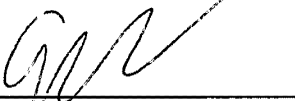
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Alexandria, Virginia 22313-1450
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received. Thus, the addition of the inventor has resulted in the loss of power of attorney in the application. See 37 CFR 1.32(e).

- ☐ The power of attorney has not been accepted because the party who is giving power of attorney has not been identified. Power of attorney may only be signed by the applicant for patent (37 CFR 1.42) or the patent owner. A patent owner who was not the applicant must appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. See 37 CFR 1.32(b)(4).
- ☐ The power of attorney from the inventors has not been accepted because it is a copy from a prior national application for which benefit is claimed and the continuing application names an inventor who was not named as an inventor in the prior application.
- ☐ The power of attorney from the inventors has not been accepted because the power of attorney must be signed by the applicant for patent. See 37 CFR 1.32(b)(4).
- ☐ Any request to correct or update the name of the applicant must include an application data sheet (ADS) in compliance with 37 CFR 1.76 specifying the correct or updated name of the applicant in the applicant information section. Any request to change the applicant after an original applicant has been specified under 37 CFR 1.46(b) must include a new ADS in compliance with 37 CFR 1.76 specifying the applicant in the applicant information section and comply with 37 CFR 3.71 and 3.73. See 37 CFR 1.46(c).

Any inquiries regarding this notice should be directed to the Application Assistance Unit at 571-272-4200.


Application Assistance Unit
571-272-4200



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/324,359	02/08/2019	Chongming ZHANG	US76497

CONFIRMATION NO. 1032

MISCELLANEOUS NOTICE



145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

Date Mailed: 03/27/2019

A communication which cannot be delivered in electronic form has been mailed to the applicant.



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/324,359	02/08/2019	2414	2180	US76497	4	4

CONFIRMATION NO. 1032
CORRECTED FILING RECEIPT



145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

Date Mailed: 03/27/2019

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)

Chongming ZHANG, Pudong, Shanghai, CHINA;
Renmao LIU, Pudong, Shanghai, CHINA;
Shohei YAMADA, Sakai City, JAPAN;

Applicant(s)

Sharp Kabushiki Kaisha, Sakai City, Osaka, JAPAN;
FG Innovation Company Limited, Tuen Mun, CHINA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/CN2017/096794 08/10/2017

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 201610658544.6 08/11/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 02/27/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/324,359**

Projected Publication Date: 06/06/2019

Non-Publication Request: No

Early Publication Request: No
Title

INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL
MULTICAST SERVICE

Preliminary Class

370

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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

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

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

NOT GRANTED

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/324,359	02/08/2019	Chongming ZHANG	US76497

CONFIRMATION NO. 1032

145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

PUBLICATION NOTICE



OC000000108730062

Title: INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE

Publication No. US-2019-0174474-A1

Publication Date: 06/06/2019

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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Attorney Docket No.:

COMBINED PATENT ASSIGNMENT AND DECLARATION (37 CFR 1.63)

特許出願宣言付き譲渡書(37 CFR 1.63)

私は下記に記載の発明者/譲渡人として:

As a below named INVENTOR/ASSIGNOR of the patent application entitled:

INFORMATION CHANGE TRANSMISSION METHOD AND
DEVICE FOR SINGLE-CELL MULTICAST SERVICE

本宣言付き譲渡書は以下に関します。

And which is:

☐

添付の出願、または

☐

The attached application, or

☒____年____月____日に出願された米国出願あるいは
PCT 国際出願番号 _____☒United States Application or PCT International Application
Number PCT/CN2017/096794 filed on August 10, 2017,

上記に明示された出願は私が作成した、または作成を許可したものである事をここに宣言します。

I declare that:

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

私は、私が本出願内で請求されている発明の最初の発明者、または最初の共同発明者であると信じます。

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

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I have reviewed and understand the contents of the application for which this assignment with declaration is being submitted.

私は 37 CFR 1.56 に定義される特許性に肝要な私の知るすべての情報について当局に開示する義務があることを認識しています。

I am aware of the duty to disclose to the Office all information known to me to be material to patentability as defined in 37 CFR 1.56.

本書以降で譲渡人と呼ばれる上記に署名した発明者は、上記で特定される本出願に記載する特定の発明をしているため、また、

Whereas, the undersigned inventor(s) hereinafter called ASSIGNOR(S), have invented certain inventions described in the application identified above; and

1 Takumi-cho, Sakai-ku, Sakai City, Osaka 590-8522, Japan の Sharp Kabushiki Kaisha および Flat 2623, 26/F Tuen Mun Central Square, 22 Hoi Wing Road, Tuen Mun, New Territories, HK, China の FG Innovation Company Limited (譲受人) は本出願および本発明に対する全ての権利、権原、および利益、ならびに当

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において証言することに同意します。

ASSIGNOR(S) agree(s), when called upon to do so by the
ASSIGNEE(S), to provide ASSIGNEE(S) with all pertinent facts and
documents relating to the application, the invention, and the
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to sign without further consideration all papers deemed
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な翻訳文です。

The combined declaration/assignment is an accurate translation
of the corresponding English language assignment and
declaration.

LEGAL NAME OF FIRST INVENTOR/ASSIGNOR

第 1 の発明者/譲渡人の正式氏名

Inventor:

発明者:

ZHANG, Chongming

Date:

日付:

2019/05/01

Signature:

署名:

ZHANG Chongming

LEGAL NAME OF SECOND INVENTOR/ASSIGNOR

第 2 の発明者/譲渡人の正式氏名

Inventor:

発明者:

LIU, Renmao

Date:

日付:

2019/05/01

Signature:

署名:

Liu Renmao

LEGAL NAME OF THIRD INVENTOR/ASSIGNOR

16R00986/US

第3の発明者/譲渡人の正式氏名

Inventor:

Date:

発明者:

YAMADA, Shohei

日付:

Signature:

署名:

Attorney Docket No.:

COMBINED PATENT ASSIGNMENT AND DECLARATION (37 CFR 1.63)

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- ☐ 添付の出願、または
- ☒ 年 月 日に出願された米国出願あるいは PCT 国際出願番号

- ☐ The attached application, or
- ☒ United States Application or PCT International Application
Number PCT/CN2017/096794 filed on August 10, 2017,

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

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

The combined declaration/assignment is an accurate translation of the corresponding English language assignment and declaration.

LEGAL NAME OF FIRST INVENTOR/ASSIGNOR 第 1 の発明者/譲渡人の正式氏名	
Inventor: 発明者: _____	Date: 日付: _____
Signature: 署名: _____	
ZHANG, Chongming	

LEGAL NAME OF SECOND INVENTOR/ASSIGNOR 第 2 の発明者/譲渡人の正式氏名	
Inventor: 発明者: _____	Date: 日付: _____
Signature: 署名: _____	
LIU, Renmao	

LEGAL NAME OF THIRD INVENTOR/ASSIGNOR 第 3 の発明者/譲渡人の正式氏名	
Inventor: 発明者: _____	Date: 日付: _____
Signature: 署名: _____	
YAMADA, Shohei	
Shohei Yamada	
Apr. 19, 2019	

Electronic Acknowledgement Receipt	
EFS ID:	37181397
Application Number:	16324359
International Application Number:	
Confirmation Number:	1032
Title of Invention:	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
First Named Inventor/Applicant Name:	Chongming ZHANG
Customer Number:	145688
Filer:	Calvin H Chai
Filer Authorized By:	
Attorney Docket Number:	US76497
Receipt Date:	16-SEP-2019
Filing Date:	08-FEB-2019
Time Stamp:	23:11:19
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	US76497190912DEC.pdf	5440646	no	5
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/324,359	02/08/2019	Chongming ZHANG	US76497	1032
145688	7590	02/18/2020		
SBPJ/ScienBiziP, P.C. 550 South Hope Street Suite 2825 Los Angeles, CA 90071			EXAMINER LIU, JUNG-JEN	
			ART UNIT 2473	PAPER NUMBER
			NOTIFICATION DATE 02/18/2020	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

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ea-procc@scienbizippc.com
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Notice of Pre-AIA or AIA Status

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

DETAILED ACTION

Claim Interpretation

1. Limitations appearing in the specification but not recited in the claim should not be read into the claim. *E-Pass Techs., Inc. v. 3Com Corp.*, 343 F.3d 1364, 1369, 67 USPQ2d 1947, 1950 (Fed. Cir. 2003) (claims must be interpreted "in view of the specification" without importing limitations from the specification into the claims unnecessarily) [MPEP 2106 Sec I, C].

"Though understanding the claim language may be aided by explanations contained in the written description, it is important not to import into a claim limitations that are not part of the claim. For example, a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment." *Superguide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 875, 69 USPQ2d 1865, 1868 (Fed. Cir. 2004). [MPEP 2111.01 Sec II].

Thus, the Examiner interprets Applicant's claims "in view of the specification" and does not "import into a claim limitations that are not part of the claim".

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2a. Claims 45-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shin Provisional Application 62/372,324 filed 8/9/2016 (of Application 16/324,288, hereinafter Shin '372,324) in view of Fujishiro (US 20190182632 A1).

2b. Summary of the Cited Prior Art

Shin '372,324 discloses a method for transmitting/receiving data in a wireless communication system supporting NB-IoT.

Fujishiro discloses a method of SC-MCCH channel management in narrowband IoT.

2c. Claim Analysis

Regarding Claim 45, Shin '372,324

A User Equipment (UE) comprising [(see Sec 5.8a.2.1 Fig 5.8a.2.1-1 UE and E-

UTRAN)]:

receiving circuitry configured to receive downlink control information (DCI) on a narrowband physical downlink control channel (NPDCCH) after receiving Single-Cell Multicast Control Channel (SC-MCCH) information

[(Shin '372,324 discloses UE acquiring SC-MCCH information, see:

5.8a.2 SC-MCCH information acquisition

5.8a.2.1 General



Figure 5.8a.2.1-1: SC-MCCH information acquisition

The UE applies the SC-MCCH information acquisition procedure to acquire the SC-PTM control information that is broadcast by the E-UTRAN. The procedure applies to SC-PTM capable UEs that are in RRC_IDLE or in RRC_CONNECTED.

5.8a.2.2 Initiation

A UE interested to receive MBMS services via SC-MRB shall apply the SC-MCCH information acquisition procedure upon entering the cell broadcasting *SystemInformationBlockType20* (e.g. upon power on, following UE mobility) and upon receiving a notification that the SC-MCCH information has changed. A UE that is receiving an MBMS service via SC-MRB shall apply the SC-MCCH information acquisition procedure to acquire the SC-MCCH information that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the SC-MCCH information acquisition procedure overwrites any stored SC-MCCH information, i.e. delta configuration is not applicable for SC-MCCH information and the UE discontinues using a field if it is absent in SC-MCCH information unless explicitly specified otherwise.

5.8a.2.3 SC-MCCH information acquisition by the UE

A SC-PTM capable UE shall:

- 1> if the procedure is triggered by an SC-MCCH information change notification:
- 2> start acquiring the *SCPTMConfiguration* message from the subframe where the change notification was received;

NOTE 1: The UE continues using the previously received SC-MCCH information until the new SC-MCCH information has been acquired.

Further, Shin '372,324 discloses monitoring and receiving NPDCCH, see:

16.6 Narrowband physical downlink control channel related procedures

A UE shall monitor a set of NPDCCH candidates (described in subclause 10.2.2.1 of [3]) as configured by higher layer signalling for control information, where monitoring implies attempting to decode each of the NPDCCHs in the set according to all the monitored DCI formats.

The set of NPDCCH candidates to monitor are defined in terms of NPDCCH search spaces.

The UE shall monitor one or more of the following search spaces

- a Type1-NPDCCH common search space,
- a Type2-NPDCCH common search space, and
- a NPDCCH UE-specific search space.

));

processing circuitry configured to acquire, in a case that the DCI includes (a) a first field indicating an SC-MCCH information change notification and (b) a second field indicating a resource for a transmission of another SC-MCCH information, the another SC-MCCH information based on the first field and the second field

[(Shin '372,324 discloses SC-MCCH information including (a) SC-MCCH information change notification indication and period, and (b) other information based on SC-MCCH change and radio resource and MCS information, see:

5.8a.1.2 SC-MCCH scheduling

The SC-MCCH information (i.e. information transmitted in messages sent over SC-MCCH) is transmitted periodically, using a configurable repetition period. SC-MCCH transmissions (and the associated radio resources and MCS) are indicated on PDCCH.

5.8a.1.3 SC-MCCH information validity and notification of changes

Change of SC-MCCH information only occurs at specific radio frames, i.e. the concept of a modification period is used. Within a modification period, the same SC-MCCH information may be transmitted a number of times, as defined by its scheduling (which is based on a repetition period). The modification period boundaries are defined by SFN values for which $\text{SFN} \bmod m = 0$, where m is the number of radio frames comprising the modification period. The modification period is configured by means of *SystemInformationBlockType20*.

When the network changes (some of) the SC-MCCH information, it notifies the UEs about the change in the first subframe which can be used for SC-MCCH transmission in a repetition period. LSB bit in 8-bit bitmap when set to '1' indicates the change in SC-MCCH. Upon receiving a change notification, a UE interested to receive MBMS services transmitted using SC-PTM acquires the new SC-MCCH information starting from the same subframe. The UE applies the previously acquired SC-MCCH information until the UE acquires the new SC-MCCH information.

Sec 5.8a.3.4

SystemInformationBlockType20

The IE *SystemInformationBlockType20* contains the information required to acquire the control information associated transmission of MBMS using SC-PTM.

SystemInformationBlockType20 information element

```
-- ASN1START
SystemInformationBlockType20-r13 ::= SEQUENCE {
    sc-mcch-RepetitionPeriod-r13    ENUMERATED (rf2, rf4, rf8, rf16, rf32, rf64, rf128, rf256),
    sc-mcch-Offset-r13              INTEGER (0..10),
    sc-mcch-FirstSubframe-r13       INTEGER (0..9),
    sc-mcch-Duration-r13            INTEGER (2..9) OPTIONAL,
    sc-mcch-ModificationPeriod-r13  ENUMERATED (rf2, rf4, rf8, rf16, rf32, rf64, rf128, rf256,
                                                rf512, rf1024, rf2048, rf4096, rf8192, rf16384, rf32768,
                                                rf65536),
    lateNonCriticalExtension         OCTET STRING OPTIONAL,
    ...
}
-- ASN1STOP
```

SystemInformationBlockType20 field descriptions	
sc-mcch-ModificationPeriod	Defines periodically appearing boundaries, i.e. radio frames for which $\text{SFN mod sc-mcch-ModificationPeriod} = 0$. The contents of different transmissions of SC-MCCH information can only be different if there is at least one such boundary in-between them. Value rf2 corresponds to 2 radio frames, value rf4 corresponds to 4 radio frames and so on.
sc-mcch-duration	Indicates, starting from the subframe indicated by <i>sc-mcch-FirstSubframe</i> , the duration during which SC-MCCH may be scheduled in non-MBSFN subframes. Absence of this IE means that SC-MCCH is only scheduled in the subframe indicated by <i>sc-mcch-FirstSubframe</i> .
sc-mcch-Offset	Indicates, together with the <i>sc-mcch-RepetitionPeriod</i> , the radio frames in which SC-MCCH is scheduled i.e. SC-MCCH is scheduled in radio frames for which: $\text{SFN mod sc-mcch-RepetitionPeriod} = \text{sc-mcch-Offset}$.
sc-mcch-FirstSubframe	Indicates the first subframe in which SC-MCCH is scheduled
sc-mcch-RepetitionPeriod	Defines the interval between transmissions of SC-MCCH information, in radio frames. Value rf2 corresponds to 2 radio frames, rf4 corresponds to 4 radio frames and so on.

Further, Fujishiro also discloses SC-MCCH information including (a) SC-MCCH information change notification indication and period, and (b) other information based on SC-MCCH change and radio resource and MCS information, see:

processing circuitry configured to acquire, in a case that the DCI includes (a) a first field indicating an SC-MCCH information change notification and (b) a second field indicating a resource for a transmission of another SC-MCCH information, the another SC-MCCH information based on the first field and the second field

[(Fujishiro discloses:

[0117] FIGS. 15A and 15B are diagrams is a diagram illustrating the repetition number information. FIG. 15A illustrates a case where the repetition number information (#of repetition) is provided in the SIB20. As illustrated in FIG. 15A, the eNB 200 provides the repetition number information of the MPDCCH (or NPDCCH) corresponding to the SC-MCCH and the repetition number information of the narrowband PDSCH corresponding to the SC-MCCH in the SIB20. Even when the

repetitive transmission is applied to the SC-MCCH, the UE 100 can appropriately receive the SC-MCCH based on the repetition number information in the SIB20. FIG. 15B illustrates a case where the repetition number information (# of repetition) is provided in the SC-MCCH. As illustrated in FIG. 15B, the eNB 200 provides the repetition number information of the MPDCCH (or NPDCCH) corresponding to the SC-MTCH and the repetition number information of the narrowband PDSCH corresponding to the SC-MTCH in the SC-MCCH. Here, an example is illustrated in which the repetition number information is provided for each MBMS service (TMGI). The UE 100 can appropriately receive the SC-MTCH based on the repetition number information in the SC-MCCH.

Fig 9-13 and 15A-15B)].

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to integrate Shin '372,324's method for transmitting/receiving data in a wireless communication system supporting NB-IoT with Fujishiro's method of SC-MCCH channel management in narrowband IoT with the motivation being to efficiently receive multicast/broadcast services (Fujishiro, Para [0004]).

Regarding Claim 46, the claim discloses similar features as of Claim 45, and is rejected based on the same rationales of Claim 45. Further, Claim 46 discloses the same operations of Claim 45, but are performed by a base station.

Regarding Claim 47, the claim discloses similar features as of Claim 45, and is rejected based on the same rationales of Claim 45.

Regarding Claim 48, the claim discloses similar features as of Claim 45, and is rejected based on the same rationales of Claim 45. Further, Claim 46 discloses the same operations of Claim 45, but are performed by a base station.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jung-Jen Liu whose telephone number is 571-270-7643. The examiner can normally be reached on Monday to Friday, 9:00 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kwang B. Yao can be reached on 571-272-3182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 16/324,359
Art Unit: 2473

Page 10

/JUNG LIU/
Primary Examiner, Art Unit 2473

Notice of References Cited	Application/Control No. 16/324,359	Applicant(s)/Patent Under Reexamination ZHANG et al.	
	Examiner JUNG-JEN LIU	Art Unit 2473	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-20170223725-A1	08-2017	Xiong; Gang	H04L5/0053	1/1
*	B	US-20180316464-A1	11-2018	Stern-Berkowitz; Janet A.	H04L1/1657	1/1
*	C	US-20190182632-A1	06-2019	FUJISHIRO; Masato	H04W72/005	1/1
*	D	US-20190223197-A1	07-2019	SHIN; Seokmin	H04W24/08	1/1
*	E	US-20190174510-A1	06-2019	SHIN; Seokmin	H04W72/042	1/1
*	F	US-20100178895-A1	07-2010	Maeda; Miho	H04W4/90	455/404.1
*	G	US-20160227383-A1	08-2016	Lin; Jung-Mao	H04W4/08	1/1
*	H	US-20190222967-A1	07-2019	Ratilainen; Antti	H04W56/001	1/1
*	I	US-20170353946-A1	12-2017	RICO ALVARINO; Alberto	H04W4/70	1/1
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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NON-PATENT DOCUMENTS

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*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.

<i>Search Notes</i> 	Application/Control No. 16/324,359	Applicant(s)/Patent Under Reexamination ZHANG et al.
	Examiner JUNG-JEN LIU	Art Unit 2473

CPC - Searched*		
Symbol	Date	Examiner
H04W4/06 H04W4/50 H04W68/005 H04W4/70 H04W80/02 H04W88/02 H04W72/042 H04W8/08 H04W76/11 H04W72/005 H04W4/06 H04W48/16 H04W80/02 H04W72/042 H04W88/02 H04W8/08 H04W76/11 H04W4/50 H04W4/70 H04W68/005 H04W72/1252 H04W4/80 H04W24/08 H04W72/042 H04W72/0446 H04L1/0061 H04W88/06 H04W72/0453 H04W68/005 H04W76/11 H04W76/27 H04W80/08	02/12/2020	JL

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
EAST inventor search	02/12/2020	JL

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/JUNG LIU/ Primary Examiner, Art Unit 2473	
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	"20190182632.pn"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 16:55
L2	2	"20190182632"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 16:56
L3	1	2 and sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 16:56
L4	1	3 and resource\$1	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 16:56
L5	544623	H04W4/06 H04W4/50 H04W68/005 H04W4/70 H04W80/02 H04W88/02 H04W72/042 H04W8/08 H04W76/11 H04W72/005 H04W4/06 H04W48/16 H04W80/02 H04W72/042 H04W88/02 H04W8/08 H04W76/11 H04W4/50 H04W4/70 H04W68/005 H04W72/1252 H04W4/80 H04W24/08 H04W72/042 H04W72/0446 H04L1/0061 H04W88/06 H04W72/0453 H04W68/005 H04W76/11 H04W76/27 H04W80/08	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:23
L6	202	5 and sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:24
L7	59	6 and npdcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:24
L8	252	sc-mcch	US-PGPUB; USPAT; FPRS;	OR	OFF	2020/02/12 17:24

			EPO; JPO; DERWENT; IBM_TDB			
L9	63	8 and npdcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:24
L10	4502	ZHANG and Chongming LIU and Renmao YAMADA and Shohei	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:26
L11	10	10 and sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:26
L12	7	11 and npdcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:26
S1	1	16/324,359	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 14:06
S2	16	("20170223725" "20180316464" "20190182632" "20190223197" "20190174510" "20100178895" "20160227383" "20190222967").pn.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 20:53
S3	8	(US-20170223725-\$ or US-20180316464-\$ or US-20190182632-\$ or US- 20190223197-\$ or US-20190174510-\$ or US-20100178895-\$ or US-20160227383-\$ or US-20190222967-\$).did.	US-PGPUB	OR	OFF	2020/02/11 20:54
S4	36801	"8" and dci	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 20:54
S5	5	S3 and dci	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 20:54
S6	556	npdcch	US-PGPUB; USPAT; FPRS; EPO; JPO;	OR	OFF	2020/02/11 22:00

EAST Search History

			DERWENT; IBM_TDB			
S7	63	S6 and sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 22:00
S8	2	"20190182632".pn.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 14:46
S9	2	S8 and chang\$4	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 14:46

2/12/2020 5:27:15 PM

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Bibliographic Data

Application No: 16/324,359

Foreign Priority claimed: ☒ Yes ☐ No

35 USC 119 (a-d) conditions met: ☒ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged:

/JUNG LIU/

Examiner's Signature

Initials

Title:

INFORMATION CHANGE TRANSMISSION METHOD AND
DEVICE FOR SINGLE-CELL MULTICAST SERVICE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
02/08/2019	370	2473	US76497
RULE			

APPLICANTS

Sharp Kabushiki Kaisha, Sakai City, Osaka, JAPAN

FG Innovation Company Limited, Tuen Mun, CHINA

INVENTORS

Chongming ZHANG Pudong, Shanghai, CHINA

Renmao LIU Pudong, Shanghai, CHINA

Shohei YAMADA Sakai City, JAPAN

CONTINUING DATA

This application is a 371 of PCT/CN2017/096794 08/10/2017

FOREIGN APPLICATIONS

CHINA 201610658544.6 08/11/2016

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/27/2019

STATE OR COUNTRY

CHINA

ADDRESS

SBPJ/ScienBiziP, P.C.

550 South Hope Street

Suite 2825

Los Angeles, CA 90071

UNITED STATES

FILING FEE RECEIVED

\$2,040

Doc code: IDS

PTO/SB/08a (03-15)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2016. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	
	Filing Date	
	First Named Inventor	Chongming ZHANG
	Art Unit	
	Examiner Name	
	Attorney Docket Number	US76497

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	1	101998270	CN	A	2011-03-30	ZTE CORP	See Abstract	×
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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Chongming ZHANG
Art Unit	
Examiner Name	
Attorney Docket Number	US76497

1	3RD GENERATION PARTNERSHIP PROJECT (3GPP TM), Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding, (Release 13), 3GPP TS 36.212 V13.2.0, June 2016, Valbonne, France.
2	VODAFONE, HUAWEI, HISILICON, ERICSSON, QUALCOMM, New work item proposal: Enhancements of NB-IoT, 3GPP TSG RAN Meeting #72, RP-161324, Jun. 13-16, 2016, Busan, Korea.
3	QUALCOMM INCORPORATED, New Work Item: NarrowBand IOT (NB-IOT), 3GPP TSG RAN Meeting #69, RP-151621, Sep. 14-16, 2015, Phoenix, USA.

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/JUNG LIU/	Date Considered	02/11/2020
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Chongming ZHANG
Art Unit	
Examiner Name	
Attorney Docket Number	US76497

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Tung-Yun McNally/	Date (YYYY-MM-DD)	2019-02-08
Name/Print	Tung-Yun McNally	Registration Number	66,725

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

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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.
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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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L./

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 16/324,359
Application Filing Date : February 8, 2019
Examiner : LIU, JUNG-JEN
Art Unit : 2473
Confirmation No. : 1032
Attorney Docket No. : US76497
First Inventor : Chongming ZHANG
Customer No. : 145688

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

Commissioner:

RESUBMISSION OF REQUEST FOR POWER OF ATTORNEY

In the Denial of Request for Power of Attorney dated March 27, 2019 (hereinafter "Correspondence"), the Correspondence states that "only one Customer Number can be designated for the Power of Attorney in an application. The Customer Number that was captured is the first Customer Number provided on the Power of Attorney document."

Applicants hereby submit a Power of Attorney executed by the original applicants, SHARP KABUSHIKI KAISHA and FG INNOVATION COMPANY LIMITED, with one designated Customer Number of 145688, and a 3.73 statement showing ownership of the above-referenced patent application.

Acceptance of the current Request for Power of Attorney is respectfully requested.

Attachments:

1. Power of Attorney with Customer Number of 145688
2. 3.73 statement

CONCLUSION

If the Examiner believes that there are any issues that can be resolved by a telephone conference, or that there are any informalities that can be corrected by an Examiner's amendment, please call the undersigned representative at the number given below.

Respectfully,
By /Calvin H Chai/

Calvin H Chai
Registration No.: 68,009
ScienBiziP, P.C.
550 S. Hope Street, Suite 2825,
Los Angeles, CA 90071
Phone: (213) 426-1784
Fax: (213) 426-1788

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STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Sharp Kabushiki Kaisha, FG Innovation Company LimitedApplication No./Patent No.: 16/324,359 Filed/Issue Date: 02-08-2019Titled: INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICESharp Kabushiki Kaisha, a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose one of options 1, 2, 3 or 4 below):

1. ☐ The assignee of the entire right, title, and interest.
2. ☒ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☒ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

FG Innovation Company LimitedAdditional 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 050393, Frame 0970, 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: _____ To: _____
- The document was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.
2. 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.

[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.

/Calvin H Chai/

2020-03-19

Signature

Date

Calvin H Chai

68,009

Printed or Typed Name

Title or Registration Number

Privacy Act Statement

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

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

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

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STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Sharp Kabushiki Kaisha, FG Innovation Company LimitedApplication No./Patent No.: 16/324,359Filed/Issue Date: 02-08-2019Titled: INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICEFG Innovation Company Limited, a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose one of options 1, 2, 3 or 4 below):1. ☐ The assignee of the entire right, title, and interest.2. ☒ An assignee of less than the entire right, title, and interest (check applicable box):☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.☒ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:Sharp Kabushiki KaishaAdditional 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 050393, Frame 0970, 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:

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2. 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.

[Page 1 of 2]

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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
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The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Calvin H Chai/

2020-03-19

Signature

Date

Calvin H Chai

68,009

Printed or Typed Name

Title or Registration Number

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

PTO/AIA/82A (07-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

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

Application Number	16/324,359
Filing Date	February 8, 2019
First Named Inventor	Chongming ZHANG
Title	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
Art Unit	2473
Examiner Name	LIU, JUNG-JEN
Attorney Docket Number	US76497

SIGNATURE of Applicant or Patent Practitioner

Signature	/Calvin H Chai/	Date (Optional)	2020-03-19
Name	Calvin H Chai	Registration Number	68,009
Title (if Applicant is a juristic entity)	Patent Practitioner		
Applicant Name (if Applicant is a juristic entity)	SHARP KABUSHIKI KAISHA, FG INNOVATION COMPANY LIMITED		
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☐ *Total of _____ forms are submitted.			

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

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

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

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Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

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

Application Number	Filing Date

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

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 145688
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

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

- ☒ The address associated with the above-mentioned Customer Number
- OR
- ☐ The address associated with Customer Number:
- OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone			Email		

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

SHARP KABUSHIKI KAISHA

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

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

Signature	/Mototaka Taneya/	Date (Optional)	
Name	Mototaka Taneya		
Title	MANAGING OFFICER BU PRESIDENT CORPORATE RESEARCH & DEVELOPMENT		

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

☐ Total of forms are submitted.

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

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

Doc Code: PA..

Document Description: Power of Attorney

PTO/AIA/82B (07-13)

Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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POWER OF ATTORNEY BY APPLICANTI 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:

OR

145688

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

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

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

OR

- ☐ The address associated with Customer Number:

OR

Firm or Individual Name				
Address				
City		State		Zip
Country				
Telephone		Email		

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

FG INNOVATION COMPANY LIMITED

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

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

Signature	<i>Chie-Ming Chou</i>	Date (Optional)	2/19/2017
Name	CHIE-MING CHOU		
Title	CEO of FG INNOVATION COMPANY LIMITED		

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

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(National Phase of PCT/JP2017/003319 filed on January 31, 2017)

Electronic Acknowledgement Receipt	
EFS ID:	38920404
Application Number:	16324359
International Application Number:	
Confirmation Number:	1032
Title of Invention:	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
First Named Inventor/Applicant Name:	Chongming ZHANG
Customer Number:	145688
Filer:	Calvin H Chai
Filer Authorized By:	
Attorney Docket Number:	US76497
Receipt Date:	20-MAR-2020
Filing Date:	08-FEB-2019
Time Stamp:	03:54:59
Application Type:	U.S. National Stage under 35 USC 371

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	Applicant Response to Pre-Exam Formalities Notice	US76497200319ANF.pdf	83566	no	2
			4727b6a1811d90489d4fb0b30c439a41464c49e6		
Warnings:					

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	US76497200319ASO.pdf	1801704	no	6
			6aa3ff05a0cb2bfa1e1d9562512653cc14904f01		
Warnings:					
Information:					
3	Power of Attorney	US76497200319POA.pdf	2344136	no	3
			deae530970b2f4bca47bcc38f695d4d089859e99		
Warnings:					
Information:					
Total Files Size (in bytes):			4229406		
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/324,359	02/08/2019	Chongming ZHANG	US76497

CONFIRMATION NO. 1032

POA ACCEPTANCE LETTER

145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071



Date Mailed: 03/24/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/20/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

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

/sleutchit/

Electronic Acknowledgement Receipt	
EFS ID:	39407297
Application Number:	16324359
International Application Number:	
Confirmation Number:	1032
Title of Invention:	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
First Named Inventor/Applicant Name:	Chongming ZHANG
Customer Number:	145688
Filer:	Kyoko C. Makino
Filer Authorized By:	
Attorney Docket Number:	US76497
Receipt Date:	11-MAY-2020
Filing Date:	08-FEB-2019
Time Stamp:	16:27:46
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	US76497200509R1.pdf	148316	no	8
			3341d12132fca58f6f76de90fa908fdc3074895c		
Warnings:					

Information:	
Total Files Size (in bytes):	148316
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 16/324,359
Application Filing Date : February 8, 2019
Examiner : Liu, Jung-Jen
Art Unit : 2473
Confirmation No. : 1032
Attorney Docket No. : US76497
First Inventor : Zhang, Chongming
Customer No. : 145688

AMENDMENT AND RESPONSE TO *NON-FINAL* OFFICE ACTION

Mail Stop Amendment

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

Dear Sir/Madam:

This is in response to the *Non-Final* Office Action dated February 18, 2020 in the above-referenced patent application. Please kindly consider the following:

A Listing of Claims begins on page **2** of this paper. This listing of claims will replace all prior versions, and listings, of claims in the application.

Remarks begin on page **5** of this paper.

Listing of Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-44. (Canceled)

45. (Currently Amended)

A User Equipment (UE) comprising:

receiving circuitry configured to receive, in more than one second subframe, a second downlink control information (DCI) format carried on a second narrowband physical downlink control channel (NPDCCH), after receiving Single-Cell Multicast Control Channel (SC-MCCH) information; and

processing circuitry configured to acquire, on the basis of a first DCI format carried on a first NPDCCH and received in more than one first subframe, another SC-MCCH information, in a case that the second DCI format includes (a) a first field indicating indicates an SC-MCCH information change notification, wherein

a period of the more than one first subframe is different from a period of the more than one second subframe, and

~~(b) a second field indicating the first DCI format indicates a resource for a transmission of the another SC-MCCH information; the another SC-MCCH information based on the first field and the second field.~~

46. (Currently Amended)

A base station comprising:

transmitting circuitry configured to transmit Single-Cell Multicast Control Channel (SC-MCCH) information; and

generating circuitry configured to generate a second downlink control information (DCI) format which includes (a) a first field indicating an SC-MCCH information change notification, ~~and (b) a second field indicating a resource for a transmission of another SC-MCCH information;~~ wherein

the transmitting circuitry is configured to transmit, in more than one second subframe, the second DCI format carried on a second narrowband physical downlink control channel (NPDCCH),
[[and]]

the generating circuitry configured to generate a first DCI format indicating a resource for a transmission of another SC-MCCH information,

the transmitting circuitry is configured to transmit, in more than one first subframe, the first DCI format carried on a first NPDDCH,

a period of the more than one first subframe is different from a period of the more than one second subframe, and

the transmitting circuitry is configured to transmit the another SC-MCCH information using with use of the resource indicated by the first DCI format and in accordance with the second DCI format second field.

47. (Currently Amended)

A method performed by a User Equipment (UE) comprising:

receiving Single-Cell Multicast Control Channel (SC-MCCH) information;

receiving, in more than one second subframe, a second downlink control information (DCI) format carried on a second narrowband physical downlink control channel (NPDCCH);

acquiring, on the basis of a first DCI format carried on a first NPDCCH and received in more than one first subframe, another SC-MCCH information, in a case that the second DCI format includes (a) a first field indicating indicates an SC-MCCH information change notification, wherein

a period of the more than one first subframe is different from a period of the more than one second subframe, and

(b) a second field indicating the first DCI format indicates a resource for a transmission of the another SC-MCCH information, the another SC-MCCH information based on the first field and the second field.

48. (Currently Amended)

A method performed by a base station comprising:

transmitting Single-Cell Multicast Control Channel (SC-MCCH) information;

generating a second downlink control information (DCI) format which includes (a) a first field indicating an SC-MCCH information change notification and (b) a second field indicating a resource for a transmission of another SC-MCCH information;

transmitting, in more than one second subframe, the second DCI format carried on a second narrowband physical downlink control channel (NPDCCH);

generating a first DCI format indicating a resource for a transmission of another SC-MCCH information;

transmitting, in more than one first subframe, the first DCI format carried on a first NPDDCH; and

transmitting the another SC-MCCH information ~~using~~ with use of the resource indicated by the ~~first DCI format and in accordance with the second DCI format-second field,~~ wherein

a period of the more than one first subframe is different from a period of the more than one second subframe.

49. (New)

The UE according to claim 45, wherein
the second DCI format includes a field of multiple bits, and
the SC-MCCH information change notification is indicated by the field of the multiple bits, one of the multiple bits indicating that a multimedia broadcast multicast service (MBMS) service is changed.

50. (New)

The base station according to claim 46, wherein
the second DCI format includes a field of multiple bits, and
the SC-MCCH information change notification is indicated by the field of the multiple bits, one of the multiple bits indicating that a multimedia broadcast multicast service (MBMS) service is changed.

REMARKS

Prior to the present Amendment and Response, claims 45-48 were pending in the present application. By the present Amendment and Response, claims 45-48 are amended. Claims 49 and 50 are newly added. No new matter has been introduced. After the present Amendment and Response, claims 45-50 remain pending in the present application.

Applicant respectfully requests reconsideration and allowance of these claims in view of the above amendments and the following remarks. As Applicant's amendments and remarks with respect to the Examiner's rejections are sufficient to overcome these rejections, Applicant's silence as to assertions by the Examiner in the Office Action or certain requirements that may be applicable to such rejections (for example, assertions regarding dependent claims, whether a reference constitutes prior art, whether references are legally combinable for obviousness purposes) is not a concession by Applicant that such assertions are accurate or such requirements have been met, and Applicant reserves the right to analyze and dispute such in the future.

A. Rejection of Claims 45-48 under 35 U.S.C. § 103

In the *Non-Final* Office Action dated February 18, 2020 (hereinafter "Office Action"), the Examiner rejects claims 45-48 under 35 U.S.C. § 103 as being unpatentable for purported obviousness over Shin et al. (US provisional application No. 62/372,324 filed August 9, 2016, claimed by US non-provisional application No. 16/324,288 which is published as US Publication No. 2019/0223197 A1, hereinafter "Shin") in view of Fujishiro et al. (US Publication No. 2019/0182632 A1, hereinafter "Fujishiro"). See pages 3-9 of the Office Action. For the reasons discussed below, Applicant respectfully submits that amended independent claim 45 is patentably distinguishable over Shin and Fujishiro, either singly or in any combination thereof.

Applicant is not conceding in this application that the previously pending claims are not patentable. Rather, any alterations are without conceding to the Examiner's positions, and being made only to expedite prosecution of the present application, and are without prejudice to the presentation or assertion, in the future, of claims relating to the same or similar subject matter as the previously pending claims.

By the present Amendment and Response, Applicant has amended independent claim 45 to recite, *inter alia*:

receiving circuitry configured to receive, **in more than one second subframe**, a second downlink control information (DCI) format carried on a second narrowband physical downlink control channel (NPDCCH) after receiving Single-Cell Multicast Control Channel (SC-MCCH) information; and processing circuitry configured to acquire, on the basis of a first DCI format carried on a first NPDCCH and received in more than one first subframe, another

SC-MCCH information, in a case that the second DCI indicates an SC-MCCH information change notification, wherein a period of the more than one first subframe is different from a period of **the more than one second subframe**. *See* claim 45 above (emphases added by Applicant).

Support for the amendment can be found, at least, page 8, lines 7-26 and page 9, line 35 through page 10, line 8 of the specification, in the originally filed application. Applicant respectfully submits that Shin and Fujishiro fail to teach, disclose, or suggest all features recited by amended independent claim 45.

In rejecting independent claim 45, the Examiner states:

[(Shin '372,324 discloses SC-MCCH information including (a) SC-MCCH information change notification indication and period, and (b) other information based on SC-MCCH change and radio resource and MCS information, see: [...]
See page 5 of the Office Action.

Turning to Shin, Shin describes:

When the network changes (some of) the SC-MCCH information, **it notifies the UEs about the change in the first subframe** which can be used for SC-MCCH transmission in a repetition period. LSB bit in 8-bit bitmap when set to '1' indicates the change in SC-MCCH. Upon receiving a change notification, a UE interested to receive MBMS services transmitted using SC-PTM acquires **the new SC-MCCH information starting from the same subframe**. The UE applies the previously acquired SC-MCCH information until the UE acquires the new SC-MCCH information. *See* "5.8a 1.3 SC-MCCH information validity and notification of changes" at page 10 of Shin (emphases added by Applicant).

Applicant respectfully submits that, Shin describes that, in the first subframe which can be used for SC-MCCH transmission in a repetition period, the network notifies the UEs on the change of the SC-MCCH notification. However, Shin fails to disclose or suggest the feature of "more than one second subframe" as recited by amended independent claim 45.

Even assuming, *ad arguendo*, that the feature of "the more than one second subframe" was described in Shin, which Applicant does not concede, Shin is entirely silent as to whether "a period of the more than one first subframe in which a resource for a transmission of the another SC-MCCH information is received is different from a period of the more than one second subframe in which an SC-MCCH information change notification is received," as recited by amended independent claim 45.

Turning to Fujishiro, Fujishiro describes:

The second update notification is an **update notification of SC-MCCH** (that is, SCPTM Configuration). **The eNB 200 may transmit the second update notification to the UE 100 by the MPDCCH or the NPDCCH which is scrambled with an SC-N-RNTI**. In response to the update notification information (Direct Indication) in the MPDCCH or NPDCCH including the

second update notification, the UE 100 can recognize the update of SC-MCCH.
See paragraph [0104] of Fujishiro (emphases added by Applicant).

Fujishiro further describes:

When the second and third update notifications are not provided, **the UE 100 receives the SC-MCCH** every SC-MCCH modification boundary or **every time the UE 100 receives the PDCCH scrambled with the SC-N-RNTI**, and the UE 100 may then check whether or not the setting (SC-MTCH-Info) related to a TMGI of interest has been updated. *See id.*, at paragraph [0106] (emphases added by Applicant).

According to the above paragraphs, Fig. 15A of Fujishiro depicts repetition of NPDCCH for SC-MCCH, and based on a common technical knowledge of 3GPP specification release 13, the NPDCCH scrambled with an SC-N-RNTI is considered as indicating both an update notification of SC-MCCH and a resource for the SC-MCCH in Fujishiro. That is, a timing of the update notification is **same as a timing of the notification about the resource for the SCCH**, and the timing corresponds to a timing of each of NPDCCH repeat transmissions. Thus, Fujishiro does not remedy the deficiencies of Shin as discussed above.

Referring again to the section 5.8a.1.3 of Shin cited above, Shin states that the new SC-MCCH information is started from the same subframe as the subframe in which the change notification is received by a UE.

Accordingly, the suggested combination of Shin and Fujishiro fails to disclose “a period of the more than one first subframe is different from a period of **the more than one second subframe** (emphasis added by Applicant)” as recited in amended independent claim 45.

As discussed above, amended independent claim 45 is patentably distinguishable over Shin and Fujishiro. Amended independent claims 46-48 include features similar to those in amended independent claim 45. *See* claims 46-48 above. For at least similar reasons presented above with regard to independent claim 45, Applicant respectfully submits that independent claims 46-48, are also patentably distinguishable over the cited references.

Withdrawal of the pending rejection is therefore respectfully requested.

B. Newly Added Claims 49 and 50

By the present Amendment and Response, Applicant has newly added claims 49 and 50. Support for claims 49 and 50 can be found, at least, page 12, line 25 through page 13, line 8 of the specification, in the originally filed application.

Applicant respectfully submits that claim 49, depending from and further limiting patentable independent claim 45 and, claim 50, depending from and further limiting patentable independent

claim 46, are, *a fortiori*, also patentably distinguishable over Shin, and over Shin in combination with any other cited reference, such as Fujishiro.

CONCLUSION

In view of the above, the undersigned representative respectfully submits that the foregoing Amendment and Response places this application in condition for allowance and a Notice to that effect is earnestly solicited. If the Examiner believes that there are any issues that can be resolved by a telephone conference, or that there are any informalities that can be corrected by an Examiner's amendment, please call the undersigned representative at the number given below.

The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 505142, referencing Attorney Docket No.: US76497.

Respectfully submitted,

By / Kyoko C. Makino, Reg.# 72200 /

Kyoko C. Makino
Registration No.: 72,200
ScienBiziP, P.C.
550 S. Hope Street, Suite 2825
Los Angeles, CA 90071
Phone: (213) 426-1771
Fax: (213) 426-1788

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/324,359		Filing Date 02/08/2019		☐ To be Mailed		
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO										
APPLICATION AS FILED - PART I										
		(Column 1)	(Column 2)							
FOR		NUMBER FILED	NUMBER EXTRA	RATE (\$)		FEE (\$)				
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A	N/A						
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A	N/A						
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A	N/A						
TOTAL CLAIMS (37 CFR 1.16(j))		minus 20 =	*	x \$100 =						
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*	x \$460 =						
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL						
APPLICATION AS AMENDED - PART II										
		(Column 1)	(Column 2)	(Column 3)						
AMENDMENT	05/11/2020	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)			
	Total (37 CFR 1.16(i))	* 6	Minus	** 20	= 0	x \$100 =		0		
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 0	x \$460 =		0		
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
					TOTAL ADD'L FEE		0			
AMENDMENT		(Column 1)	(Column 2)	(Column 3)						
		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)			
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =				
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =				
	☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
					TOTAL ADD'L FEE					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.					LIE					
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".					/JACQUELYN L WILLIAMS/					
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".										
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.										

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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NOTICE OF ALLOWANCE AND FEE(S) DUE

145688 7590 05/20/2020
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

EXAMINER

LIU, JUNG-JEN

ART UNIT

PAPER NUMBER

2473

DATE MAILED: 05/20/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/324,359	02/08/2019	Chongming ZHANG	US76497	1032

TITLE OF INVENTION: INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	08/20/2020

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.

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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
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P.O. Box 1450
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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)

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550 South Hope Street
Suite 2825
Los Angeles, CA 90071

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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/324,359	02/08/2019	Chongming ZHANG	US76497	1032

TITLE OF INVENTION: INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	08/20/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIU, JUNG-JEN	2473	370-312000

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,

1 _____

(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.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/324,359	02/08/2019	Chongming ZHANG	US76497	1032
145688	7590	05/20/2020	EXAMINER	
SBPJ/ScienBiziP, P.C.			LIU, JUNG-JEN	
550 South Hope Street			ART UNIT	
Suite 2825			PAPER NUMBER	
Los Angeles, CA 90071			2473	
DATE MAILED: 05/20/2020				

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.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/324,359	Applicant(s) ZHANG et al.	
	Examiner JUNG-JEN LIU	Art Unit 2473	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 5/11/2020.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are See Continuation Sheet. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov**.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☒ All b) ☐ Some *c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
---	--

/JUNG LIU/ Primary Examiner, Art Unit 2473	
---	--

Continuation of 3. The allowed claim(s) is/are: 45-50 renumbered 1-6

Notice of Pre-AIA or AIA Status

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

DETAILED ACTION

Response to Applicant's Remarks

Applicant's arguments and remarks, filed on 5/11/2020 (hereinafter Remarks), are acknowledged, and have been fully considered.

Allowable Subject Matter

Claims 45-50 renumbered 1-6 are allowed.

Reason for Allowance

The present invention is directed to information change transmission method and device related to a single-cell multicast service.

Each independent claim identifies the uniquely distinct features, particularly:

receiving circuitry configured to receive, in more than one second subframe, a second downlink control information (DCI) format carried on a second narrowband physical downlink control channel (NPDCCH). after receiving Single-Cell Multicast Control Channel (SC-MCCH) information; and

processing circuitry configured to acquire, on the basis of a first DCI format carried on a first NPDCCH and received in more than one first subframe, another SC-

MCCH information, in a case that the second DCI format indicates an SC-MCCH information change notification, wherein

a period of the more than one first subframe is different from a period of the more than one second subframe, and

the first DCI format indicates a resource for a transmission of the another SC-MCCH information.

The closest prior art:

Shin (US 20190223197 A1) discloses a method for transmitting/receiving data in a wireless communication system supporting NB-IoT.

Fujishiro (US 20190182632 A1) discloses a method of SC-MCCH channel management in narrowband IoT.

Maeda (US 20100178895 A1) discloses a method for emergency information broadcasting in a wireless network.

All the prior art disclose conventional method for information change transmission, either singularly or in combination, fail to anticipate or render the above features obvious.

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."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jung-Jen Liu whose telephone number is 571-270-7643. The examiner can normally be reached on Monday to Friday, 9:00 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kwang B. Yao can be reached on 571-272-3182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JUNG LIU/
Primary Examiner, Art Unit 2473

<i>Search Notes</i> 	Application/Control No. 16/324,359	Applicant(s)/Patent Under Reexamination ZHANG et al.
	Examiner JUNG-JEN LIU	Art Unit 2473

CPC - Searched*		
Symbol	Date	Examiner
H04W4/06 H04W4/50 H04W68/005 H04W4/70 H04W80/02 H04W88/02 H04W72/042 H04W8/08 H04W76/11 H04W72/005 H04W4/06 H04W48/16 H04W80/02 H04W72/042 H04W88/02 H04W8/08 H04W76/11 H04W4/50 H04W4/70 H04W68/005 H04W72/1252 H04W4/80 H04W24/08 H04W72/042 H04W72/0446 H04L1/0061 H04W88/06 H04W72/0453 H04W68/005 H04W76/11 H04W76/27 H04W80/08	02/12/2020	JL

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
EAST inventor search	02/12/2020	JL
Update search for NOA	05/13/2020	JL

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	see the search note	05/13/2020	JL

/JUNG LIU/ Primary Examiner, Art Unit 2473	
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Issue Classification 	Application/Control No. 16/324,359	Applicant(s)/Patent Under Reexamination ZHANG et al.
	Examiner JUNG-JEN LIU	Art Unit 2473

CPC						
Symbol					Type	Version
H04W	/	72	/	042	F	2013-01-01
H04W	/	4	/	06	I	2013-01-01
H04W	/	68	/	005	I	2013-01-01
H04L	/	12	/	189	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Set
	/		/		

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 6	
/JUNG LIU/ Primary Examiner, Art Unit 2473 (Primary Examiner) _____ (Date) 13 May 2020		O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification 	Application/Control No. 16/324,359	Applicant(s)/Patent Under Reexamination ZHANG et al.
	Examiner JUNG-JEN LIU	Art Unit 2473

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H04W		72	04
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	6	
/JUNG LIU/	13 May 2020	O.G. Print Claim(s)	O.G. Print Figure
Primary Examiner, Art Unit 2473		1	1
(Primary Examiner)	(Date)		

Issue Classification 	Application/Control No. 16/324,359	Applicant(s)/Patent Under Reexamination ZHANG et al.
	Examiner JUNG-JEN LIU	Art Unit 2473

☐ 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	45														
3	46														
5	47														
6	48														
2	49														
4	50														

NONE	Total Claims Allowed:	
(Assistant Examiner)	(Date)	6
/JUNG LIU/	13 May 2020	
Primary Examiner, Art Unit 2473		O.G. Print Claim(s)
(Primary Examiner)	(Date)	1
		O.G. Print Figure
		1

Bibliographic Data

Application No: 16/324,359

Foreign Priority claimed: ☒ Yes ☐ No

35 USC 119 (a-d) conditions met: ☒ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged:

/JUNG LIU/

Examiner's Signature

Initials

Title:

INFORMATION CHANGE TRANSMISSION METHOD AND
DEVICE FOR SINGLE-CELL MULTICAST SERVICE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
02/08/2019	370	2473	US76497
RULE			

APPLICANTS

Sharp Kabushiki Kaisha, Sakai City, Osaka, JAPAN

FG Innovation Company Limited, Tuen Mun, CHINA

INVENTORS

Chongming ZHANG Pudong, Shanghai, CHINA

Renmao LIU Pudong, Shanghai, CHINA

Shohei YAMADA Sakai City, JAPAN

CONTINUING DATA

This application is a 371 of PCT/CN2017/096794 08/10/2017

FOREIGN APPLICATIONS

CHINA 201610658544.6 08/11/2016

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/27/2019

STATE OR COUNTRY

CHINA

ADDRESS

SBPJ/ScienBiziP, P.C.

550 South Hope Street

Suite 2825

Los Angeles, CA 90071

UNITED STATES

FILING FEE RECEIVED

\$2,040

EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	16/324,359	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 14:06
S2	16	("20170223725" "20180316464" "20190182632" "20190223197" "20190174510" "20100178895" "20160227383" "20190222967").pn.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 20:53
S3	8	(US-20170223725-\$ or US-20180316464-\$ or US-20190182632-\$ or US-20190223197-\$ or US-20190174510-\$ or US-20100178895-\$ or US-20160227383-\$ or US-20190222967-\$).did.	US-PGPUB	OR	OFF	2020/02/11 20:54
S4	36801	"8" and dci	US-PGPUB; USPAT; FPRS; EPO; JPO;	OR	OFF	2020/02/11 20:54

			DERWENT; IBM_TDB			
S5	5	S3 and dci	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 20:54
S6	556	npdcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 22:00
S7	63	S6 and sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/11 22:00
S8	2	"20190182632".pn.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 14:46

S9	2	S8 and chang\$4	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 14:46
S10	0	"20190182632.pn"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 16:55
S11	2	"20190182632"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 16:56
S12	1	S11 and sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 16:56
S13	1	S12 and resource\$1	US-PGPUB; USPAT; FPRS; EPO; JPO;	OR	OFF	2020/02/12 16:56

			DERWENT; IBM_TDB			
S14	544623	H04W4/06 H04W4/50 H04W68/005 H04W4/70 H04W80/02 H04W88/02 H04W72/042 H04W8/08 H04W76/11 H04W72/005 H04W4/06 H04W48/16 H04W80/02 H04W72/042 H04W88/02 H04W8/08 H04W76/11 H04W4/50 H04W4/70 H04W68/005 H04W72/1252 H04W4/80 H04W24/08 H04W72/042 H04W72/0446 H04L1/0061 H04W88/06 H04W72/0453 H04W68/005 H04W76/11 H04W76/27 H04W80/08	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:23
S15	202	S14 and sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:24
S16	59	S15 and npdcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:24

S17	252	sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:24
S18	63	S17 and npdcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:24
S19	4502	ZHANG and Chongming LIU and Renmao YAMADA and Shohei	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:26
S20	10	S19 and sc-mcch	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/12 17:26
S21	7	S20 and npdcch	US-PGPUB; USPAT; FPRS; EPO; JPO;	OR	OFF	2020/02/12 17:26

			DERWENT; IBM_TDB			
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5/13/2020 10:26:46 AM
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United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/324,359	02/08/2019	2473	2180	US76497	4	4

CONFIRMATION NO. 1032
CORRECTED FILING RECEIPT



145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

Date Mailed: 07/13/2020

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

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

Inventor(s)

Chongming ZHANG, Pudong, Shanghai, CHINA;
Renmao LIU, Pudong, Shanghai, CHINA;
Shohei YAMADA, Sakai City, JAPAN;

Applicant(s)

Sharp Kabushiki Kaisha, Sakai City, Osaka, JAPAN;
FG Innovation Company Limited, Tuen Mun, CHINA;
Chongming ZHANG, Shanghai, CHINA

Power of Attorney: The patent practitioners associated with Customer Number 145688

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/CN2017/096794 08/10/2017

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 201610658544.6 08/11/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 02/27/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/324,359**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL
MULTICAST SERVICE

Preliminary Class

370

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

page 2 of 4

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

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

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

NOT GRANTED

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United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/324,359	02/08/2019	2473	2180	US76497	4	4

CONFIRMATION NO. 1032
CORRECTED FILING RECEIPT



0000000119272986

145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

Date Mailed: 08/18/2020

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

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

Inventor(s)

Chongming ZHANG, Pudong, Shanghai, CHINA;
Renmao LIU, Pudong, Shanghai, CHINA;
Shohei YAMADA, Sakai City, JAPAN;

Applicant(s)

Sharp Kabushiki Kaisha, Sakai City, Osaka, JAPAN;
FG Innovation Company Limited, Tuen Mun, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 145688

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/CN2017/096794 08/10/2017

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 201610658544.6 08/11/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 02/27/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/324,359**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL
MULTICAST SERVICE

Preliminary Class

370

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PART B—FEE(S) TRANSMITTAL

Complete and send this form, together with the applicable fee(s), to: MailMail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22314-1450
(571)-273-2885or Fax

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note Use Block 1 for any change of address)

145688 7590 05/20/2020
ScienBiziP, P.C.
550 S. Hope Street, Suite 2825
Los Angeles, CA 90071

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, EFS-Web transmitted, or facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's Name)

(Signature)

(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
16/324359	02/08/2019	Chongming ZHANG	US76497	1032

TITLE OF INVENTION:

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	Undiscounted	1000			1000	08/20/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS

1. Change of correspondence address or indication of "Fee Address" (37CFR 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 03-02 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 attorney or agent. If no name is listed, no name will be printed

1. ScienBiziP, P.C.

2.

3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

1a. NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

SHARP KABUSHIKI KAISHA

Sakai City, Osaka, JAPAN

FG Innovation Company Limited

Tuen Mun, HONG KONG

Please check the appropriate assignee categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☒ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies

4b. Payment of Fees(s); (Please first reapply and previously paid fee shown above)

- ☐ A check is enclosed
- ☐ Payment by credit card. Form PTO-2038 is attached
- ☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 602615 (enclose an extra copy of this form)

5. Change of 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 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 /Alvin Koan/

Date 08/19/2020

Typed or printed name Alvin Koan

Registration No. 68468

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.

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

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

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

Electronic Patent Application Fee Transmittal				
Application Number:		16324359		
Filing Date:		08-Feb-2019		
Title of Invention:		INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
First Named Inventor/Applicant Name:		Chongming ZHANG		
Filer:		Alvin Sean Koan/Vivienne Cao		
Attorney Docket Number:		US76497		
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000

Electronic Acknowledgement Receipt	
EFS ID:	40344924
Application Number:	16324359
International Application Number:	
Confirmation Number:	1032
Title of Invention:	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
First Named Inventor/Applicant Name:	Chongming ZHANG
Customer Number:	145688
Filer:	Alvin Sean Koan
Filer Authorized By:	
Attorney Docket Number:	US76497
Receipt Date:	20-AUG-2020
Filing Date:	08-FEB-2019
Time Stamp:	20:57:51
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$1000
RAM confirmation Number	E20208JK58103121
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	200820_16R00986_US76497_FI F.pdf	1700164	no	2
			d119b9e80e9969afn7298e2fbbbd1ba3ada bda07		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30510	no	2
			7907a4a3e81d2d898620f364b17be69599 26ac62		
Warnings:					
Information:					
Total Files Size (in bytes):			1730674		
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. <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. <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. <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.					

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)

Approved for use through 07/31/2016. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16324359
	Filing Date	2019-02-08
	First Named Inventor	CHONGMING ZHANG
	Art Unit	
	Examiner Name	
	Attorney Docket Number	US76497

U.S. PATENTS							Remove	
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
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If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
U.S. PATENT APPLICATION PUBLICATIONS							Remove	
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1							
If you wish to add additional U.S. Published Application citation information please click the Add button.							Add	
FOREIGN PATENT DOCUMENTS							Remove	
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
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NON-PATENT LITERATURE DOCUMENTS							Remove	
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	Filing Date	2019-02-08
	First Named Inventor	CHONGMING ZHANG
	Art Unit	
	Examiner Name	
	Attorney Docket Number	US76497

1	QUALCOMM INCORPORATED: "Power Efficient SC-MCCH Monitoring", 3GPP DRAFT; R2-156589 SC-MCCH CHANGE NOTIFICATION, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG2, no. Anaheim, USA; 20151116 -20151120, 7 November 2015 (2015-11-07), XP051024847, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_92/Docs/	+
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If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

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

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16324359
	Filing Date	2019-02-08
	First Named Inventor	CHONGMING ZHANG
	Art Unit	
	Examiner Name	
	Attorney Docket Number	US76497

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Alvin Koan/	Date (YYYY-MM-DD)	2020-08-20
Name/Print	Alvin Koan	Registration Number	68468

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

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.

Electronic Patent Application Fee Transmittal				
Application Number:		16324359		
Filing Date:		08-Feb-2019		
Title of Invention:		INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE		
First Named Inventor/Applicant Name:		Chongming ZHANG		
Filer:		Alvin Sean Koan		
Attorney Docket Number:		US76497		
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	40339082
Application Number:	16324359
International Application Number:	
Confirmation Number:	1032
Title of Invention:	INFORMATION CHANGE TRANSMISSION METHOD AND DEVICE FOR SINGLE-CELL MULTICAST SERVICE
First Named Inventor/Applicant Name:	Chongming ZHANG
Customer Number:	145688
Filer:	Alvin Sean Koan
Filer Authorized By:	
Attorney Docket Number:	US76497
Receipt Date:	20-AUG-2020
Filing Date:	08-FEB-2019
Time Stamp:	14:13:14
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$240
RAM confirmation Number	E20208JE14144316
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	Non Patent Literature	US76497200818IDS-NPL.pdf	826424	no	3
			8c56e044dee6ba4a765f9f6842b6399751483873		
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	US76497__IDS.pdf	532865	no	4
			866c25c7b83dbd507e74af735dcfd0e13c68384e		
Warnings:					
Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
3	Fee Worksheet (SB06)	fee-info.pdf	30597	no	2
			60c0bc077926354aab185cd347149e530a0f7602		
Warnings:					
Information:					
Total Files Size (in bytes):			1389886		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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



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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.
16/324,359	02/08/2019	Chongming ZHANG	US76497	1032
7590 SBPJ/ScienBiziP, P.C. 550 South Hope Street Suite 2825 Los Angeles, CA 90071			EXAMINER LIU, JUNG-JEN	
			ART UNIT	PAPER NUMBER
			2473	
			NOTIFICATION DATE	DELIVERY MODE
			08/31/2020	ELECTRONIC

NOTICE OF NON-COMPLIANT INFORMATION DISCLOSURE STATEMENT

An Information Disclosure Statement (IDS) filed 8-20-20 in the above-identified application fails to meet the requirements of 37 CFR 1.97(d) for the reason(s) specified below. Accordingly, the IDS will be placed in the file, but the information referred to therein has not been considered.

The IDS is not compliant with 37 CFR 1.97(d) because:

- ☒ The IDS lacks a statement as specified in 37 CFR 1.97(e).
- ☐ The IDS lacks the fee set forth in 37 CFR 1.17(p).
- ☐ The IDS was filed after the issue fee was paid. Applicant may wish to consider filing a petition to withdraw the application from issue under 37 CFR 1.313(c) to have the IDS considered. See MPEP 1308.

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



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
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/324,359	09/22/2020	10785764	US76497	1032

145688 7590 09/02/2020
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Chongming ZHANG, Pudong, Shanghai, CHINA;
Sharp Kabushiki Kaisha, Sakai City, Osaka, JAPAN;
Renmao LIU, Pudong, Shanghai, CHINA;
FG Innovation Company Limited, Tuen Mun, CHINA;
Shohei YAMADA, Sakai City, JAPAN;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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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. 2:23-cv-00261	DATE FILED 5/31/2023	U.S. DISTRICT COURT for the Eastern District of Texas, Marshall Division
PLAINTIFF ACTIVE WIRELESS TECHNOLOGIES LLC		DEFENDANT T-MOBILE USA, INC. and T-MOBILE US, INC.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 10,531,443	1/7/2020	Active Wireless Technologies LLC
2 11,019,557	3/25/2021	Active Wireless Technologies LLC
3 10,785,764	9/22/2020	Active Wireless Technologies LLC
4 10,601,566	3/24/2020	Active Wireless Technologies LLC
5		

In the above--entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above--entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
-------	-------------------	------

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court _____ for the Eastern District of Texas, Marshall Division _____ on the following

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

DOCKET NO. 2:23-cv-00261	DATE FILED 5/31/2023	U.S. DISTRICT COURT for the Eastern District of Texas, Marshall Division
PLAINTIFF ACTIVE WIRELESS TECHNOLOGIES LLC		DEFENDANT T-MOBILE USA, INC. and T-MOBILE US, INC.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 10,531,443	1/7/2020	Active Wireless Technologies LLC
2 11,019,557	3/25/2021	Active Wireless Technologies LLC
3 10,785,764	9/22/2020	Active Wireless Technologies LLC
4 10,601,566	3/24/2020	Active Wireless Technologies LLC
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1			
2			
3			
4			
5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT		
CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy