PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | |
| Examiner Name | |
| Attorney Docket Number | P4998USC1 |

**U.S.PATENTS**

| 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 |
|---|---|---|---|---|---|---|
| | 1 | 8606336 | | 2013-12-10 | Womack, et al. | |

If you wish to add additional U.S. Patent citation information please click the Add button.

**U.S.PATENT APPLICATION PUBLICATIONS**

| 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 | 20090274120 | | 2009-11-05 | Chou | Corresponding to KR 10-2009-0115913 |
| | 2 | 20100111005 | | 2010-05-06 | Ahn, et al. | Corresponding to KR 10-2008-0063023 |
| | 3 | 20100041399 | | 2010-02-18 | Kim, et al. | Corresponding to KR 10-2008-0079961 |
| | 4 | 20100238857 | | 2010-09-23 | Zhang, et al. | |
| | 5 | 20100323744 | | 2010-12-23 | Kim, et al. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | |
| | Examiner Name | |
| | Attorney Docket Number | P4998USC1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 6 | 20100118720 | | 2010-05-13 | Gauvreau, et al. | |
| | 7 | 20110170495 | | 2011-07-14 | Earnshaw, et al. | |
| | 8 | 20090316642 | | 2009-12-24 | Yamada, et al. | |
| | 9 | 20090318175 | | 2009-12-24 | Sandberg | |
| | 10 | 20100086065 | | 2010-04-08 | Higuchi, et al. | |
| | 11 | 20090270094 | | 2009-10-29 | Ito, et al. | |
| | 12 | 20090116434 | | 2009-05-07 | Lohr, et al. | |

If you wish to add additional U.S. Published Application citation information please click the Add button.

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] ¡ | 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] |
|---|---|---|---|---|---|---|---|---|
| | 1 | 10-2009-0115913 | KR | | 2009-11-10 | Industrial Technology Research Institute | Corresponding to US 20090274120 | ☐ |
| | 2 | 10-2008-0063023 | KR | | 2008-07-03 | Posdata Co., Ltd. | Corresponding to US 20100111005 | ☐ |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | |
| | Examiner Name | |
| | Attorney Docket Number | P4998USC1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 | 10-2008-0079961 | KR | | 2008-09-02 | LG Electronics Inc. | Corresponding to US 20100041399 | ☐ |

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**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|
| | 1 | International Search Report of PCT/KR2011/000909 dated December 7, 2011. | ☐ |
| | 2 | Non Final Office Action issued on July 16, 2014, in U.S. Application No. 13/578,531. | ☐ |
| | 3 | Notice of Allowance issued on February 4, 2015, in U.S. Application No. 13/578,531. | ☐ |

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**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
|---|---|---|---|

*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 | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | |
| | Examiner Name | |
| | Attorney Docket Number | P4998USC1 |

**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 | /dongil moon/ | Date (YYYY-MM-DD) | 2015-06-08 |
|---|---|---|---|
| Name/Print | Dongil Moon | Registration Number | L0830 |

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 record s.

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:** | |
| **Filing Date:** | |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Filer:** | Hae-Chan Park/Daniele Adams |
| **Attorney Docket Number:** | P4998USC1 |

Filed as Large Entity

**Filing Fees for Utility under 35 USC 111(a)**

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| Utility application filing | 1011 | 1 | 280 | 280 |
| Utility Search Fee | 1111 | 1 | 600 | 600 |
| Utility Examination Fee | 1311 | 1 | 720 | 720 |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **1600** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 22562731 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 58027 |
| **Filer:** | Hae-Chan Park/Dongil Moon |
| **Filer Authorized By:** | Hae-Chan Park |
| **Attorney Docket Number:** | P4998USC1 |
| **Receipt Date:** | 08-JUN-2015 |
| **Filing Date:** | |
| **Time Stamp:** | 14:10:01 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Credit Card |
| Payment was successfully received in RAM | $1600 |
| RAM confirmation Number | 312 |
| 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 | Application Data Sheet | P4998USC1_ADS.pdf | 2709974<br>0a990bbabed612bc290af08bae212b7f8870c609 | no | 7 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied ADS fillable form | | | | | |
| 2 | Power of Attorney | P4998USC1_POA_373.pdf | 1964568<br>23871d5c65ab3dabcb2ee44fcd1d70d4944a4c28 | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Oath or Declaration filed | P4998USC1_Declarations.pdf | 9282883<br>70ef5312bd1599957341a0476d4376e4322af2c1 | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | | P4998USC1_Specification.pdf | 280274<br>26a455f96793f9ba3671484abea388cf985412bf | yes | 55 |

**Multipart Description/PDF files in .zip description**

| Document Description | Start | End |
|---|---|---|
| Specification | 1 | 51 |
| Claims | 52 | 54 |
| Abstract | 55 | 55 |

| | | | | | |
|---|---|---|---|---|---|
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Drawings-only black and white line drawings | P4998USC1_Drawings.pdf | 539035<br>6fa3edccbabdfa8f33972e3d00386be4e8ab28f1 | no | 11 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Information Disclosure Statement (IDS) Form (SB08) | P4998USC1_IDS.pdf | 1593582<br>97fbe9a6e49de4e8b5da2402fbf43fd2d0c7c42f | no | 5 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 7 | Non Patent Literature | 2014-07-16_P4998US00_NFOA.pdf | 1890408<br>f3fc4243fb88374e14987677f8962e98d945975b | no | 29 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 8 | Non Patent Literature | 2015-02-04_P4998US00_NOA.pdf | 1603750<br>b47a38a87af9adb989e1dfcc4fbf4147d21f4cff | no | 23 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 9 | Fee Worksheet (SB06) | fee-info.pdf | 35587<br>765db67ea1d2678211d2de2618f7f00644ee6f47 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 19900061 | | |

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**New Applications Under 35 U.S.C. 111**

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

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

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

**New International Application Filed with the USPTO as a Receiving Office**

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

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| **Application Data Sheet 37 CFR 1.76** | Attorney Docket Number | P4998USC1 |
|---|---|---|
| | Application Number | |
| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM | |

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 |
|---|---|---|---|---|
| | Kibum | | KWON | |

**Residence Information (Select One)** ○ US Residency ◉ Non US Residency ○ Active US Military Service

| City | Seoul | Country of Residence [i] | KR |
|---|---|---|---|

**Mailing Address of Inventor:**

| | | | |
|---|---|---|---|
| **Address 1** | Pantech Bldg., I-2, DMC Sangam-dong, Mapo-gu | | |
| **Address 2** | | | |
| **City** | Seoul | **State/Province** | |
| **Postal Code** | 121-270 | **Country** [i] | KR |

**Inventor 2** Remove

**Legal Name**

| Prefix | Given Name | Middle Name | Family Name | Suffix |
|---|---|---|---|---|
| | Myungcheul | | JUNG | |

**Residence Information (Select One)** ○ US Residency ◉ Non US Residency ○ Active US Military Service

| City | Seoul | Country of Residence [i] | KR |
|---|---|---|---|

**Mailing Address of Inventor:**

| | | | |
|---|---|---|---|
| **Address 1** | Pantech Bldg., I-2, DMC Sangam-dong, Mapo-gu | | |
| **Address 2** | | | |
| **City** | Seoul | **State/Province** | KR |
| **Postal Code** | 121-270 | **Country** [i] | |

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

## Correspondence Information:

PTO/AIA/14 (12-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

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|---|---|---|
| | Application Number | |
| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM | |

| **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** | 58027 | |
| **Email Address** | | Add Email / Remove Email |

## Application Information:

| **Title of the Invention** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM | | |
|---|---|---|---|
| **Attorney Docket Number** | P4998USC1 | **Small Entity Status Claimed** ☐ | |
| **Application Type** | Nonprovisional | | |
| **Subject Matter** | Utility | | |
| **Total Number of Drawing Sheets (if any)** | 11 | **Suggested Figure for Publication (if any)** | |

## 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 | 58027 | | |

| **Application Data Sheet 37 CFR 1.76** | Attorney Docket Number | P4998USC1 |
|---|---|---|
| | Application Number | |
| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM | |

## Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this 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 blank.

| Prior Application Status | Pending | | Remove |
|---|---|---|---|
| Application Number | Continuity Type | Prior Application Number | Filing Date (YYYY-MM-DD) |
| | Continuation of | 13578531 | 2012-08-10 |
| Prior Application Status | | | Remove |
| Application Number | Continuity Type | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13578531 | a 371 of international | PCT/KR2011/000909 | 2011-02-10 |

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

## 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(d). 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(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

| | | | Remove |
|---|---|---|---|
| Application Number | Country[i] | Filing Date (YYYY-MM-DD) | Access Code[i] (if applicable) |
| 10-2010-0012564 | KR | 2010-02-10 | |
| | | | Remove |
| Application Number | Country[i] | Filing Date (YYYY-MM-DD) | Access Code[i] (if applicable) |
| 10-2010-0027230 | KR | 2010-03-26 | |
| | | | Remove |
| Application Number | Country[i] | Filing Date (YYYY-MM-DD) | Access Code[i] (if applicable) |
| 10-2011-0008683 | KR | 2011-01-28 | |

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

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | P4998USC1 |
|---|---|---|
| | Application Number | |
| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM | |

## 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.

## Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

If 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 World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

## 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.

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| **Application Data Sheet 37 CFR 1.76** | Attorney Docket Number | P4998USC1 |
|---|---|---|
| | Application Number | |
| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM | |

**Applicant 1**

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 | Pantech Co., Ltd. |
|---|---|

**Mailing Address Information For Applicant:**

| | | | |
|---|---|---|---|
| **Address 1** | Pantech Bldg., I-2, DMC Sangam-dong, Mapo-gu | | |
| Address 2 | | | |
| **City** | Seoul | **State/Province** | |
| **Country** | KR | Postal Code | 121-270 |
| Phone Number | | Fax Number | |
| Email Address | | | |

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

## Assignee Information including Non-Applicant Assignee Information:

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

**Assignee 1**

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

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

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| **Application Data Sheet 37 CFR 1.76** | Attorney Docket Number | P4998USC1 |
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| | Application Number | |
| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM | |

| 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 form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.

| **Signature** | /dongil moon/ | | | Date (YYYY-MM-DD) | 2015-06-08 |
|---|---|---|---|---|---|
| First Name | Dongil | Last Name | Moon | Registration Number | L0830 |

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 C o o p eration 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.

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# POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

☑ Practitioners associated with Customer Number: 58027

OR

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

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

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

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

☑ The address associated with Customer Number: 58027

OR

| | | | |
|---|---|---|---|
| ☐ | Firm or Individual Name | | |
| | Address | | |
| | City | | |
| | Country | | |
| | Telephone | | Email |

Assignee Name and Address: Pantech Co., Ltd.
Pantech Bldg., I-2, DMC Sangam-dong
Mapo-gu, Seoul 121-792
Republic of Korea

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

## SIGNATURE of Assignee of Record

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

| | | | |
|---|---|---|---|
| Signature | [signature] | Date | September 29, 2012 |
| Name | Hwang, Chadong | Telephone | 82-2-3280-9519 |
| Title | IP Team Leader | | |

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

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

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# STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Pantech Co., Ltd.

Application No./Patent No.: _____ Filed/Issue Date: 2015-06-08

Titled: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

Pantech Co., Ltd., 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:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 028776, Frame 0338, 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.



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.*

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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

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.

| | |
|---|---|
| /dongil moon/ | 2015-06-08 |
| Signature | Date |
| Dongil Moon | Patent Agent (Reg. No. L0830) |
| 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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# DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
|---|---|

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

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

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

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

## WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Myung Cheul JUNG Date (Optional) 2015-06-09

Signature: Myung Cheul

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

## Privacy Act Statement

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

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

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

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

| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
|---|---|

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____
  filed on _____.

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

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

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LEGAL NAME OF INVENTOR

Inventor: Kibum KWON Date (Optional): 2014-06-08

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# APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

## CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application is a continuation of U.S. Patent Application No. 13/578,531, filed on August 10, 2012, which is the National Stage Entry of International Application No. PCT/KR2011/000909, filed on February 10, 2011, and claims priority from and the benefit of Korean Patent Application No. 10-2010-0012564, filed on February 10, 2010, Korean Patent Application No, 10-2010-0027230, filed on March 26, 2010, and Korean Patent Application No. 10-2011-0008683, filed on January 28, 2011, all of which are hereby incorporated by reference for all purposes as if fully set forth herein.

## BACKGROUND

**[0002]** FIELD

**[0003]** The present invention relates to a method and apparatus for establishing an uplink (UL) synchronization in a wireless communication system, and more particularly, to a method and apparatus for configuring a UL synchronization with respect to at least one Component Carrier (CC).

**[0004]** DISCUSSION OF THE BACKGROUND

**[0005]** Synchronization between a user equipment (UE) and an evolved node B (eNB) is an important issue in a wireless communication system since transmission/reception of information between the UE and the eNB may not be performed without synchronization.

**[0006]** Current wireless communication system needs to satisfy a user demand through



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use of a plurality of CCs, unlike a conventional wireless communication system that supports a single component carrier (CC) or a single service band. However, a detailed scheme for synchronization with respect to the plurality of CCs has not been provided yet.

**[0007]** Accordingly, there is a desire for a scheme for effective synchronization in a wireless communication using a plurality of CCs since synchronization is a factor that has a great effect on an efficiency of a network.

## SUMMARY

**[0008]** Therefore, the present invention has been made in view of the above-mentioned problems, and an aspect of the present invention is to provide a method and apparatus for effectively operating a synchronization process by configuring an uplink (UL) synchronization in a wireless communication network supporting a plurality of CCs of Carrier Aggregation system for efficiency of a network, and secures stability of transmission/ reception.

**[0009]** Another aspect of the present invention is to provide a method and apparatus for establishing synchronization in a wireless communication system.

**[0010]** Another aspect of the present invention is to provide a method and apparatus for transmitting/receiving synchronization information to be used for establishing synchronization in a wireless communication system.

**[0011]** Another aspect of the present invention is to provide a method and apparatus for configuring a synchronization group with respect to a plurality of CCs in a wireless communication system.

**[0012]** Another aspect of the present invention is to provide a method and apparatus for configuring a synchronization group with respect to a plurality of CCs based on a connection

mode of a UE in a wireless communication system.

**[0013]** Another aspect of the present invention is to provide a method and apparatus for configuring a synchronization group based on characteristics of a plurality of CCs available in a wireless communication system.

**[0014]** Another aspect of the present invention is to provide a method and apparatus of a UE that may configure a UL timing synchronization group with respect to a plurality of CCs in a wireless communication system.

**[0015]** Another aspect of the present invention is to provide a method and apparatus of a UE that may obtain synchronization information associated with a plurality of CCs through a random access procedure in a wireless communication system, and may establish and update synchronization with an eNB.

**[0016]** In accordance with an aspect of the present invention, there is provided a method for an eNB to establish an uplink (UL) synchronization in a wireless communication system, the method including: receiving a synchronization request message from a user equipment (UE) through one or more delegate CCs in a UL timing group; and transmitting UL synchronization information corresponding to the UL timing group to the UE through the one or more CCs, so as to establish the UL synchronization, and the one or more delegate CCs are selected by the UE based on a state of the UL timing group and characteristics of a plurality of CCs forming the UL timing group, so as to establish the UL synchronization.

**[0017]** In accordance with another aspect of the present invention, there is provided a method for a UE to establish a UL synchronization in a wireless communication system, the method including: transmitting a synchronization request message to an eNB through one or more delegate CCs in a UL timing group; receiving UL synchronization information



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corresponding to the UL timing group for establishing the UL synchronization, from the eNB through the one or more delegate CCs; and establishing synchronization by applying, to the UL timing group, the UL synchronization information received through the one or more delegate CCs, and the one or more delegate CCs are selected by the UE based on a state of the UL timing group and characteristics of a plurality of CCs forming the UL timing group, so as to establish the UL synchronization.

**[0018]** In accordance with another aspect of the present invention, there is provided an eNB to establish a UL synchronization in a wireless communication system, the eNB including: a controller to generate UL synchronization information corresponding to a UL timing group, so as to establish the UL synchronization; and a transceiving unit to receive a synchronization request message from a user equipment (UE) through one or more delegate CCs in the UL timing group, and to transmit the UL synchronization information to the UE through the one or more delegate CCs, and the one or more delegate CCs are selected by the UE based on a state of the UL timing group and characteristics of a plurality of CCs forming the UL timing group, so as to establish the UL synchronization.

**[0019]** In accordance with another aspect of the present invention, there is provided a UE to establish a UL synchronization in a wireless communication system, the UE including: a transceiving unit to transmit a synchronization request message to an eNB through one or more delegate CCs in a UL timing group, and to receive UL synchronization information corresponding to the UL timing group through the one or more delegate CCs; a controller to determine the UL synchronization information received by the transceiving unit; and a UL timing adjusting unit to establish a UL synchronization of the UL timing group, based on the UL synchronization information determined by the controller, and the one or more delegate CCs are

selected by the UE based on a state of the UL timing group and characteristics of a plurality of CCs forming the UL timing group, so as to establish the UL synchronization.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0020]** FIG. 1 is a diagram illustrating an example of configuring a plurality of component carriers (CCs);

**[0021]** FIG. 2 is a diagram illustrating an example associated with a timing advance (TA) of a synchronization process;

**[0022]** FIG. 3 is a diagram illustrating a random access process performed between a user equipment (UE) and an evolved Node-B (eNB);

**[0023]** FIG. 4 is a diagram illustrating a process that obtains an uplink (UL) synchronization according to an embodiment of the present invention;

**[0024]** FIG. 5 is a diagram illustrating a process that obtains a Up Link(UL) synchronization according to another embodiment of the present invention;

**[0025]** FIG. 6 is a diagram illustrating a process that obtains a UL synchronization according to still another embodiment of the present invention;

**[0026]** FIG. 7 is a diagram illustrating a process in which an eNB enables the UE to obtain a UL synchronization in response to a request from the UE according to an embodiment of the present invention;

**[0027]** FIG. 8 is a diagram illustrating a process in which a UE obtains a UL synchronization through use of a UL timing group according to an embodiment of the present invention;

**[0028]** FIG. 9 is a diagram illustrating a process in which a UE obtains a UL

synchronization through use of a UL timing group according to an embodiment of the present invention;

**[0029]** FIG. 10 is a block diagram of an eNB according to an embodiment of the present invention; and

**[0030]** FIG. 11 is a block diagram of a UE according to an embodiment of the present invention.

## DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

**[0031]** Hereinafter, exemplary embodiments of the present invention will be described with reference to the accompanying drawings. In the following description, the same elements will be designated by the same reference numerals although they are shown in different drawings. Further, in the following description of the present invention, a detailed description of known functions and configurations incorporated herein will be omitted when it may make the subject matter of the present invention rather unclear.

**[0032]** The specifications will describe a wireless communication system as an example, and operations performed in wireless communication may include all operations performed in a system that manages the wireless communication and a wireless communication device that transmits data. The wireless communication system may provide various communication services such as voice data, packet data, and the like. According to an embodiment, the wireless communication system may include, for example, a user equipment (UE) and an evolved Node-B (eNB).

**[0033]** The UE may be an inclusive concept indicating a user terminal utilized in a wireless communication, including a UE in Wideband Code Division Multiple Access

(WCDMA), Long Term Evolution (LTE), High Speed Packet Access (HSPA), and the like, and a mobile station (MS), a user terminal (UT), a subscriber station (SS), a wireless device and the like in Global System for Mobile Communications (GSM).

**[0034]** The eNB or a cell may refer to a fixed station where communication with the UE is performed, and may also be referred to as a Node-B, a base transceiver system (BTS), an access point, and the like.

**[0035]** The eNB or the cell may be construed as an inclusive concept indicating a portion of an area covered by a radio network controller (RNC) in WCDMA, and the like, and the concept may include various cell coverage areas, such as a megacell, macrocell, a microcell, a picocell, a femtocell, and the like.

**[0036]** In the specifications, the UE and the eNB are used as two inclusive transceiving subjects to embody the technology and technical concepts described in the specifications, and may not be limited to a predetermined term or word.

**[0037]** A multiple access scheme applied to the wireless communication system may not be limited. The wireless communication system may utilize varied multiple access schemes, such as Code Division Multiple Access (CDMA), Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), Orthogonal Frequency Division Multiple Access (OFDMA), Orthogonal Frequency Division Multiple Frequency Division Multiple Access (OFDM-FDMA), Orthogonal Frequency Division Multiple Time Division Multiple Access (OFDM-TDMA), Orthogonal Frequency Division Multiple Code Division Multiple Access (OFDM-CDMA), and the like. Uplink (UL) transmission and downlink (DL) transmission may be performed based on a time division duplex (TDD) scheme that performs transmission based on different times, or based on a frequency division duplex (FDD) scheme that performs

transmission based on different frequencies.

**[0038]** An embodiment of the present invention may be applicable to an asynchronous wireless communication scheme that is advanced through GSM, WCDMA, and HSPA, to be LTE and LTE-advanced, and may be applicable to a synchronous wireless communication scheme that is advanced through CDMA and CDMA-2000, to be UMB. Embodiments of the present invention may not be limited to a specific wireless communication scheme, and may be applicable to all technical fields to which a technical idea of the present invention is applicable.

**[0039]** FIG. 1 illustrates an example of a wireless communication system that uses a plurality of CCs according to an embodiment of the present invention.

**[0040]** Referring to FIG. 1, the wireless communication system may be a next generation communication system, including an LTE system and an LTE-A system.

**[0041]** The LTE/LTE-A system may extend a bandwidth to satisfy a high data transmission rate corresponding to a system requirement, and may use a plurality of component carriers (CCs) which are unit carriers. Here, a single CC may have a maximum bandwidth of 20 megahertz (MHz). Resource allocation may be performed within a bandwidth of 20 MHz depending on a service. However, it is merely an example during a process of embodying a system. Depending on a configuration of a system, a single CC may be configured to have a bandwidth smaller than or equal to 20 MHZ. Also, a plurality of CCs may be bound and used as a single system band, and may be referred to as a carrier aggregation (CA).

**[0042]** As illustrated in FIG. 1, when five CCs having a maximum bandwidth of 20 MHz are used, a bandwidth may be expanded up to 100 MHz to support a quality of service. In this example, an allocable frequency band, which may be determined by each CC, may be contiguous or non-contiguous based on a scheduling of the CA.

**[0043]** Throughout the specifications, a component carrier may be denoted by a CC and may be distinguished by names, for example, CC0, CC1, and the like. However, a number included in a name of each CC may not always match an order of a corresponding CC or a location of a frequency band of the corresponding CC.

**[0044]** Referring to FIG. 1, the CA may be configured to include a first CC (CC1) 110, a second CC (CC2) 120, a third CC (CC3) 130, and an $N^{th}$ CC (CCN) 140. A UL and a DL allocated to each CC may be different from each other, or may be the same as one another based on a scheduler.

**[0045]** In a wireless communication environment, an electric wave may experience a propagation delay while the electric wave is transferred from a transmitter to a receiver. Accordingly, although both the transmitter and the receiver are accurately aware of a time when the electric wave is transmitted from the transmitter, a time when the electric wave is received by the receiver may be affected by a distance between the transmitter and the receiver, an ambient propagation environment, and the like, and may vary over time when the receiver moves. When the receiver is not accurately aware of a point in time when a signal transmitted from the transmitter is to be received, the receiver may fail to receive the signal, or may receive a signal distorted due to the propagation delay and may fail to perform communication.

**[0046]** Accordingly, in the wireless communication system, synchronization between the eNB and the UE may be established first to receive a signal, irrespective of a UL and a DL. That is, a synchronization process is an essentially important process in a communication system, and maintaining the synchronization process may also significantly affect a stability of the system and a quality of communication.

**[0047]** There may be various types of synchronization, such as a frame synchronization,

an information symbol synchronization, a sampling period synchronization, and the like. The sampling period synchronization may need to be obtained basically, so as to distinguish a physical signal.

**[0048]** In DL transmission corresponding to a communication link of transmission in a direction from the eNB to the UE, synchronization may be obtained in the UE based on a signal of the eNB. The eNB may transmit a predetermined signal that is mutually prearranged, so that the UE may readily obtain a DL synchronization, and the UE may need to accurately distinguish a time when the predetermined signal is transmitted from the eNB. In a case of a DL, a single eNB may simultaneously transmit the same synchronization signal to a plurality of UEs and thus, each UE may independently obtain synchronization based on the synchronization signal.

**[0049]** Conversely, in a case of a UL, the eNB may receive signals transmitted from the plurality of UEs and thus, the eNB may have difficulty in obtaining synchronization based on one of the UEs. Accordingly, a synchronization process that is different from the DL may be required.

**[0050]** When distances between the UEs and the eNB are different from each other, the UEs may have different transmission delay times. When each UE transmits UL information based on a corresponding DL synchronization, information transmitted from each UE may be received by the eNB at different times.

**[0051]** Although the uplink information transmitted from each UE is received at different times, the information may be received with a complexity being increased when a transmission scheme adopted by the wireless communication system, such as CDMA, is capable of separately receiving the information. However, in a wireless communication system that is based on OFDMA or FDMA, uplink transmission information of all the UEs may be simultaneously

received by the eNB and may be demodulated and thus, a reception performance may increase as the uplink transmission information is received at an accurate time, and a reception performance may be rapidly deteriorated as a reception time difference of each UE signal received in the eNB is increased.

**[0052]** Accordingly, in a wireless communication system that utilizes OFDMA or SC-FDMA as a UL transmission scheme, such as LTE, a timing alignment value may be calculated for each UE based on a random access scheme and the like, to obtain a transmission delay time in a DL and a transmission delay time in a UL, and each UE may be informed of the calculated TA value, so that a UL synchronization is obtained.

**[0053]** FIG. 2 illustrates an example associated with a timing advance (TA) in a synchronization process according to an embodiment of the present invention.

**[0054]** In general, a UL radio frame i 220 may need to be transmitted at the same point in time as a point in time when a DL radio frame i 210 is transmitted, so as to perform communication between an eNB and a UE. However, a time difference may exist between the UE and the eNB due to propagation delay and the like.

**[0055]** Accordingly, a TA may be applied to enable the UE to transmit the UL radio frame i 220 a little earlier than the DL frame i 210 by taking the propagation delay into consideration, so that synchronization between the eNB and the UE may be obtained. An equation to calculate the TA may be expressed by Equation 1.

**[0056]** [Equation 1]

$$TA = \left(N_{TA} + N_{TA\,offset}\right) \cdot T_s \quad \text{seconds}$$

**[0057]** Here, $N_{TA}$ denotes a value to be variable based on TA command information transmitted from the eNB, and $N_{TAoffset}$ denotes a value set based on a frame structure. $T_s$ denotes a sampling period. As shown in FIG. 2, to obtain a UL synchronization, the UE may receive the TA command information provided by the eNB, and may proceed with a TA based on the received TA command information so thatUE may obtain synchronization with the eNB for wireless communication.

**[0058]** FIG. 3 illustrates a random access process performed between a UE and an eNB according to an embodiment of the present invention.

**[0059]** To perform transmission and reception of data with an eNB 390, a UE 380 may need to obtain a UL synchronization. To obtain the UL synchronization, the UE 380 may proceed with a process of receiving information required for synchronization, from the eNB 390. FIG. 3 shows a random access procedure for receiving information required for synchronization. The random access procedure may be applicable when a UE is newly coupled to a network through a handover and the like. Also, upon completing the coupling, the UE may proceed with the random access procedure even under a circumstance such as synchronization, a state change, for example, from an RRC_IDLE to an RRC_CONNECTED, and the like.

**[0060]** The UE 380 may randomly select a preamble signature so as to generate a random access preamble (RAP). Subsequently, the UE 380 may transmit the selected preamble to the eNB 390 (step S310). The process of selecting the preamble signature may be contention-based selection or contention-free selection. In this example, the eNB may inform the UE of a previously reserved RAP, and the UE may transmit, to the eNB 390, a preamble selected based on received information (step S310). Also, according to the contention-free selection, a procedure associated with a contention resolution (CR) message, which is required in the

contention-based selection, may not need to be performed.

**[0061]** Here, the UE 380 may recognize random access-radio network temporary identifier (RA-RNTI) based on a transmission time and a frequency resource temporarily selected for selecting a preamble or for random access channel (RACH) transmission.

**[0062]** The eNB 390 may perform random access response (RAR) with respect to the preamble received from the UE 380. In this example, the eNB 390 may transmit an RAR message through a physical downlink shared channel (PDSCH).

**[0063]** Information transmitted through the RAR message may include, for example, identification information of the UE preamble received by the eNB, an identifier (ID) of the eNB, a temporary cell radio network temporary identifier (C-RNTI), information associated with a time slot where the preamble is received, TA information, and the like. Timing information for a UL synchronization may be received through the RAR message and thus, the UE 380 may perform the UL synchronization with the eNB 390. The UE 380 may perform a scheduled transmission that transmits data at a scheduled time determined based on the TA information received in step S320 (step S330). In this example, the UE 380 may transmit synchronized data through a physical uplink shared channel (PUSCH), and may perform hybrid automatic repeat request (HARQ).

**[0064]** Examples of a message transmitted in step S330 may include a radio resource control (RRC) connection request, a tracking area update, a scheduling request, and the like. Also, one of the messages may include a temporary C-RNTI, a C-RNTI (if the UE already has one), UE identification information, and the like.

**[0065]** In steps S310 through 330, collision may occur and thus, when the eNB 390 transmits a CR message (step S340), the UE 380 may i) determine whether a received message

corresponds to the UE 380, and may transmit an acknowledgement (ACK) when the received message corresponds to the UE 380 or ii) may not transmit response data when the received message corresponds to another UE. Also, the UE 380 may not transmit the response data when the UE 380 misses DL allocation or fails to decode the message. Also, the CR message may include a C-RNTI, UE identification information, and the like.

**[0066]** Unlike a process of obtaining a TA when a single carrier is utilized, in a wireless system that uses a plurality of CCs, TA values of the CCs may have a high probability of being different from each other when locations of center frequencies of the CCs are significantly distant from each other as shown in FIG. 1, when the CCs are supported by different devices in a network, or the like.

**[0067]** Accordingly, when a synchronization obtaining scheme used for a single carrier is applied as is, the CCs may have difficulty in obtaining the UL synchronization for the CCs. Accordingly, the UE may perform stable UL communication for a few CCs that obtain UL synchronization from among available CCs.

**[0068]** When the UE transmits, based on the same UL synchronization standard, information through CCs of which UL synchronization standards are different from each other, a probability of transmission error may be significantly high, and a time and resources for restoring the error may be wasted. In this example, it is difficult to satisfy a UL quality of service (QoS) for an application program required by a system.

**[0069]** When the wireless communication uses a plurality of CCs, a transmission delay time may be different in a DL based on a supporting scheme in a radio network and a characteristic of each CC with respect to a single UE. Accordingly, when CCs or CCs having the same TA value are configured as a set, a UL synchronization standard may be different for

each CC set and thus, UL performance may be deteriorated.

**[0070]** Therefore, embodiments of the present invention for a wireless communication system supporting a plurality of CCs, are provided so that the UE obtains a UL synchronization of a corresponding CC or a group of CCs based on a type of each CC, a location of a center frequency, a network service type, and the like when CCs or groups including at least one CC have different UL synchronization standards.

**[0071]** Hereinafter, a user terminal may be referred to as a UE and a base station may be referred to as an eNB.

**[0072]** FIG. 4 illustrates a process that obtains a UL synchronization according to an embodiment of the present invention.

**[0073]** FIG. 4 shows a process in which a UE configures a group associated with a timing from among a plurality of CCs and performs RAP through a delegate CC when an eNB transmits information associated with the CCs to the UE.

**[0074]** Referring to FIG. 4, when an RRC connection mode is an RRC_CONNECTED mode indicating that a UE 480 and an eNB 490 are connected, step S410 may be performed. When the RRC connection mode is an IDLE mode or requires resetting, step S405 may be performed first, and then step S410 may be performed.

**[0075]** In step S405, RRC connection may be performed. When the RRC connection mode between the eNB 490 and the UE 480 is the IDLE mode or requires resetting, the eNB 490 may have difficulty in defining a CC set of the corresponding UE and transmitting CC set information in the IDLE mode UE. Therefore, the CC set information may be formed by selecting at least one CC to perform RRC connection so that the RRC connection is performed (step S405). At least one CC to perform the RRC connection may be selected based on one of

the following methods.

**[0076]** i) select a CC that is most appropriate for attempting RRC connection based on information measured by the UE 480

**[0077]** ii) attempt RRC connection based on information fixedly set in a system and stored in an internal memory of the UE 480

**[0078]** iii) attempt RRC connection based on information transmitted to the UE 480 from the eNB 490 through system information

**[0079]** iv) attempt RRC connection through CCs corresponding to system information of the available CCs stored in an internal memory of the UE 480

**[0080]** For example, a UE in an IDLE mode may select a single DL CC for the RRC connection based on the conditions, and may receive system information via a broadcasting channel that is transmitted through the selected CC. Based on the received system information, the selected DL CC and a UL CC having a linkage with the DL CC may be configured as a primary serving cell (PCell). The UE may transmit, to an eNB, an RRC connection request message through the PCell. In this example, the UE may transfer the RRC connection request message to the eNB through an RACH procedure.

**[0081]** Here, the DL CC corresponding to the PCell may be referred to as a DL primary CC (DL PCC), and the UL CC corresponding to the PCell may be referred to as a UL primary CC (UL PCC). Also, a CC corresponding to a secondary serving cell (SCell) 920 in a DL may be referred to as a DL secondary CC (DL SCC), and a CC corresponding to the SCell in a UL may be referred to as a UL secondary CC (UL SCC).

**[0082]** The PCell and the SCell have characteristics as follows.

**[0083]** First, the PCell may be used for PUCCH transmission.

**[0084]** Second, the PCell is always activated, whereas the SCell 920 is activated or deactivated based on a predetermined condition.

**[0085]** Third, when the radio link failure (RLF) is detected via PCell, RRC reconnection PCell may be triggered. When the RLF is detected via SCell 920, RRC reconnection on SCell may not be triggered.

**[0086]** Fourth, the PCell may be changed by a change of a security key or by a handover procedure accompanying the RACH procedure. In a case of an MSG4 (contention resolution), only a PDCCH that indicates the MSG4 may be transmitted through the PCell, and MSG4 information may be transmitted through the PCell or the SCell.

**[0087]** Fifth, non-access stratum (NAS) information may be received through the PCell.

**[0088]** Sixth, the PCell may be configured as a pair of a DL PCC and a UL PCC.

**[0089]** Seventh, each UE sets a different CC as the PCell.

**[0090]** Eighth, a procedure such as, reconfiguration, adding, and removal of the SCell may be performed by an RRC layer. To add a new SCell, RRC signaling may be used to transmit system information associated with a dedicated SCell.

**[0091]** Technical concept of the PCell and the SCell in embodiments of the present invention may not be limited to the descriptions provided in the foregoing, and may include further examples.

**[0092]** When RRC connection setup is completed through one of the methods, and the RRC connection mode between the eNB 490 and the UE is the RRC_CONNECTED mode, step S410 may be performed.

**[0093]** The eNB 490 may allow the UE 480 to use a plurality of CCs based on a performance of hardware of the UE 480, available frequency resources of the eNB 490, and the

like, and may define the plurality of CCs to be a CC set. The eNB 490 may transmit, to the UE 480, CC set information associated with the CC set that is allowed to the UE 480 (step S410).

**[0094]** As described in the foregoing, the UE 480 and the eNB 490 maintain the RRC_CONNECTED mode from step S405 or before. That is, a UL synchronization of a UL CC through which the RRC connection of the UE 480 is set up is maintained. The UE 480 may receive the CC set information determined based on the above condition, from the eNB 490.

**[0095]** According to a scheme of transmitting and receiving the CC set information, the eNB 490 may include the CC set information in an RRC reconfiguration message for transmission to the UE 480, or may use another message for transmission.

**[0096]** Also, the CC set information may be configured by adding/removing each CC. For example, when initial CC set information is transmitted, the CC set information configured of DL CC1, DL CC2, and DL CCN may be configured as an added DL CC list and the list may include CC1, CC2, and CCN. In the same manner, UL CC set information may be configured as an added UL CC list.

**[0097]** As another example, when the CC set information is changed, that is, when the configured DL CC set is changed into CC1, CC3, and CCN, the DL CC set information may be transmitted by configuring CC2 as a removed DL CC list and CC3 as an added DL CC list.

**[0098]** The UE 480 may receive system information (SI) associated with CCs in the CC set, based on the received CC set information (step S420).

**[0099]** When a CC that is incapable of transmitting SI to a corresponding CC exists from among the CCs in the CC set, for example, an extension CC (ECC), or a CC that is incapable of receiving SI transmitted via a broadcasting channel (for example, a DL CC that belongs to an SCell) exists, the SI may be received by a CC that is capable of receiving the SI or may be

received by a CC that is capable of receiving SI that is transformed in a form of control information.

**[0100]** The transformed SI may be transmitted to the UE together with the CC set information included in the RRC reconfiguration message transmitted by the eNB, or may be transmitted to the UE through the RRC reconfiguration message after the CC set information is received. Also, the current stage may be performed without receiving the SI associated with the corresponding CC.

**[0101]** The UE 480 may configure a UL timing group including CCs in the CC set as elements of the UL timing group, based on the received SI (step S432). When the UL timing group is configured, considerations may be as follows.

**[0102]** First, whether a plurality of CCs is assigned to different groups may be determined based on the following conditions. That is, a CC that satisfies at least one of the conditions may be configured to be a different group.

**[0103]** a-i) CCs of which a difference in center frequency values is greater than or equal to a threshold, are assigned to different groups. When a difference in the center frequency values is high, delay occurring in a wireless signal propagation process may be changed and thus, a difference in TA values may also increase.

**[0104]** a-ii) CCs to which different beamforming schemes are applied are assigned to different groups. TA values are highly likely to be different from each other when the beamforming schemes are different from each other.

**[0105]** a-iii) CCs that are set to be updated every time a UL synchronization update request exists are assigned to different groups. The setting may be included in SI set by the eNB 490 for transmission, or may be included in other messages for transmission.

**[0106]** a-iv) CCs that do not provide services in a macrocell or CCs that provide services in a space superposed on the macrocell by a femtocell, a picocell, a microcell, a relay, a repeater, and the like may have different characteristics from CCs that provide services by the macrocell and thus, the CCs are configured to be different groups.

**[0107]** a-v) a CC that has a UL synchronization update request from the eNB 490 may be a CC that has a changed synchronization and thus, the CC may be assigned to a different group.

**[0108]** As described in the foregoing, examples of a condition for setting CCs to be a UL timing group may be a-i) through a-v). In addition, CCs are configured to be a single group or to be different groups based on a wireless propagation characteristic, a predetermined measurement value, and the like.

**[0109]** When one of the following conditions are satisfied, CCs may be configured to be a single group.

**[0110]** b-i) CCs of which a difference in center frequency values is within a threshold range may have similar propagation characteristic and thus, the CC may be configured to be a single group.

**[0111]** b-ii) CCs to which the same beamforming scheme is applied may be configured to be a single group

**[0112]** b-iii) CCs used in devices in the same radio network may be configured to be a single group

**[0113]** b-iv) CCs that do not satisfy conditions a-I through a-v for assigning CCs to different groups may be configured to be a single group

**[0114]** A method for the UE 480 to generate a group may include two schemes, that is, a scheme of generating groups by distinguishing CCs that belong to different groups and a scheme

of generating a group by distinguishing CCs to be included in the same group. The two schemes may be used together or one of the two schemes may be used. Conditions to be used in a process of applying each scheme have been described in the foregoing.

**[0115]** When the UL timing group is generated, the UE 480 may select a delegate CC for each group (step S434). In this example, the delegate CC may be selected based on following conditions, from among CCs that are capable of obtaining a TA value to be used for obtaining a UL synchronization.

**[0116]** c-i) a CC having a lowest center frequency value

**[0117]** c-ii) a CC having a center frequency value that is closest to a mean value

**[0118]** c-iii) a CC having a highest center frequency value

**[0119]** c-iv) a CC having a broadest frequency band

**[0120]** c-v) a CC that is set to be used for monitoring DL quality

**[0121]** A CC satisfying one of the conditions may be selected as a delegate CC.

**[0122]** Here, a CC may be defined to include a DL CC or both the DL CC and a UL CC, and may be defined to be a cell or a serving cell. In other words, the cell may be defined by only DL frequency resources (for example, a CC) through which a wireless signal recognized by a UE reaches a predetermined area, and may be defined to be a pair of the DL frequency resources that is used by the UE to receive a signal from the eNB and UL frequency resources that is used by the UE to transmit a signal to the eNB.

**[0123]** Therefore, with respect to only a UE that is able to form a plurality of CCs, the eNB may be able to form a plurality of serving cells to perform transmission and reception of data with the UE

**[0124]** In this example, a PCell may indicate a single serving cell that provides a security

input and NAS mobility information in an RRC establishment state or re-establishment state. Also, based on the capabilities of the UE, at least one cell may be configured to form a serving cell set with the PCell, and the at least one cell may be referred to as an SCell.

**[0125]** Accordingly, a serving cell set configured for a single UE may be configured of a single PCell or of a single PCell and at least one SCell. An adjacent cell in a frequency of the PCell and/or an adjacent cell in a frequency of the SCell may be in the same carrier frequency, and adjacent cells in frequencies of the PCell and the SCell may be in different carrier frequencies.

**[0126]** Here, a CC set for monitoring the DL quality may include an SCell to which a radio link monitoring (RLM) is defined. In particular, the RLM may include a process in which a UE monitors DL quality based on a cell-specific reference (CRS) signal so as to detect DL quality of a serving cell set between the UE and an eNB.

**[0127]** In this example, the UE may predict the DL quality based on predetermined parameters which are defined by a ratio of the measured CRS to energy of control channels.

**[0128]** The RLM may be set based on following conditions. To predict the DL quality through the RLM, a value that expresses a ratio of reception energy of an RE (single sub-carrier in a single OFDM symbol) through which a PDCCH/physical control format indicator channel (PCFICH) is transmitted, to an average RE energy of the CRS based on a dB unit may be used as a criterion.

**[0129]** From among the parameters, a parameter $Q_{out}$ that is a criterion to determine an out-of-sync state may be configured based on a parameter set for transmitting a PDCCH/PCFICH and a value of which a block error rate (BER) of hypothetical PDCCH (based on a DCI format 1A) transmission based on an error of the PCFICH is greater than or equal to

10%. The value may be changed based on a number of antenna ports through which the CRS is transmitted.

**[0130]** For example, when the CRS is transmitted through a single antenna port, a ratio of energy between the PDCCH and the CRS to be determined as $Q_{out}$ may be based on 4dB, and when the CRS is transmitted through two or more antenna ports, $Q_{out}$ may be based on 1 dB. From among the parameters, a parameter $Q_{in}$ that is a criterion to determine synchronization restoration or in-sync state may be determined based on a value having a sufficiently large reliability when compared to $Q_{out}$.

**[0131]** That is, a parameter set for transmitting the PDCCH/PCFICH and a value of which a BER of hypothetical PDCCH (based on a DCI format 1C) transmission based on an error of the PCFICH is greater than or equal to 2% may be used. The value may be changed based on a number of antenna ports through which the CRS is transmitted.

**[0132]** For example, when the CRS is transmitted through a single antenna port, a ratio of energy between the PDCCH and the CRS to be determined as $Q_{in}$ may be based on 0dB, and when the CRS is transmitted through two or more antenna ports, $Q_{in}$ may be based on -3 dB.

**[0133]** A reason that an energy ratio used for determining $Q_{in}$ is lower than $Q_{out}$, is that the energy ratio is based on the parameter set for transmitting the PDCCH/PCFICH and the BER of the hypothetical PDCCH transmission. The parameters set for transmitting the PDCCH/PCFICH may include a DCI format of a PDCCH, a number of OFDM symbols through which control information of a subframe is transmitted, an aggregation level indicating a self-duplication rate of the PDCCH, and the like. The parameters may be affected by a bandwidth of a DL. $Q_{out}$ and $Q_{in}$ may be affected based on whether a UE performs discontinuous reception (DRX) with respect to a corresponding cell.

**[0134]** Therefore, the UE or the eNB may select a delegate CC in each group. In this example, the UE or the eNB may select the delegate CC by selecting an SCell including the delegate CC. In this example, the delegate CC or the SCell may be selected based on the conditions c-i) through c-v), from among CCs that are capable of obtaining a TA value to be used for obtaining a UL synchronization. That is, one of the c-i) through c-v) may be selected as a delegate CC.

**[0135]** In this example, according to a method of selecting a delegate CC for each UL timing group, the same criterion may be used for all groups or a different criterion may be used for each timing group. That is, the delegate CC may be selected based on a network state of each group, characteristics of CCs forming each group, and the like.

**[0136]** After completing steps S432 and S434 for setting a UL timing group and a corresponding delegate CC, to obtain a UL synchronization, the UE 480 may set an RAP through a delegate CC of each group, and may transmit the set preamble by selecting one of the resources defined in SI of each CC (step S440). The preamble may be included in a synchronization request message through which the UE requests synchronization. Transmission of the corresponding preamble may include a case in which the UE 480 sequentially, simultaneously, or randomly transmits a preamble through a selected CC in time/frequency resources set by the eNB 490.

**[0137]** Cases that require obtaining a UL synchronization may be as follows. Although a condition does not satisfy one of the cases described below, when the UE 480 determines that it is required, the UE 480 may generate an RAP and may transmit the RAP to the eNB 490.

**[0138]** d-i) a case in which the eNB 490 requires re-establishment of the entire DL synchronization

**[0139]** d-ii) a case that initializes and retries all UL data transmission

**[0140]** d-iii) a case in which a time alignment timer of the UE 480 expires

**[0141]** The UE 480 may transmit a preamble to be used for obtaining a UL synchronization with respect to total available CC groups.

**[0142]** Also, the UE 480 may need to obtain a UL synchronization with respect to a few available CC groups. Relevant cases will be described as follows.

**[0143]** e-i) a case in which a CC set is initially set and a TA value does not exist in a corresponding group

**[0144]** e-ii) a case in which a response is not obtained in response to UL transmission data transmitted through CCs in a group of the UE 480

**[0145]** e-iii) a case in which an RRC connection between the eNB 490 and the UE 480 is reconfigured

**[0146]** e-iv) a case in which the UE 480 performs handover of a predetermined CC group to an eNB 490 that is physically different from the UE 480

**[0147]** e-v) a case in which the eNB 490 requests reconfiguration with respect to a predetermined CC group associated with a DL synchronization.

**[0148]** e-vi) a case in which a CC time alignment timer expires (the timer is set for each CC or for each group). When a condition satisfies one of the cases, a process for obtaining a UL synchronization with respect to a CC group including a corresponding CC may be performed.

**[0149]** For example, in steps S432 and S434, CC1, CC2, CC3, CC4, and CC5 exist, and CC1 and CC2 are configured to be group 1, and CC3, CC4, and CC5 are configured to be group 2. A delegate CC of group 1 is CC1, a delegate CC of group 2 is CC3. In this example, when a UL synchronization for the total available CC groups is required, the UE 480 may transmit an

RAP through CC1 and CC3. When synchronization needs to be obtained for a few CC groups, that is, when synchronization needs to be obtained for group 2, the UE 480 may transmit an RAP through CC3.

**[0150]** When a UL synchronization needs to be re-established while data is transmitted through a UL, the UE 480 may perform the following operation first, for example, initializing UL data transmission, and then may perform initializing HARQ buffers, releasing a physical uplink control channel (PUCCH)/ releasing sounding reference signal (SRS), initializing semi-persistent scheduling allocation/allowance, and the like, as a procedure to obtain a UL synchronization.

**[0151]** The eNB 490 may calculate a TA value for each group with respect to each CC group (each delegate CC) based on the received RAP signal. The eNB 490 may transmit, to the UE 480, UL grant information and a TA value of a UL timing group (a delegate CC) through an RAR message (step S450). The TA value may be an example of UL synchronization information required when the UE adjusts a UL transmission time.

**[0152]** Subsequently, when the UE 480 determines that the TA value received in a CR procedure (step S460) is valid, the UE 480 may apply the TA value to another CC in the group for updating (step S470).

**[0153]** As described in the foregoing, when a procedure of obtaining a UL synchronization is performed with respect to all the groups, TA values associated with CC1 and CC3 may be applied to CCs each included in group 1 and group 2. When a TA value of CC3 is received for group 2, the TA value may be applied to CCs included in group 2.

**[0154]** FIG. 5 illustrates a process that obtains a UL synchronization according to another embodiment of the present invention. Here, FIG. 5 shows that an eNB 590 configures a UL

timing group.

**[0155]** Referring to FIG. 5, the eNB 590 determines a mode (RRC_CONNECTED/ RRC_IDLE) of a UE before transmitting UL timing information. When the eNB 590 is not connected to the UE, the eNB 590 may proceed with RRC connection (step S505), and may use a PCell for RRC connection, which will be performed in the same manner as step S405 of FIG. 4.

**[0156]** A scheme of generating a group in the eNB 590 may be performed based the conditions a-i) through a-v) or b-i) through b-iv) of FIG. 4.

**[0157]** Accordingly, the eNB 590 may transmit CC set information of the UE 580 and UL timing group information of the set UL timing group to the UE 580 (step S510). Here, the UL timing group information may be included in a CC set information message for transmission to the UE 580, or a separate other message may be used for transmission. A case that uses a separate message will be described with reference to FIG. 6. The CC set information message provided for each UE may be an RRC (L3) message, an L1 signaling, or an L2 signaling.

**[0158]** The UE 580 may receive SI of CCs in a set, based on the received CC set information (step S520). In this example, the UE 580 may use the UL timing group generated by the eNB 590 in step S508 as it is, or may slightly change the UL timing group based on a current network state as shown in step S432 of FIG. 4. This may indicate that the UE 580 may change the UL timing group when the UL timing group generated by the eNB 590 is inappropriate for an environment of the UE 580.

**[0159]** That is, after receiving a UL timing group or after changing or newly generating a UL timing group, the UE 580 may select a delegate CC for each UL timing group (step S534). The conditions taken into consideration when a delegate CC is selected for each UL timing

group have been described in step S434 of FIG. 4.

**[0160]** After completing selection of a delegate CC for each UL timing group in step S534, when a UL synchronization needs to be obtained, the delegate CC in each group may set an RAP, and may transmit the selected preamble by selecting one of the resources defined in SI of each CC (step S540). The preamble may be included in a synchronization request message through which the UE requests synchronization.

**[0161]** Here, the UE 580 may transmit an RAP transmit message and the like for obtaining the UL timing information. Also, the corresponding preamble may be sequentially, simultaneously, or randomly selected and transmitted by the UE 580 in time/frequency resources set by the eNB 590.

**[0162]** A case that requires the UE 580 to obtain a UL synchronization may be associated with conditions d-i) through d-iii). Also, the UE 580 may transmit a preamble to obtain a UL synchronization with respect to available total CC groups. The UE 580 may need to obtain a UL synchronization with respect to a few available CC groups.

**[0163]** The eNB 590 may calculate a TA value for each group with respect to each CC group (each delegate CC) based on the received RAP signal, and may include the corresponding TA value together with UL grant information in RAR information for transmission to UE 580 (step S550). The TA value may be an example of UL synchronization information required when the UE adjusts a UL transmission time.

**[0164]** For example, the eNB 590 may calculate a TA value based on the UL timing group set in step S508, and may transmit the calculated TA value. Also, the eNB 590 may transmit the RAR message through a predetermined CC, and may transmit the RAR message through all CCs in the corresponding UL timing group.

**[0165]** When the UE 580 determines that a TA value received in a CR procedure (step S560) is valid, the UE 580 may apply the TA value to remaining CCs in a group so as to update a TA value for each UL timing group (step S570).

**[0166]** FIG. 6 illustrates a process that obtains a UL synchronization according to still another embodiment of the present invention. Here, FIG. 6 shows that an eNB 690 configures a UL timing group and transmits group information through a separate message.

**[0167]** Referring to FIG. 6, the eNB 690 determines a mode (RRC_CONNECTED/ RRC_IDLE) of a UE 680. When the eNB 690 is not connected to the UE 680, the eNB 690 may proceed with an RRC connection setup (step S605), and may use a PCell for RRC connection, which will be performed in the same manner as step S405 of FIG. 4 and step S505 of FIG. 5.

**[0168]** The eNB 690 may allow the UE 680 to use a plurality of CCs based on a performance of hardware of the UE 680, available frequency resources of the eNB 690, and the like, and may define the plurality of CCs to be a CC set. The eNB 690 may transmit CC set information of the UE 680 to the UE 680 (step S610). A CC set information message provided for each UE may be a message used for an RRC (L3) message and the like or may be an L1 signaling or an L2 signaling.

**[0169]** As described in the foregoing, the UE 680 and the eNB 690 maintain the RRC_CONNECTED mode from step S605 or before. That is, a UL synchronization of a UL CC through which the RRC connection of the UE 680 is set up is maintained. The UE 680 may receive the CC set information determined based on the above condition, from the eNB 690. As one of the schemes of receiving the CC set information, the eNB 690 may include the CC set information in an RRC reconfiguration message for transmission, and other messages may be used for transmission.

**[0170]** The UE 680 may receive SI of CCs in a set based on the received CC set information (step S620).

**[0171]** The eNB 690 may set a UL timing group with respect to CCs assigned to the UE 580 (step S624). In the process of configuring the UL timing group in the eNB 690, CCs may be configured to be different groups of at least two or to be the same group. The conditions a-i) through a-v) or b-i) through b-iv) may use to set a UL timing group.

**[0172]** A method for the eNB 690 to generate a group may include two schemes, that is, a scheme of generating groups by distinguishing CCs that belong to different groups and a scheme of generating a group by distinguishing CCs to be included in the same group. The two schemes may be used together or one of the two schemes may be used. Conditions to be used in a process of applying each scheme have been described in the foregoing.

**[0173]** The eNB 690 may transmit the UL timing group information to the UE 680 (step S626). The UL timing group information may not be included in the CC set information message and the like for transmission, and The UL timing group information may be transmitted independently with the CC set information through use of a separate message. The UL timing group information may be transmitted through a channel, such as a PDCCH channel, an RRC signaling, and a broadcasting channel, and may be transmitted through an L2 (MAC element control) message.

**[0174]** The UE 680 that receives the CC set information message may use the received UL timing group as it is, or may slightly change the UL timing group based on a current network state. This may include a case in which the UE 680 changes the UL timing group when the UL timing group generated by the eNB 690 is inappropriate for an environment of the UE 680. After receiving the UL timing group or after changing or newly generating the UL timing group,

the UE 680 may select a delegate CC for each UL timing group (step S634). The conditions taken into consideration when a delegate CC is selected for each UL timing group have been described in step S434 of FIG. 4, and step S534 of FIG. 5.

**[0175]** After completing selection of a delegate CC for each UL timing group in step S634, when a UL synchronization needs to be obtained, the delegate CC in each group may set an RAP, and may transmit the selected preamble by selecting one of the resources that are allocated for random access and defined in SI of each CC (step S640). The preamble may be sequentially, simultaneously, or randomly selected and transmitted by the UE 680 in time/frequency resources set by the eNB 690. The preamble may be included in a synchronization request message through which the UE requests synchronization.

**[0176]** The eNB 690 may calculate a TA value for each CC group (each delegate CC) based on the received RAP signal, and may include the corresponding TA value together with UL grant information in RAR information for transmission to UE 680 (step S650). For example, the eNB 690 may calculate a TA value based on the UL timing group set in step S624, and may transmit the calculated TA value in advance. Also, the eNB 690 may transmit the RAR message through a predetermined CC, and may transmit the RAR message through all CCs in the corresponding UL timing group. The TA value may be an example of UL synchronization information required when the UE adjusts a UL transmission time.

**[0177]** When the UE 680 determines that a TA value received in a CR procedure (step S660) is valid, the UE 680 may apply the TA value to remaining CCs in a group so as to update a TA value for each UL timing group (step S670).

**[0178]** As described in FIG. 6, the UE 680 may receive a set UL timing group from the eNB 690, and may perform a random access procedure based on a representative value of a

corresponding group. Subsequently, the UE 680 may receive a TA value of the timing group based on a preamble associated with the random access procedure, and may adjust a UL timing for obtaining synchronization.

**[0179]** FIG. 7 illustrates a process in which an eNB supports the UE to obtain a UL synchronization in response to a request from the UE according to an embodiment of the present invention.

**[0180]** Referring to FIG. 7, the eNB determines an RRC mode of the UE (step S702). When the RRC mode between the eNB and the UE is an RRC_CONNECTED mode (step S704), the eNB may proceed with step S710.

**[0181]** When the RRC mode is different from the RRC_CONNECTED mode, the eNB may proceed with step S705. The eNB may determine whether an RRC connection request from the UE exists in step S705. The eNB may receive the RRC connection request from the UE (step S705), and may complete RRC connection (step S706). In this example, the eNB may receive an RRC connection request message from the UE, may transmit an RRC connection setup message, and may receive an RRC connection setup complete message from the UE so as to complete RRC connection. As described in steps S405, S505, and S605, a PCell may be used for RRC connection.

**[0182]** The eNB may set a CC set including at least one available CC with respect to an RRC_CONNECTED UE, and may transmit CC set information associated with the CC set to the UE (step S710).

**[0183]** The eNB may transmit SI associated with at least one predetermined CC in the CC set, based on the CC set information of the UE (step S720). Here, the CC set information may be transmitted through an RRC message. Also, the SI of the CC set may be transmitted

through a broadcasting channel.

**[0184]** The eNB may determine whether a subject of generating a UL timing group is the eNB (step S722). When the UL timing group is generated by the eNB, the eNB may generate a UL timing group based on the CC set information of the UE, and may transmit information associated with the generated UL timing group to the UE (step S726). Here, the UL timing group information may be generated at the same point in time when the CC set information is generated and transmitted in step S710, or may be transmitted together with the CC set information.

**[0185]** The eNB may receive an RAP from the UE (step S740). The preamble may be included in a synchronization request message through which the UE requests synchronization. Step S740 may include a case in which the subject of generating the UL timing group is the UE. That is, the UE may generate a UL timing group based on available CC set information of step S710 and SI of a corresponding CC of step S720, may set a delegate CC for each timing group, and may transmit an RAP through a corresponding delegate CC. Therefore, the eNB may receive the preamble transmitted from the UE. Here, the eNB may receive a synchronization request message, for example, the preamble, simultaneously through a plurality of delegate CCs, or at separated time, that is, sequentially through a delegate CC for each UL timing group.

**[0186]** Subsequently, the eNB may transmit an RAR message with respect to the received preamble. In this example, the eNB may transmit UL grant information for the UE and TA information for each UL timing group along with the RAR message (step S750).

**[0187]** The TA value may be an example of UL synchronization information required when the UE adjusts a UL transmission time. Also, the TA information for each UL timing group may be transmitted through a plurality of delegate CCs, simultaneously or at separated time. Here, the TA information for each UL timing group may be transmitted in a form of a

table including a TA value corresponding to a group index. Also, the TA information for each UL timing group may be transmitted in a form including a unit error for each timing group based on a reference TA value. In this example, the error for each group may be expressed by an integer-multiple of a predetermined unit value, or may be specified in detail. The TA information for each UL timing group may be transmitted in a form of an indicator indicating a TA based on a predetermined rule.

**[0188]** The eNB may transmit a CR message to the UE (step S760). This may include an operation that enables the UE to determine the validity of the received TA value and to update a TA value of a corresponding group.

**[0189]** FIG. 8 illustrates a process in which a UE obtains a UL synchronization through use of a UL timing group according to an embodiment of the present invention.

**[0190]** Referring to FIG. 8, the UE may determine an RRC mode (step S802). When the RRC mode is different from an RRC_CONNECTED mode, that is, when the RRC mode is an IDLE mode, the UE may perform RRC connection setup.

**[0191]** Accordingly, the UE may select a predetermined CC through which RRC connection is performed (step S806), may transmit an RRC connection request message to the selected predetermined CC, may receive an RRC connection setup message from the eNB through the selected predetermined CC, and may transmit an RRC connection setup complete message to the eNB so as to complete RRC connection setup (step S808).

**[0192]** When the UE corresponds to the RRC_CONNECTED mode (step S804), whether a UL is continuously maintained may be determined (step S810).

**[0193]** When the UL is not maintained, step S812 may be performed. In step S812, the UE may determine whether an RRC connection setup reconfiguration message is received from

the eNB (step S812).

**[0194]** Here, when the RRC mode of the UE is the IDLE mode, or when the RRC connection setup reconfiguration is performed, the eNB may have difficulty in defining a CC set and transmitting CC set information. Accordingly, the UE may f-i) select a CC that is most appropriate for attempting RRC connection based on information measured by the UE, or may select at least one CC to perform RRC connection through use of one of f-ii)information fixedly set in a system and stored in an internal memory of the UE, f-iii) information transmitted to the UE from the eNB through SI, or f-iv) SI of available CCs stored in an internal memory of the UE and thus, may form the CC set information. When the mode of the UE is changed to the RRC_CONNECTED mode after completing RRC connection setup, step S830 may be performed.

**[0195]** When the UE performs handover, the UE may determine the received RRC connection setup reconfiguration message (step S814), and determine mobility control information (MCI) (step S816). The UE may determine information to be used for obtaining synchronization of a corresponding CC from a target eNB (T-eNB), based on the MCI information. That is, the UE may obtain a UL synchronization from the T-eNB. When the UE does not perform handover, the UE may merely determine the received RRC connection setup reconfiguration message (step S814), and may not proceed with steps S816 and S818.

**[0196]** In other words, when the UE does not perform handover in the process of obtaining a UL synchronization, the UE may proceed with a procedure for obtaining a UL synchronization between a source eNB (S-eNB) and a corresponding CC so as to obtain the UL synchronization. As another example, when the UE performs handover, the UE may proceed with a procedure for obtaining a UL synchronization of a corresponding CC based on SI of a CC

of a T-eNB received from an S-eNB, so as to obtain the UL synchronization. Desirably, a random access procedure may be used, and other procedures may also be applicable.

**[0197]** Subsequently, to obtain synchronization with the S-eNB or the T-eNB, the UE may select a preamble and may transmit the preamble to the S-eNB or the T-eNB (step S820). The preamble may be included in a synchronization request message through which the UE requests synchronization. The UE may receive an RAR message from the S-eNB or the T-eNB in response to transmission of the preamble. In the RAR message, UL grant information for the UE and TA information for each group including at least one CC to be used for obtaining a UL synchronization may be included (step S822).

**[0198]** The UE may verify whether the TA received through a CR procedure in step S822 is valid (step S824), and the UE may update a UL timing group including at least one CC based on the received TA value (step S826) when the UE determines that the TA is valid.

**[0199]** When the RRC connection setup reconfiguration message is not received, step S820 may be performed.

**[0200]** When a UL is maintained or when the UE obtains a UL synchronization, the UE may receive CC set information from the eNB (step S830). Also, the UE may receive SI of the received CC set (step S832).

**[0201]** Subsequently, the UE may determine whether UL timing group information is received (step S840). In this example, when the UL timing group information is generated by the eNB, the UE may receive the UL timing group through the CC set information receiving process or through a separate message. The UL timing group information may include delegate CC information for each group. When the delegate CC information for each group is included in the UL timing group, step S852 may not be performed. When the delegate CC information for

each group is not included in the UL timing group, the UE may determine the received UL timing group, and may set a delegate CC for the corresponding UL timing group (step S852). The delegate CC may be set based on the conditions c-i) through c-v) of FIG. 4. Also, the delegate CC used for adjusting a TA value of each UL timing group may be set by applying the same criterion to all groups, or by applying a different criterion based on a characteristic of each UL timing group.

**[0202]** When the UL timing group information is not received or when the received timing group is inappropriate for a radio network state where the UE is located or inappropriate for the UE, the UE may set UL timing group information based on the received CC set information (step S850). Also, the UE may set a predetermined CC in the set UL timing group, as a delegate CC for the timing group (step S852).

**[0203]** The UE may select a preamble and may transmit the preamble through the delegate CC (step S854). This may also be applicable when a TA needs to be updated after the delegate CC is set.

**[0204]** The UE may receive an RAR message from the eNB. In this example, the UE may receive UL grant information for the UE and the TA information for each UL group (step S856). Here, the UE may determine a TA value in a form of a table corresponding to a group index of each UL timing group. Also, the UE may determine a TA difference value in a form including a unit error for each timing group based on a predetermined reference TA value. Also, the UE may determine an error for each UL timing group that has a size of an integer-multiple of a predetermined unit value, and may also determine an error for each UL timing group that is specified in detail. Also, the UE may determine a TA indicator determined to be an indicator based on a predetermined rule.

**[0205]** Subsequently, the UE may verify the validity of a TA through a CR procedure (step S860).

**[0206]** When the UE determines that the TA is valid, the UE may update a TA value for each UL timing group (step S870).

**[0207]** Here, the UE may transmit the updated TA value for each UL timing group to the eNB through a delegate CC. That is, a procedure of determining the TA value may be additionally performed to obtain accurate synchronization with the eNB.

**[0208]** FIG. 9 illustrates operations of a UE according to an embodiment of the present invention. Here, FIG. 9 shows the operations of the UE when setting of an initial UL timing group is performed in an eNB.

**[0209]** Referring to FIG. 9, the UE may receive CC set information from the eNB (step S972). The CC set information may be received via a PCC or a Pcell. The PCC may correspond to the PCell as described in the foregoing. A UE in an IDLE mode may select a single DL CC based on the condition described in the foregoing, for RRC connection, and may receive SI through a broadcasting channel transmitted through the selected CC. The CC set information may be transmitted through an RRC message.

**[0210]** The UE may receive SI associated with CCs in the CC set, based on the received CC set information (step S974). The SI may be transmitted to a plurality of UEs in common through a broadcasting channel or may be transmitted through an RRC message in a form of a dedicated channel. The SI may be transmitted through the PCC. Accordingly, the UE may configure UL CCs in the CC set based on the SI.

**[0211]** In step S974, the UE may receive an RAP of each CC or information associated with time/frequency resources to be used by the UE, from the eNB. The UE may configure an

initial UL timing group based on the received RAP of each CC or the information associated with the time/frequency resources. The RAP or the information associated with the time/frequency resources may be included in the SI for transmission through the PCC, or may be transmitted in a form of an RRC message.

**[0212]** The UE may determine whether simultaneous transmission of the RAP through all UL CCs configured for obtaining a UL synchronization is possible, based on CC parameters and RACH information included in the received SI (step S976).

**[0213]** Here, the UE may determine a UE-specific RACH parameter from among RACH parameters of the UL CCs configured by the eNB.

**[0214]** In this example, when RAP information is set in the UE-specific RACH parameter, the UE may determine the RAP information of the UE and may set an RAP to be transmitted through each of the configured UL CCs. Here, the RAP information may be preamble information set to be different for each UE for distinguishing the UEs.

**[0215]** When time/frequency resource information is set in the UE-specific RACH parameter, the UE may determine the time/frequency resource information of the UE, and may set an RAP to be transmitted to the configured UL CCs. Here, the time/frequency resource information may be set by the eNB to be different for each UE.

**[0216]** When simultaneous transmission of the RAP through all the configured UL CCs is possible in step S976, the UE may simultaneously transmit the RAP (step S978).

**[0217]** Conversely, when it is determined that the UE is incapable of simultaneously transmitting the RAP through all the UL CCs in step S976, the UE may proceed with step S990.

**[0218]** With respect to the simultaneous transmission of the RAP, the UE may determine RACH parameters included in SI of each of a plurality of UL CCs, and determine a plurality of

time/frequency resources defined in the RACH parameters, and may select a RAP transmission time (rach_t) for transmitting the RACH at the same time. The RAP transmission time (rach_t) may correspond to a time when the RAPs are simultaneously transmitted by the UE through all the UL CCs.

**[0219]** When the UE is incapable of setting the RAP transmission time (rach_t), that is, when the UE is incapable of transmitting the RAP through all the configured UL CC at the same time, the UE may transmit an RAP resource information request message to the eNB (step S990).

**[0220]** For example, it is assumed that a time for determining the RACH parameters of all the UL CCs and transmitting RAP is limited to t0 and t1. When the UE determines that transmitting RAP through CC1, CC3, and CCN is allowed at t0, and is not allowed at t1, and the UE determines that transmitting RAP through CC2 is allowed at t1, and is not allowed at t0, the UE may transmit an RAP resource information request message to the eNB.

**[0221]** Subsequently, in response to the RAP resource information request, the UE may receive an RAP resource information response message from the eNB (step S992). Here, the eNB that receives the RAP resource information request message may determine that the UE is incapable of simultaneously transmitting the RAP through all the CCs. Therefore, the eNB may include transmission time/frequency resource to be used for RAP transmission of the UE and a type of a preamble in the RAP resource information response message for transmission to the UE.

**[0222]** Accordingly, the UE may transmit the RAP through all UL CCs configured based on information included in the RAP resource information response message (step S994). When the RAP resource information does not exist in the RAP resource information response message

received from the eNB, a time that is closest to the time when the RAP needs to be transmitted may be selected so that the RAP may be simultaneously transmitted through all the UL CCs. In this example, the same RAP may be selected from all the CCs and may be simultaneously transmitted.

**[0223]** Subsequently, the UL timing group information may be received from the eNB through a PCC. That is, the eNB may determine RAPs transmitted from the UE, may determine that the UE requests configuration of a UL timing group, may calculate a TA value based on the preambles received through the RAPs, and may generate the UL timing group of the UE based on the calculated TA. The UL timing group information of the generated UL timing group may be transmitted to the UE.

**[0224]** The UL timing group information may be received through the PCC (PCell) in a form of a PDCCH or control information of a MAC message, or may be received through an RRC message.

**[0225]** The UE may simultaneously receive RAR from the eNB through a few or all of DL CCs having linkages with all the configured UL CCs (step S982). The linkage may be set fixedly in a wireless communication system, or may be set for each eNB based on SI, or may be set for each UE or for each UE group based on an RRC message.

**[0226]** The RAR message may include, for example, identification information of the UE preamble received by the eNB, an identifier (ID) of the eNB, a temporary C-RNTI, information associated with a time slot where the UE preamble is received, UL grant information, TA information for obtaining a UL synchronization, and the like.

**[0227]** Accordingly, the UE may transmit data through a PUSCH through use of time/frequency resource information included in the UL grant information at a scheduled time

determined based on the received TA information, and may perform HARQ.

**[0228]** The UE may simultaneously verify the validity of the TA with respect to CCs through which the RAR is received (step S984). In this example, when RAP information is set in the UE-specific RACH parameter, the UE may omit verifying the validity of the TA.

**[0229]** As described in the foregoing, the UE may determine whether C-RNTI, T_C-RNTI, or UE identity included in an ACK message received from the eNB is identical to C-RNTI, T_C-RNTI, or UE identity assigned to the UE, so as to simultaneously verify the validity of the TA. Here, the UE may transmit an L2/L3 message including the C-RNTI, the T_C-RNTI, or the UE identity to the eNB, and may receive an L1/L2 message from the eNB since the ACK message is based on the HARQ operation.

**[0230]** The UE may recognize that the eNB sets UL CCs having linkages with the received DL CC through which the RAR is received as delegate CCs in a group, and may set the UL CCs as the delegate CCs in the group (step S986).

**[0231]** The UE may apply a TA value of the delegate CC received in step S972 to remaining CCs in each group for updating (step S988).

**[0232]** FIG. 10 illustrates a configuration of a transmitting apparatus according to an embodiment of the present invention.

**[0233]** Referring to FIG. 10, a transmitting apparatus 1000 may include a connection mode determining unit 1005 to determine an RRC mode of a UE, a CC set determining unit 1020 to determine a CC set including at least one CC available to the UE, a UL timing group generating unit 1030 to generate a UL timing group, a transceiving unit 1050, and a controller 1010 to control the above component elements.

**[0234]** The controller 1010 may generate UL synchronization information corresponding

to the UL timing group, so as to establish a UL synchronization. The transceiving unit 1050 may receive a synchronization request message from the UE through at least one delegate CC in the UL timing group, and may transmit the UL synchronization information to the UE through the at least one delegate CC. The at least one delegate CC may be selected by the UE based on a state of the UL timing group and characteristics of a plurality of CCs forming the UL timing group, so as to obtain the UL synchronization. In particular, the at least one delegate CC may correspond to at least one of c-i) through c-v). The CC may be included in the serving cell as described in the foregoing.

**[0235]** In particular, the RRC mode determining unit 1005 may determine a connection mode between the UE and the eNB, and when the UE and the eNB are not connected, that is, when the connection mode is an RRC_IDLE mode or UL synchronization is not established, the RRC mode determining unit 1005 may change the connection mode of the UE to an RRC_CONNECTED mode or may enable the UL synchronization to be established. In this example, RRC connection setup may be performed through use of the UE and a PCC as described in the foregoing.

**[0236]** For example, the RRC mode determining unit 1005 may operate the transceiving unit 1050 to receive an RRC connection request transmitted from the UE, and to transmit an RRC connection setup message to the UE. Also, the RRC mode determining unit 1005 may receive an RRC connection setup complete message from the UE, may complete the RRC connection setup, and may determine an UE RRC_CONNECTED mode.

**[0237]** The CC set determining unit 1020 may determine at least one CC available to the UE, and may set a CC set of the UE. In this example, the CC set for the UE may be set based on a difference in UL synchronization times of the available (configurable) CCs, type information

of each CC, a center frequency location of each CC, a service type of each CC, a network service for each CC, and the like.

**[0238]** The controller 1010 may set the CC set determined by the CC set determining unit 1020 as a CC set to be used by the UE, and the transceiving unit 1050 may transmit information associated with the set CC set to the UE through a PCell or a primary CC, before receiving the synchronization request message.

**[0239]** The UL timing group generating unit 1030 may generate the UL timing group of the UE based on the CC set determined by the CC set determining unit 1020. Here, the UL timing group may be generated to satisfy at least one of the conditions a-i) through a-v) or b-i) through b-iv), and may be determined by comparing a difference in center frequency values of CCs with a threshold, determining whether the CCs have the same beamforming scheme or different beamforming schemes, determining whether the CCs are updated in response to a UL synchronization update request, or determining whether the CCs correspond to CCs that are incapable of providing services in a macrocell but are capable of providing services in a space superposed by a cell smaller than the macrocell, such as a femtocell, a picocell, a micorcell, a relay, a repeater, and the like.

**[0240]** The transceiving unit 1050 may transmit the CC set information and UL timing group information to the UE. In this example, the transceiving unit 1050 may transmit the UL timing group information together with the CC set information as shown in FIG. 5, or may transmit the UL timing group information and the CC set information separately as shown in FIG. 6. Also, the transceiving unit 1050 may additionally transmit SI after transmitting the CC set information. Therefore, the UE may be able to configure the UL timing group based on the CC set information and the SI.

**[0241]** The transceiving unit 1050 may receive, from the UE, the synchronization request message requesting synchronization, for example, a message including an RAP. That is, the RAP transmitted through the delegate CC determined by the UE for the UL timing group may be determined, and a TA value for each UL timing group may be transmitted. The synchronization request message may be received through at least one delegate CC, simultaneously or sequentially at separated time.

**[0242]** The transceiving unit 1050 may change a portion or all of the UL timing group determined by the UL timing group generating unit 1030, based on the RAP message transmitted from the UE.

**[0243]** The controller 1010 may control the transceiving unit 1050 to generate information associated with synchronization based on the received RAP, for example, a message including UL grant information, TA information associated with the synchronization, and the like, and to transmit the generated information to the UE. In this example, the message including the TA information may include an RAR message. The information associated with the synchronization may include TA information required to move up a UL transmission time. Therefore, the controller 1010 may control the transceiving unit 1050 to generate and transmit synchronization information with respect to the UL timing group.

**[0244]** Here, the controller 1010 may generate TA information for each UL timing group in a form of a table including a TA value corresponding to a group index, in a form of a TA value including a unit error for each timing group. The error for each timing group may have a size of an integer-multiple of a predetermined unit value, or may be specified in detail. Also, the controller 1010 may control the transceiving unit 1050 to transmit the TA information for each UL timing group as an indicator indicating a TA based on a predetermined rule. The TA value

may be an example of the UL synchronization information required when the UE adjusts a UL transmission time, and the synchronization information for the UL timing group may be transmitted through one or more delegate CCs, simultaneously or at separated time.

**[0245]** The UL synchronization information, as described in the foregoing, may be calculated by comparing, with a predetermined threshold, a difference in center frequency values of a plurality of CCs in the CC set configured for the UE, or may be calculated to enable the CCs to have different transmission times by determining whether the CCs correspond to CCs having the same beamforming scheme, correspond to CCs updated in response to a synchronization update request, or correspond to CCs that do not provide services in a macrocell but provide services in a space superposed by a coverage cell smaller than the macrocell.

**[0246]** Also, the controller 1010 may control all component elements, and a few component elements may independently operate. The component elements of FIG. 10 may be configured as a single module or two or more modules, or may be configured to perform a single function in two or more modules.

**[0247]** FIG. 11 illustrates a configuration of a receiving apparatus according to an embodiment of the present invention.

**[0248]** Referring to FIG. 11, a receiving apparatus 1110 may include a connection mode determining unit 1105, a CC set determining unit 1107, a controller 1110, a UL timing adjusting unit 1120, a UL timing group generating unit 1130, and a transceiving unit 1150.

**[0249]** The transceiving unit 1150 may transmit a synchronization request message to an eNB through one or more CCs in a UL timing group, and may receive UL synchronization information through the one or more CCs. The controller 1110 may control the transceiving unit. The controller 1110 may determine the UL synchronization information received through

the transceiving unit. The UL timing adjusting unit 1120 may establish a UL synchronization of the UL timing group based on the UL synchronization information determined by the controller. That is, the UL timing adjusting unit 1120 may establish the UL synchronization of the UL timing group based on the UL synchronization information received through the transceiving unit. Here, the controller 1110 may determine UL grant information and a TA value calculated to adjust a UL transmission time for each group corresponding to the UL timing group, through an RAR message received in response to the synchronization request message transmitted through the transceiving unit. The UL timing adjusting unit 1120 may establish a UL synchronization based on the UL synchronization information determined by the controller. In this example, the UL timing adjusting unit 1120 may establish the UL synchronization based on a TA value distinguished based on the UL timing group, based on a unit error distinguished based on the UL timing group, or based on an error distinguished based on the UL timing group and having a size of an integer-multiple of a determined unit value, or using an indicator associated with a rule determined based on the UL timing group. The UL synchronization information may be distinguished based on a group index of the UL timing group.

**[0250]** Here, the one or more delegate CCs may be selected by the UE based on a state of the UL timing group and characteristics of a plurality of CCs forming the UL timing group, so as to obtain the UL synchronization. In particular, the one or more delegate CCs may correspond to at least one of c-i) through c-v). The CCs may be included in a serving cell as described in the foregoing.

**[0251]** In particular, the connection mode determining unit 1105 may determine a connection mode with the eNB. That is, when the connection mode is an UE RRC_IDLE mode or UL synchronization with the eNB is not established, the connection mode determining unit

1105 may enable the UE to change the connection mode to an RRC_CONNECTED mode or enable the UL synchronization to be established. In this example, RRC connection setup may be performed through use of the UE and a PCC as described in the foregoing.

**[0252]** For example, the connection mode determining unit 1005 may transmit an RRC connection request message to the eNB through use of the transceiving unit 1050, may receive an RRC connection setup message from the eNB, and may complete RRC connection setup through use of an RRC connection setup complete message.

**[0253]** The transceiving unit 1150 may perform transmission and reception of information with the eNB. For example, the transceiving unit 1150 may receive CC set information and information associated with synchronization from the eNB. In particular, the transceiving unit 1150 may receive the CC set information from the eNB through a PCell or a primary CC, before transmitting the synchronization request message. After receiving the CC set information, the transceiving unit 1150 may receive SI associated with the CCs in the CC set, from the eNB. The SI may include frequency band information of a CC, information associated with an available frequency magnitude, and the like.

**[0254]** The CC set determining unit 1107 may determine at least one CC available to the UE, from the CC set information. The CC set may be determined based on a difference in UL synchronization times of the CCs available to the UE, type information of each CC, a center frequency location of each CC, a service type of each CC, a network service for each CC, and the like.

**[0255]** The UL timing group generating unit 1130 may generate a UL timing group of the UE based on the CC set determined by the CC set determining unit 920. Here, the UL timing group may be configured by the UE based on the conditions described in FIG. 10 (at least one of

conditions a-i) through a-v) or b-I through b-iv)). Also, the UL timing group generating unit 1130 may select a delegate CC of the UL timing group.

**[0256]** For example, when the UL timing group generating unit 1130 receives, from the eNB, UL timing group information of CCs together with the CC set information, the UL timing group generating unit 1130 may select a delegate CC from the received UL timing group. Also, the UL timing group generating unit 1130 may receive, through the transceiving unit 1150, the UL timing group information separately from the CC set information, through a separate signaling.

**[0257]** Therefore, when the transceiving unit 1150 does not receive the UL timing group information of CCs or the UL timing group information generated by the eNB is inappropriate for a network state of the UE, the UL timing group generating unit 1130 may configure a new UL timing group.

**[0258]** Also, the controller 1110 may control the transceiving unit 1150 to transmit a synchronization request message requesting synchronization to the eNB through the delegate CC, and to receive information associated with synchronization from the eNB through the delegate CC.

**[0259]** For example, the controller 1110 may control the transceiving unit 1150 to transmit a message including a RAP selected by the UE, and to receive an RAR message transmitted from the eNB. Also, the controller 1110 may control the transceiving unit 1150 to perform, with the eNB, transmission and reception of a message for RRC reconfiguration and synchronization. The synchronization request message may be transmitted through one or more delegate CCs simultaneously or at separated time.

**[0260]** Also, the controller 1110 may control the UL timing group generating unit 930 to

change a portion or all of the determined UL timing group, based on the RAR message.

**[0261]** In particular, the controller 1110 may perform controlling so as to determine a TA value associated with each UL timing group based on the set UL timing group included in the RAR message. Also, the controller 1110 may perform controlling so as to determine frequency resource information assigned for UL transmission of the UE.

**[0262]** The UL timing adjusting unit 1120 may determine the TA value determined by the controller 1110, and may apply the TA value to all CCs of the corresponding UL timing group where the delegate CC is included. That is, the TA value may be applied to the corresponding UL timing group for synchronization with the eNB. Here, TA information for each UL timing group may be in a form of a table including a TA value corresponding to a group index, in a form of a TA value including a unit error for each timing group, in a form of an error having a size of an integer-multiple of a predetermined unit value, for each timing group, in a form of an error specified in detail for each timing group, or in a form of an indicator indicating a TA based on a predetermined rule. Therefore, the UL timing adjusting unit 1120 may obtain synchronization by applying a determined TA to each UL timing group. The TA value may be an example of UL synchronization information required when the UE adjusts a UL transmission time, and the synchronization information for the UL timing group may be received through one or more delegate CCs simultaneously or at separated time.

**[0263]** For example, when the TA information is included in the synchronization information, the TA information may be set equally to all CCs in the UL timing group.

**[0264]** As described in the foregoing, the controller 1110 may control all component elements, and a few component elements may independently operate. The component elements of FIG. 11 may be configured as a single module or two or more modules, and may be

configured to perform a single function in two or more modules.

**[0265]** Based on the descriptions of FIG. 9, the transceiving unit 1150 may receive SI of CCs in the CC set based on the CC set information, and the controller 1110 may control the transceiving unit 1105 to simultaneously transmit the synchronization request message to the eNB through all UL CCs in the CC set, based on the received SI.

**[0266]** Subsequently, the transceiving unit 1105 may receive UL timing group information from the eNB, and simultaneously receive UL synchronization information through a few or all of DL CCs associated with the received UL timing group, and the controller 1110 may set a UL CC associated with a CC through which the UL synchronization information is received as a delegate CC of the received UL timing group.

**[0267]** Therefore, according to an embodiment of the present invention, when a plurality of CCs is used, a different UL synchronization may be obtained for each CC or for each CC group and thus, when the UE transmits information in a UL through a plurality of CCs, data transmission error due to an error in obtaining synchronization and delay in receiving information in the eNB may be effectively reduced.

**[0268]** Also, when a UL synchronization standard is different for each of the plurality of CCs, the UE may obtain a UL synchronization based on a type of each CC, a center frequency location, and a service type.

WHAT IS CLAIMED IS:

1. A method for establishing an uplink (UL) synchronization in a wireless communication system by an evolved NodeB (eNB), the method comprising:

transmitting, to a User Equipment (UE), Radio Resource Control (RRC) signaling including a UL timing group information set through a primary Component Carrier (CC), the UL timing group information set comprising one or more UL timing groups, the one or more UL timing groups each comprising one or more UL CCs;

receiving a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group; and

transmitting a Random Access Response (RAR) including a Timing Advance (TA) value for UL CCs in the respective UL timing group,

wherein each TA value is calculated by the eNB for the respective UL timing group based on the received RAP associated with a delegate CC of the respective UL timing group, and

wherein each TA value is configured to be applied to CCs in the respective UL timing group.

2. A method for establishing an uplink (UL) synchronization by a User Equipment (UE), the method comprising:

receiving a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);

configuring one or more UL timing groups based on the UL timing group information set,

the one or more UL timing groups each comprising one or more UL CCs;

transmitting a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group;

receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group; and

applying each TA value to CCs in the respective UL timing group.

3. A User Equipment (UE) to establish an uplink (UL) synchronization in a wireless communication system, the UE comprising:

a transceiver configured to receive a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);

a controller configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs,

wherein the transceiver transmits a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group, and receives a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group,

wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group,

and

wherein the controller applies each TA value to CCs in the respective UL timing group.

ABSTRACT

Uplink synchronization establishment in a base station which operates a plurality of component carriers according to one embodiment of the present description, is performed in that the base station is connected to a user equipment, sets component carrier aggregation information, generates an uplink timing groups in the set component carrier aggregation, and transmits information on the thus-generated uplink timing groups to the user equipment.

*FIG.1*

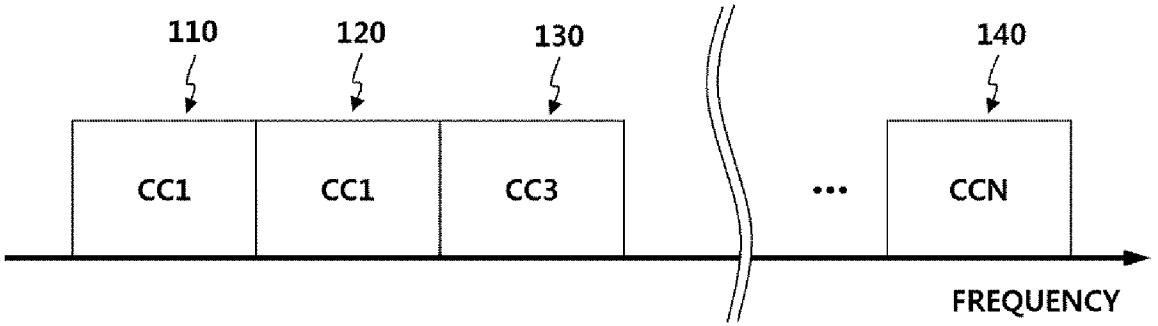


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*FIG.2*

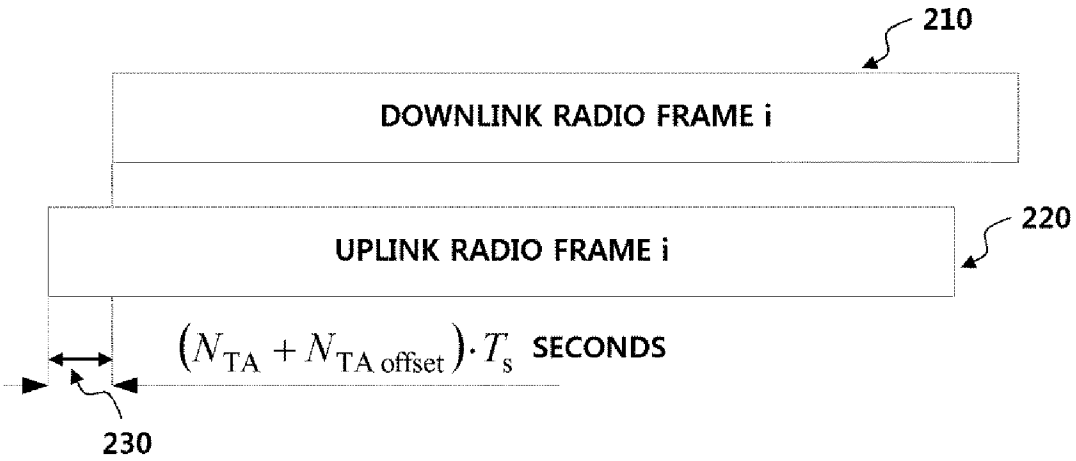
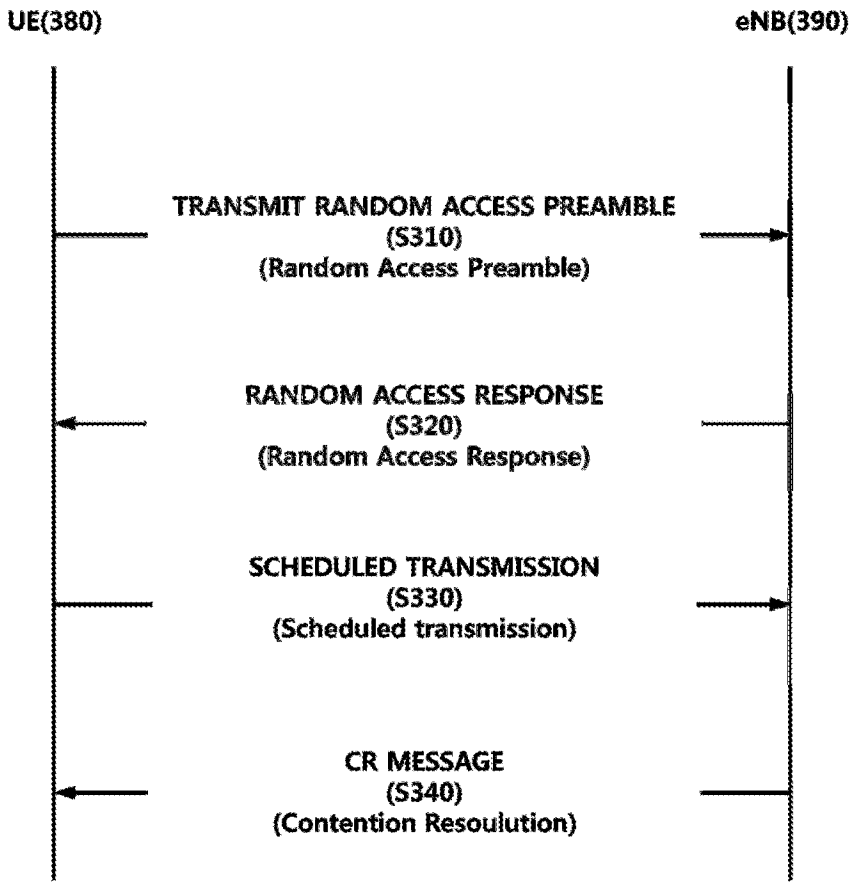
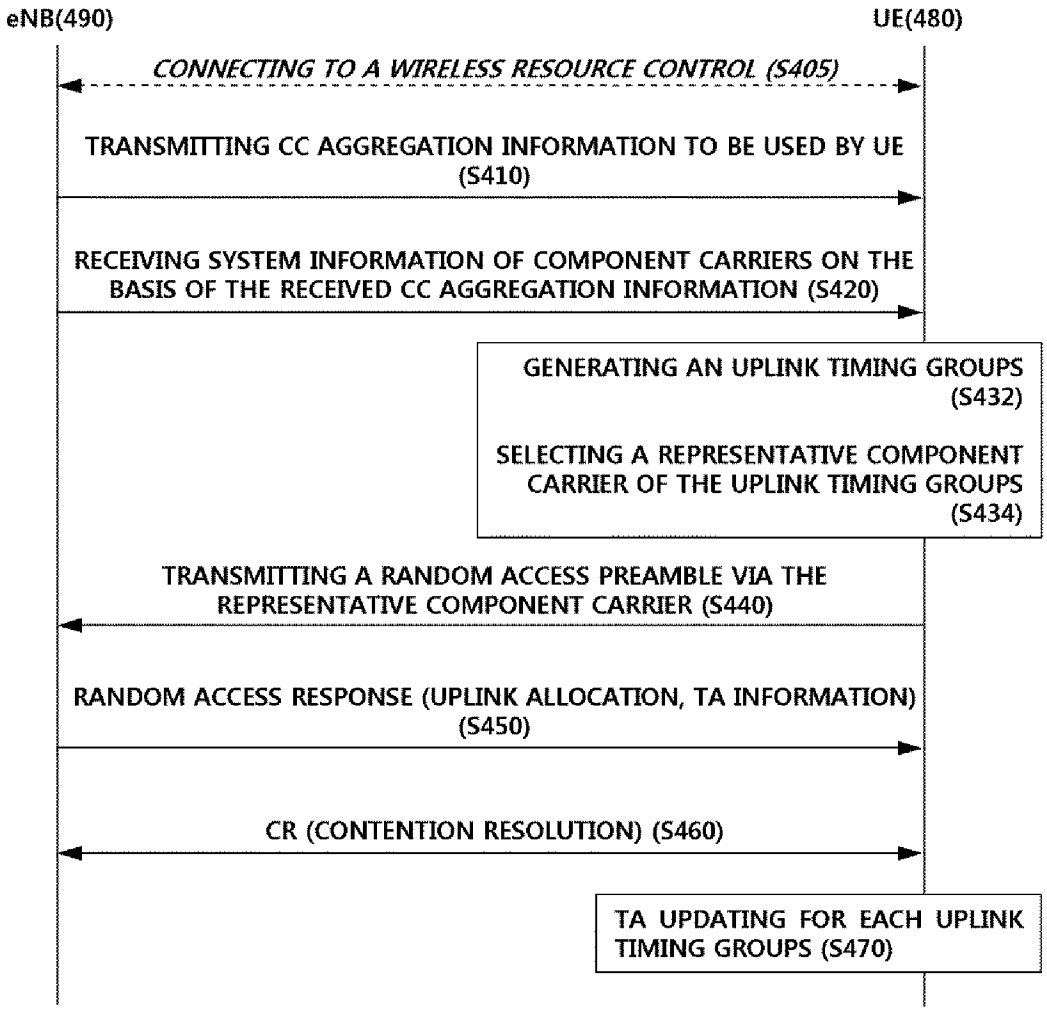

210
DOWNLINK RADIO FRAME i
220
UPLINK RADIO FRAME i
$(N_{TA} + N_{TA\ offset}) \cdot T_s$ SECONDS
230

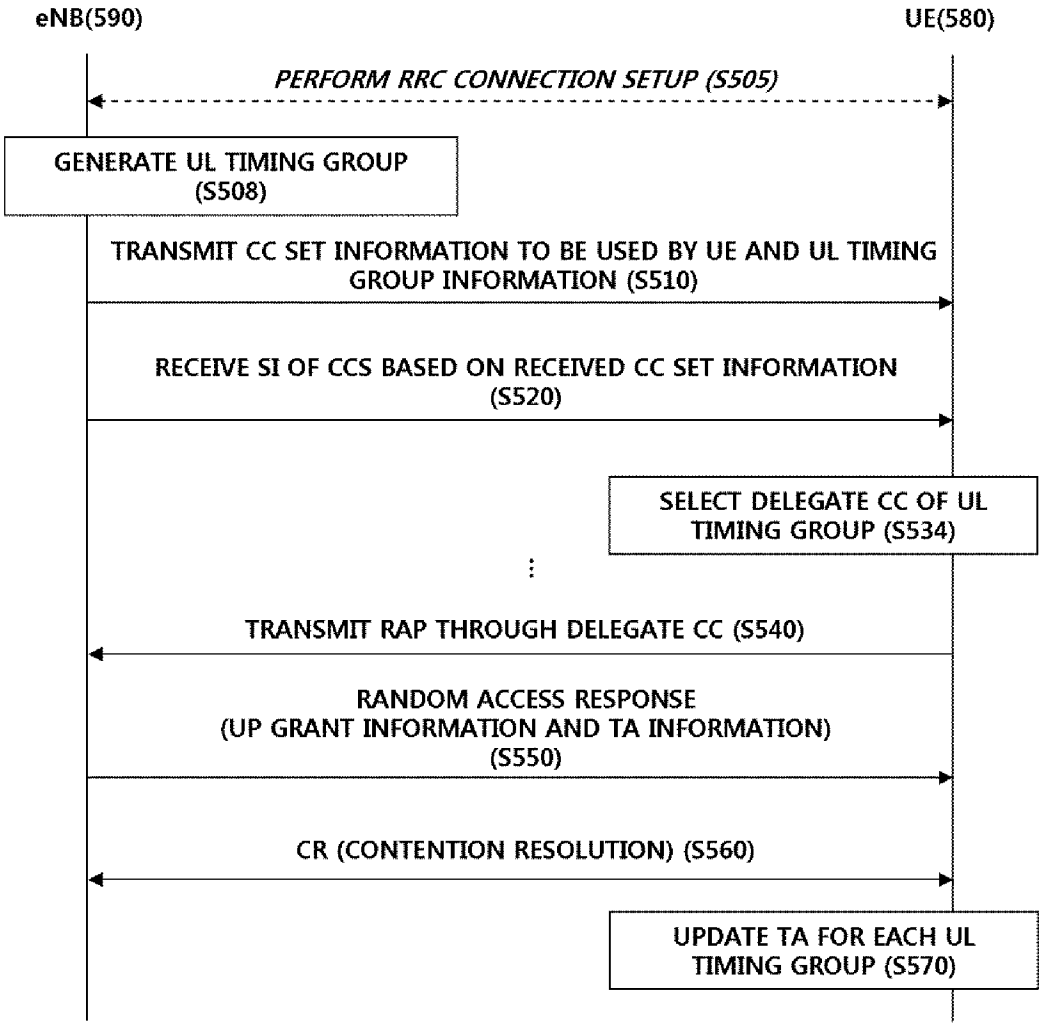
*FIG.3*


UE(380)
eNB(390)
TRANSMIT RANDOM ACCESS PREAMBLE
(S310)
(Random Access Preamble)
RANDOM ACCESS RESPONSE
(S320)
(Random Access Response)
SCHEDULED TRANSMISSION
(S330)
(Scheduled transmission)
CR MESSAGE
(S340)
(Contention Resoulution)

# FIG. 4


eNB(490)
UE(480)
CONNECTING TO A WIRELESS RESOURCE CONTROL (S405)
TRANSMITTING CC AGGREGATION INFORMATION TO BE USED BY UE (S410)
RECEIVING SYSTEM INFORMATION OF COMPONENT CARRIERS ON THE BASIS OF THE RECEIVED CC AGGREGATION INFORMATION (S420)
GENERATING AN UPLINK TIMING GROUPS (S432)
SELECTING A REPRESENTATIVE COMPONENT CARRIER OF THE UPLINK TIMING GROUPS (S434)
TRANSMITTING A RANDOM ACCESS PREAMBLE VIA THE REPRESENTATIVE COMPONENT CARRIER (S440)
RANDOM ACCESS RESPONSE (UPLINK ALLOCATION, TA INFORMATION) (S450)
CR (CONTENTION RESOLUTION) (S460)
TA UPDATING FOR EACH UPLINK TIMING GROUPS (S470)

# FIG.5


eNB(590)
UE(580)
PERFORM RRC CONNECTION SETUP (S505)
GENERATE UL TIMING GROUP (S508)
TRANSMIT CC SET INFORMATION TO BE USED BY UE AND UL TIMING GROUP INFORMATION (S510)
RECEIVE SI OF CCS BASED ON RECEIVED CC SET INFORMATION (S520)
SELECT DELEGATE CC OF UL TIMING GROUP (S534)
TRANSMIT RAP THROUGH DELEGATE CC (S540)
RANDOM ACCESS RESPONSE (UP GRANT INFORMATION AND TA INFORMATION) (S550)
CR (CONTENTION RESOLUTION) (S560)
UPDATE TA FOR EACH UL TIMING GROUP (S570)

# FIG.6

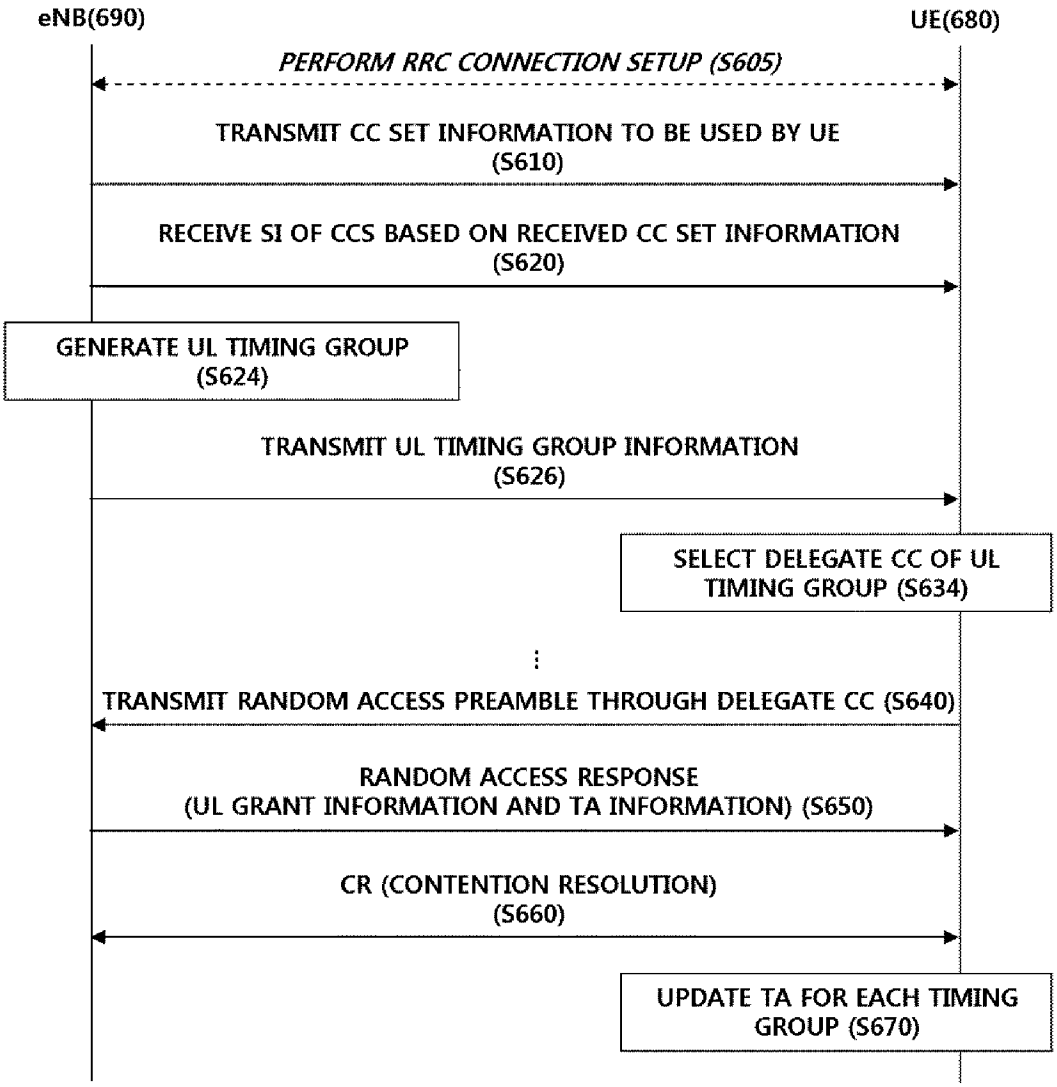

eNB(690)
UE(680)
PERFORM RRC CONNECTION SETUP (S605)
TRANSMIT CC SET INFORMATION TO BE USED BY UE (S610)
RECEIVE SI OF CCS BASED ON RECEIVED CC SET INFORMATION (S620)
GENERATE UL TIMING GROUP (S624)
TRANSMIT UL TIMING GROUP INFORMATION (S626)
SELECT DELEGATE CC OF UL TIMING GROUP (S634)
TRANSMIT RANDOM ACCESS PREAMBLE THROUGH DELEGATE CC (S640)
RANDOM ACCESS RESPONSE (UL GRANT INFORMATION AND TA INFORMATION) (S650)
CR (CONTENTION RESOLUTION) (S660)
UPDATE TA FOR EACH TIMING GROUP (S670)

*FIG. 7*

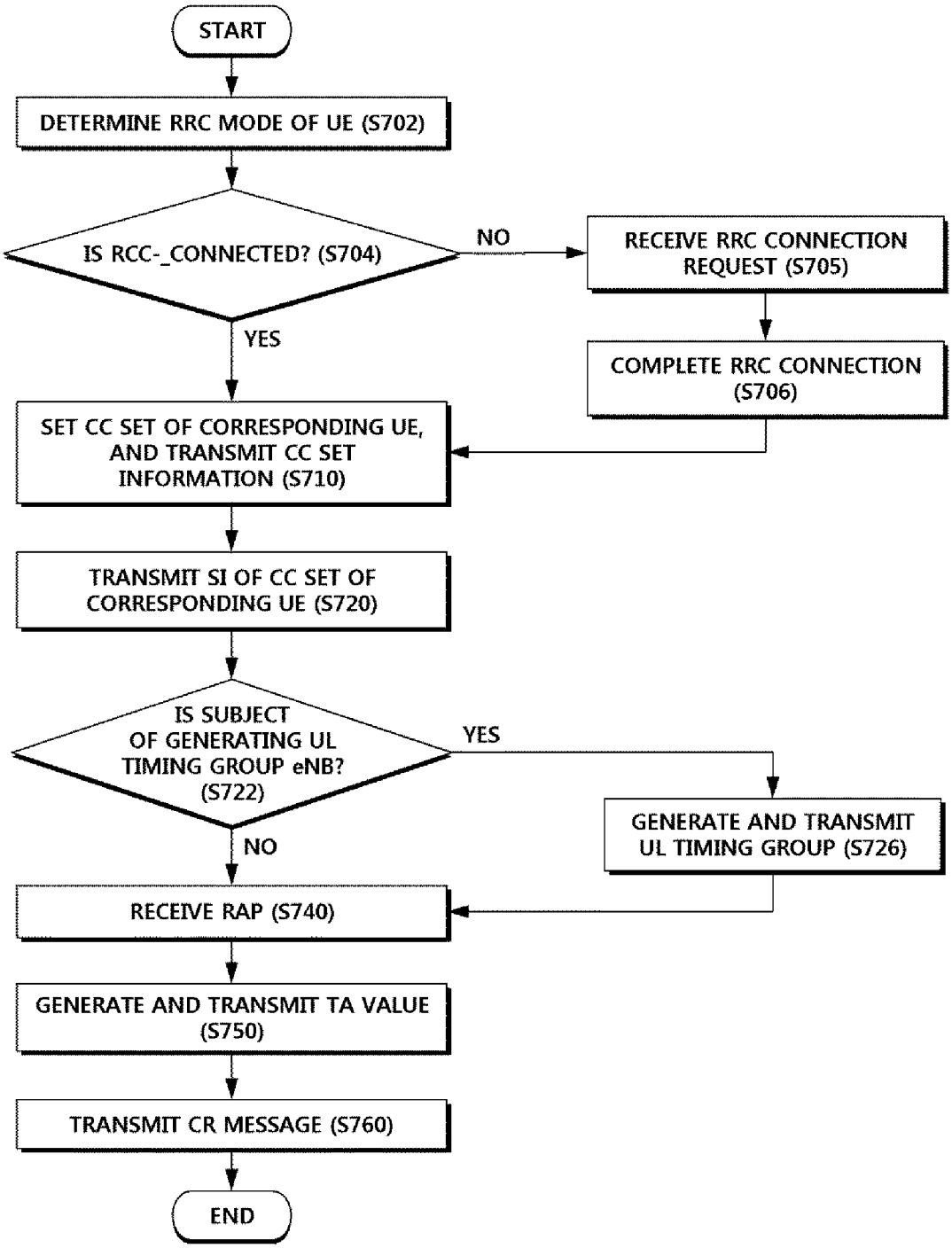

START
DETERMINE RRC MODE OF UE (S702)
IS RCC-_CONNECTED? (S704)
NO
RECEIVE RRC CONNECTION REQUEST (S705)
COMPLETE RRC CONNECTION (S706)
YES
SET CC SET OF CORRESPONDING UE, AND TRANSMIT CC SET INFORMATION (S710)
TRANSMIT SI OF CC SET OF CORRESPONDING UE (S720)
IS SUBJECT OF GENERATING UL TIMING GROUP eNB? (S722)
YES
GENERATE AND TRANSMIT UL TIMING GROUP (S726)
NO
RECEIVE RAP (S740)
GENERATE AND TRANSMIT TA VALUE (S750)
TRANSMIT CR MESSAGE (S760)
END

FIG.8

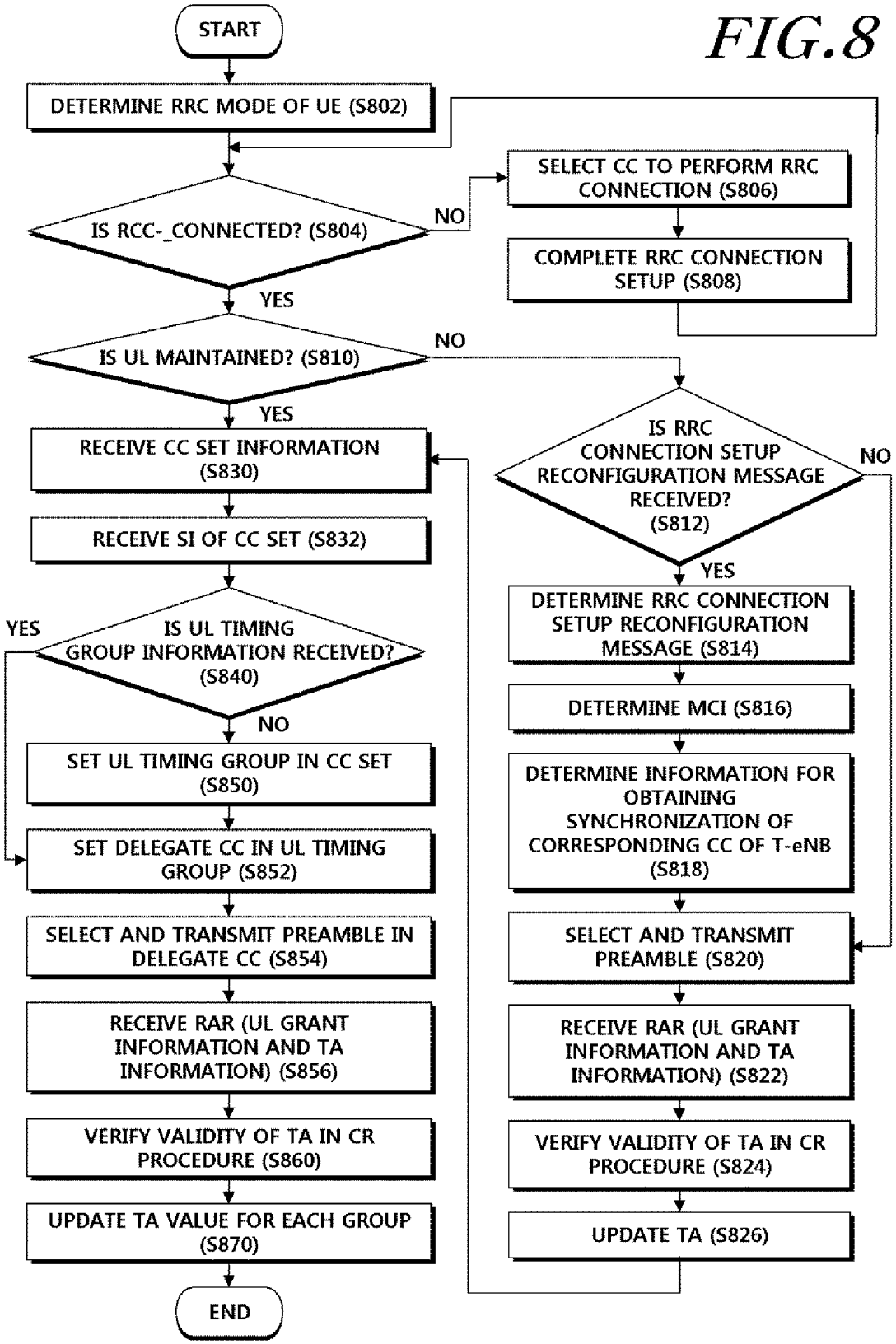

START
DETERMINE RRC MODE OF UE (S802)
IS RCC-_CONNECTED? (S804)
NO
SELECT CC TO PERFORM RRC CONNECTION (S806)
COMPLETE RRC CONNECTION SETUP (S808)
YES
IS UL MAINTAINED? (S810)
NO
YES
RECEIVE CC SET INFORMATION (S830)
RECEIVE SI OF CC SET (S832)
YES
IS UL TIMING GROUP INFORMATION RECEIVED? (S840)
NO
SET UL TIMING GROUP IN CC SET (S850)
SET DELEGATE CC IN UL TIMING GROUP (S852)
SELECT AND TRANSMIT PREAMBLE IN DELEGATE CC (S854)
RECEIVE RAR (UL GRANT INFORMATION AND TA INFORMATION) (S856)
VERIFY VALIDITY OF TA IN CR PROCEDURE (S860)
UPDATE TA VALUE FOR EACH GROUP (S870)
END
IS RRC CONNECTION SETUP RECONFIGURATION MESSAGE RECEIVED? (S812)
NO
YES
DETERMINE RRC CONNECTION SETUP RECONFIGURATION MESSAGE (S814)
DETERMINE MCI (S816)
DETERMINE INFORMATION FOR OBTAINING SYNCHRONIZATION OF CORRESPONDING CC OF T-eNB (S818)
SELECT AND TRANSMIT PREAMBLE (S820)
RECEIVE RAR (UL GRANT INFORMATION AND TA INFORMATION) (S822)
VERIFY VALIDITY OF TA IN CR PROCEDURE (S824)
UPDATE TA (S826)

*FIG.9*

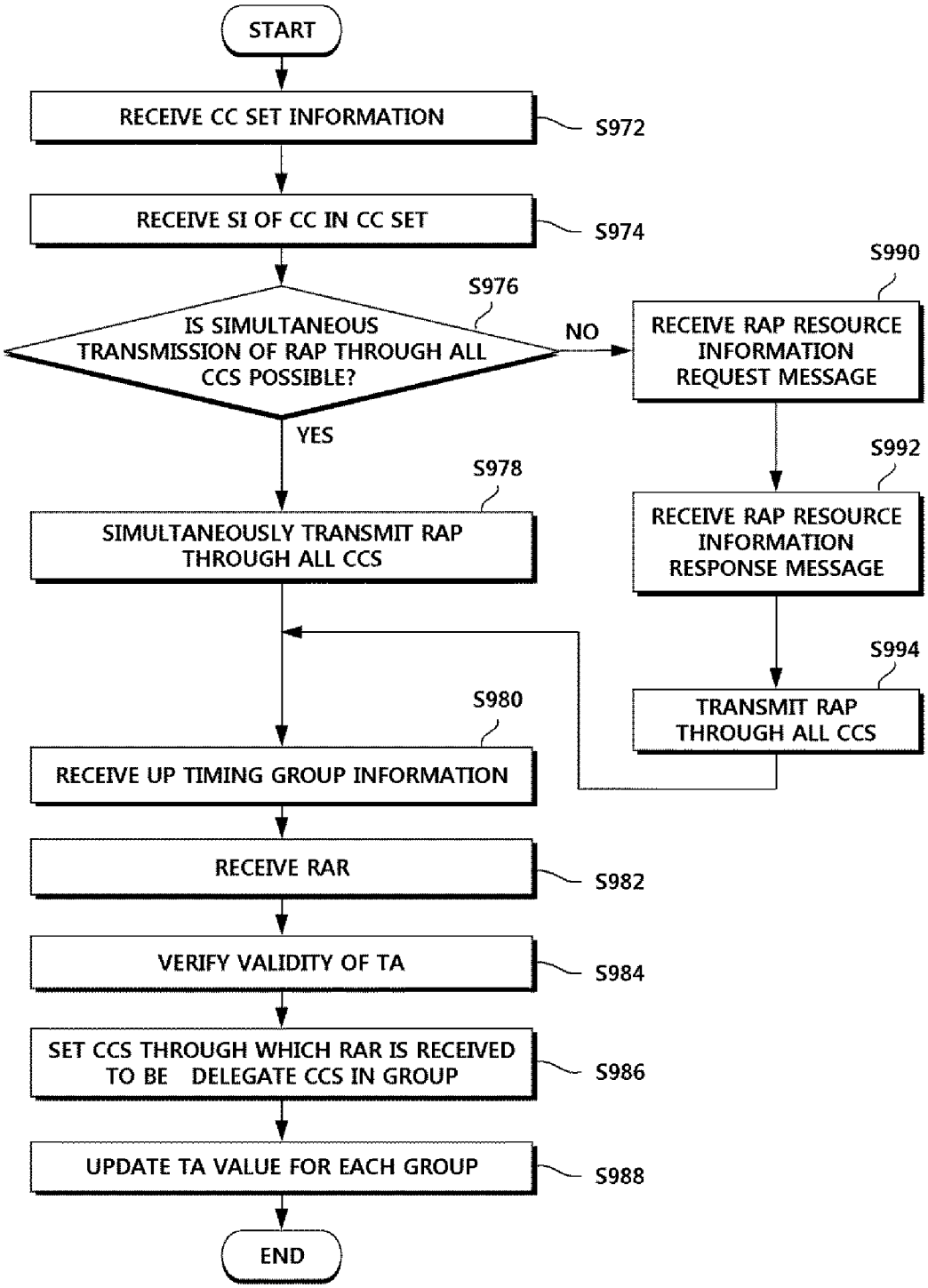

START
RECEIVE CC SET INFORMATION
S972
RECEIVE SI OF CC IN CC SET
S974
S976
IS SIMULTANEOUS TRANSMISSION OF RAP THROUGH ALL CCS POSSIBLE?
NO
YES
S990
RECEIVE RAP RESOURCE INFORMATION REQUEST MESSAGE
S992
RECEIVE RAP RESOURCE INFORMATION RESPONSE MESSAGE
S994
TRANSMIT RAP THROUGH ALL CCS
S978
SIMULTANEOUSLY TRANSMIT RAP THROUGH ALL CCS
S980
RECEIVE UP TIMING GROUP INFORMATION
RECEIVE RAR
S982
VERIFY VALIDITY OF TA
S984
SET CCS THROUGH WHICH RAR IS RECEIVED TO BE DELEGATE CCS IN GROUP
S986
UPDATE TA VALUE FOR EACH GROUP
S988
END

*FIG.10*

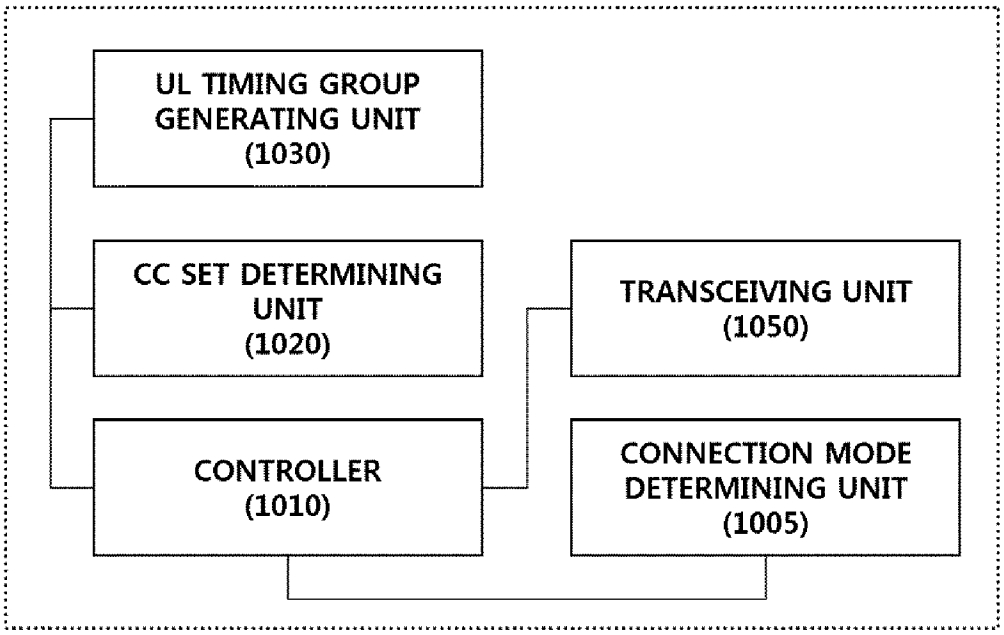
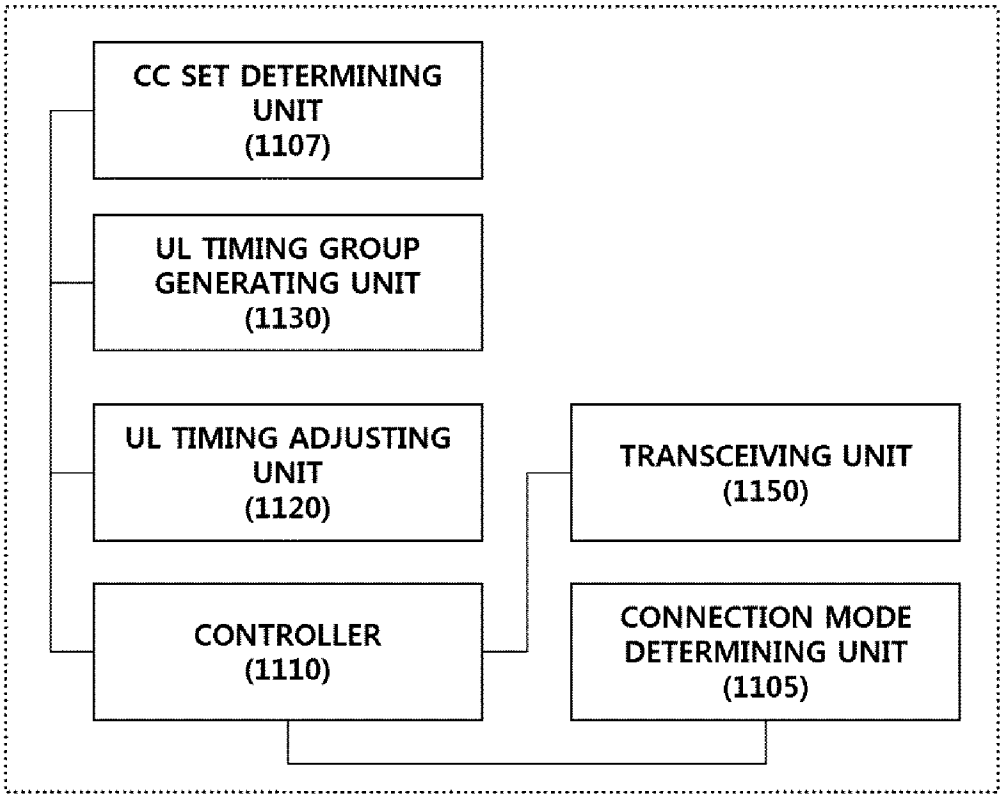

UL TIMING GROUP GENERATING UNIT (1030)
CC SET DETERMINING UNIT (1020)
TRANSCEIVING UNIT (1050)
CONTROLLER (1010)
CONNECTION MODE DETERMINING UNIT (1005)

*FIG.11*


CC SET DETERMINING UNIT (1107)
UL TIMING GROUP GENERATING UNIT (1130)
UL TIMING ADJUSTING UNIT (1120)
TRANSCEIVING UNIT (1150)
CONTROLLER (1110)
CONNECTION MODE DETERMINING UNIT (1105)

| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875 | Application or Docket Number<br>14/733,068 |
|---|---|

## APPLICATION AS FILED - PART I

| | (Column 1) | (Column 2) | SMALL ENTITY | | OR | OTHER THAN SMALL ENTITY | |
|---|---|---|---|---|---|---|---|
| FOR | NUMBER FILED | NUMBER EXTRA | RATE($) | FEE($) | | RATE($) | FEE($) |
| BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | | | N/A | 280 |
| SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | | | N/A | 600 |
| EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | | | N/A | 720 |
| TOTAL CLAIMS (37 CFR 1.16(i)) | 3 minus 20 = | * | | | OR | x 80 = | 0.00 |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | 3 minus 3 = | * | | | | x 420 = | 0.00 |
| 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 | 1600 |

## APPLICATION AS AMENDED - PART II

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

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

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

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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 |
|---|---|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | 2414 | 1600 | P4998USC1 | 3 | 3 |

**CONFIRMATION NO. 5097**

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

**FILING RECEIPT**

OC000000075795548

Date Mailed: 06/19/2015

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)**

Kibum KWON, Seoul, KOREA, REPUBLIC OF;
Myungcheul JUNG, Seoul, KOREA, REPUBLIC OF;

**Applicant(s)**

Pantech Co., Ltd., Seoul, KOREA, REPUBLIC OF;

**Power of Attorney:** The patent practitioners associated with Customer Number 58027

**Domestic Priority data as claimed by applicant**

This application is a CON of 13/578,531 08/10/2012 PAT 9054835
which is a 371 of PCT/KR2011/000909 02/10/2011

**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.)
REPUBLIC OF KOREA 10-2010-0012564 02/10/2010
REPUBLIC OF KOREA 10-2010-0027230 03/26/2010
REPUBLIC OF KOREA 10-2011-0008683 01/28/2011

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

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

**If Required, Foreign Filing License Granted:** 06/17/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/733,068**

**Projected Publication Date:** 09/24/2015

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

**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).

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## Title 35, United States Code, Section 184

## Title 37, Code of Federal Regulations, 5.11 & 5.15

**GRANTED**

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

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

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

**NOT GRANTED**

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

---


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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 |

**CONFIRMATION NO. 5097**

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

**FORMALITIES LETTER**

*OC000000075795549*

Date Mailed: 06/19/2015

# NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

**FILED UNDER 37 CFR 1.53(b)**

***Filing Date Granted***

**Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing.

Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.
  The surcharge is due for any one of:
  - late submission of the basic filing fee, search fee, or examination fee,
  - late submission of inventor's oath or declaration,
  - filing an application that does not contain at least one claim on filing, or
  - submission of an application filed by reference to a previously filed application.

**SUMMARY OF FEES DUE:**

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- $ **140** surcharge.
- $( **0**) previous unapplied payment amount.
- $ **140** TOTAL FEE BALANCE DUE.

**Items Required To Avoid Processing Delays:**

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

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

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

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**.

/ldvan/

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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 |

**CONFIRMATION NO. 5097**

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1894 PRESTON WHITE DRIVE
RESTON, VA 20191

**FORMALITIES LETTER**

*OC000000075795549*

Date Mailed: 06/19/2015

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An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing.

Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.
  The surcharge is due for any one of:
  - late submission of the basic filing fee, search fee, or examination fee,
  - late submission of inventor's oath or declaration,
  - filing an application that does not contain at least one claim on filing, or
  - submission of an application filed by reference to a previously filed application.

**SUMMARY OF FEES DUE:**

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- $ **140** surcharge.
- $( **0**) previous unapplied payment amount.
- $ **140** TOTAL FEE BALANCE DUE.

**Items Required To Avoid Processing Delays:**

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

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

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

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**.

/ldvan/

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 14733068 |
| **Filing Date:** | 08-Jun-2015 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Filer:** | Hae-Chan Park/Daniele Adams |
| **Attorney Docket Number:** | P4998USC1 |

Filed as Large Entity

**Filing Fees for Utility under 35 USC 111(a)**

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| Late Filing Fee for Oath or Declaration | 1051 | 1 | 140 | 140 |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **140** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 23209590 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 58027 |
| **Filer:** | Hae-Chan Park/Christopher Kilner |
| **Filer Authorized By:** | Hae-Chan Park |
| **Attorney Docket Number:** | P4998USC1 |
| **Receipt Date:** | 14-AUG-2015 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 15:29:40 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Credit Card |
| Payment was successfully received in RAM | $140 |
| RAM confirmation Number | 10825 |
| 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 | | P4998USC1_Declaration.pdf | 541269<br>ee4176a00bb8088faed56eb0f04d8e5d3527591d | yes | 3 |

| Multipart Description/PDF files in .zip description | | |
|---|---|---|
| **Document Description** | **Start** | **End** |
| Oath or Declaration filed | 1 | 1 |
| Applicant Response to Pre-Exam Formalities Notice | 2 | 3 |

**Warnings:**

**Information:**

| | | | | | |
|---|---|---|---|---|---|
| 2 | Fee Worksheet (SB06) | fee-info.pdf | 30939<br>9da5c5095f9709dd1ad649a05efcfbd72015950b | no | 2 |

**Warnings:**

**Information:**

| **Total Files Size (in bytes):** | 572208 |
|---|---|

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

**New Applications Under 35 U.S.C. 111**

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

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

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

**New International Application Filed with the USPTO as a Receiving Office**

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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

| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
|---|---|

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/733,068

filed on 2015-06-08.

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

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

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

## WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Myungcheul JUNG Date (Optional): 2015-08-13

Signature: JUNG MC

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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*

## PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/733,068

### APPLICATION AS FILED - PART I

| FOR | (Column 1) NUMBER FILED | (Column 2) NUMBER EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY FEE($) |
|---|---|---|---|---|---|---|---|
| BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | | | N/A | 280 |
| SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | | | N/A | 600 |
| EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | | | N/A | 720 |
| TOTAL CLAIMS (37 CFR 1.16(i)) | 3 minus 20 = | * | | | OR | x 80 = | 0.00 |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | 3 minus 3 = | * | | | | x 420 = | 0.00 |
| 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 | 1600 |

### APPLICATION AS AMENDED - PART II

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

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

| APPLICATION NUMBER | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | 2414 | 1740 | P4998USC1 | 3 | 3 |

**CONFIRMATION NO. 5097**

**UPDATED FILING RECEIPT**

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

OC000000077030516

Date Mailed: 08/24/2015

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)**

Kibum KWON, Seoul, KOREA, REPUBLIC OF;
Myungcheul JUNG, Seoul, KOREA, REPUBLIC OF;

**Applicant(s)**

Pantech Co., Ltd., Seoul, KOREA, REPUBLIC OF;

**Power of Attorney:** The patent practitioners associated with Customer Number 58027

**Domestic Priority data as claimed by applicant**

This application is a CON of 13/578,531 08/10/2012 PAT 9054835
which is a 371 of PCT/KR2011/000909 02/10/2011

**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.)
REPUBLIC OF KOREA 10-2010-0012564 02/10/2010
REPUBLIC OF KOREA 10-2010-0027230 03/26/2010
REPUBLIC OF KOREA 10-2011-0008683 01/28/2011

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

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

**If Required, Foreign Filing License Granted:** 06/17/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/733,068**

**Projected Publication Date:** 09/24/2015

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

**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 AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

**NOT GRANTED**

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

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대 한 민 국 특 허 청
KOREAN INTELLECTUAL PROPERTY OFFICE

별첨 사본은 아래 출원의 원본과 동일함을 증명함.

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Intellectual Property Office

출 원 번 호 : 10-2010-0012564
Application Number

출 원 년 월 일 : 2010년 02월 10일
Filing Date FEB. 10, 2010

출 원 인 : 주식회사 팬택
Applicant(s) PANTECH CO.,LTD.

2015년 09월 01일

특 허 청
COMMISSIONER

제출 일자 : 2010-02-10

【서지사항】

【서류명】 특허출원서

【출원구분】 특허출원

【출원인】

【명칭】 주식회사 팬택

【출원인코드】 1-1998-004053-1

【대리인】

【성명】 송해모

【대리인코드】 9-2002-000179-4

【포괄위임등록번호】 2005-094061-4

【대리인】

【성명】 김은구

【대리인코드】 9-1999-000318-1

【포괄위임등록번호】 2009-049482-2

【발명의 국문명칭】 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치

【발명의 영문명칭】 METHOD AND APPARATUS FOR CONFIGURING UPLINK SYNCHRONIZATION IN COMPONENT CARRIER AGGREGATION

【발명자】

【성명】 권기범

【성명의 영문표기】 KWON, Ki Bum

【주민등록번호】 771104-1XXXXXX

【우편번호】 426-160

【주소】 경기도 안산시 상록구 이동 530-20번지

【국적】 KR

【발명자】

제출 일자 : 2010-02-10

【성명】 정명철

【성명의 영문표기】 JUNG, Myung Cheul

【주민등록번호】 740410-1XXXXXX

【우편번호】 156-032

【주소】 서울특별시 동작구 상도2동 358-36 2/2

【국적】 KR

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 송해모 (서명 또는 인)

대리인 김은구 (서명 또는 인)

【수수료】

| | | | |
|---|---|---|---|
| 【출원료】 | 0 | 면 | 38,000 원 |
| 【가산출원료】 | 61 | 면 | 0 원 |
| 【우선권주장료】 | 0 | 건 | 0 원 |
| 【심사청구료】 | 0 | 항 | 0 원 |
| 【합계】 | 38,000 원 | | |

# 【명세서】

## 【발명의 명칭】

다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치{METHOD AND APPARATUS FOR CONFIGURING UPLINK SYNCHRONIZATION IN COMPONENT CARRIER AGGREGATION}

## 【기술분야】

<1> 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치를 제공하는 것으로, 적어도 하나 이상의 요소 반송파에 대한 업링크 동기 그룹을 설정하는 방법 및 장치에 관한 것이다.

## 【배경기술】

<2> 무선 통신 시스템에서 사용자 단말과 기지국간의 동기화는 중요한 문제이다. 왜냐하면 동기화가 이루어지지 않으면, 사용자 단말과 기지국은 정상적인 정보를 교환할 수 없기 때문이다.

<3> 한편, 하나의 요소 반송파 또는 하나의 서비스 대역을 지원하는 기존의 무선 통신 시스템과 달리, 현재 무선 통신 시스템은 다수의 요소 반송파들을 사용하여 사용자 서비스 요구를 만족시키고자 한다. 그러나, 상기 다수의 요소 반송파들에 대하여 어떻게 동기화를 수행할 것인지에 대한 구체적인 논의가 정해지지 않은 상태이다.

<4> 다시 설명하여, 통신을 수행하기 위하여 동기화는 네트워크의 효율에 큰 영향을 미치는 요소이며, 이러한 요소를 고려한 다수의 요소 반송파들이 존재하는 무선 통신 시스템에서의 효과적인 동기화 방안이 필요한 실정하다.

【발명의 내용】

【해결하려는 과제】

<5> 동기화 과정의 효율성은 네트워크의 효율성으로 직결되며, 전송의 안전성 역시 보장하게 되므로, 다수의 요소 반송파를 운용하는 무선 통신 네트워크 환경에서 업링크 동기를 설정하여 동기화 과정을 효율적으로 운용하고자 한다.

<6> 본 발명은, 무선 통신 시스템에서의 동기를 수행하는 장치 및 방법을 제공하고자 한다.

<7> 또한, 본 발명은, 무선 통신 시스템에서 다수의 요소 반송파들에 대한 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<8> 또한, 본 발명은, 무선 통신 시스템에서의 단말의 연결 상태를 고려하여 다수의 요소 반송파들에 대한 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<9> 또한, 본 발명은, 무선 통신 시스템에서 사용 가능한 다수의 요소 반송파들의 특성을 고려하여 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<10> 또한, 본 발명은, 무선 통신 시스템에서 다수의 요소 반송파들에 대한 업링



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크 타이밍 동기 그룹을 설정하는 단말 장치 및 방법을 제공하고자 한다.

<11> 또한, 본 발명은, 무선 통신 시스템에서의 랜덤 액세스 절차를 통해 다수의 요소 반송파들에 대한 동기 정보를 획득하여 기지국과의 동기를 설정 및 업데이트 하는 단말 장치 및 방법을 제공하고자 한다.

【과제의 해결 수단】

<12> 전술한 과제를 달성하기 위해, 본 명세서의 일 실시 예에 따른 , 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법은 사용자 단말과 연결을 수행한 후, 요소 반송파 집합 정보를 설정하고, 설정된 요소 반송파 집합에서 업링크 타이밍 그룹을 생성하여 업링크 타이밍 그룹 정보를 사용자 단말에 송신한다.

<13> 또한, 본 명세서의 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법은 기지국과 연결을 수행한 후, 요소 반송파 집합 정보을 수신하고 업링크 타이밍 그룹에 대하여 대표 요소 반송파를 설정하여, 동기화가 필요한 경우 동기화를 요청하는 메시지를 상기 대표 요소 반송파에서 송신한다.

<14> 또한, 본 명세서의 또다른 실시 예에 따른 다수의 요소 반송파를 운영하는 기지국은 사용자 단말과 연결을 수행한 후, 요소 반송파 집합 정보를 설정하고, 설정된 요소 반송파 집합에서 업링크 타이밍 그룹을 생성하여 업링크 타이밍 그룹 정



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보를 사용자 단말에 송신하여 업링크 동기를 설정한다.

<15> 또한, 본 명세서의 또다른 실시 예에 따른 다수의 요소 반송파를 운영하는 사용자 단말은 기지국과 연결을 수행한 후, 요소 반송파 집합 정보을 수신하고 업링크 타이밍 그룹에 대하여 대표 요소 반송파를 설정하여, 동기화가 필요한 경우 동기화를 요청하는 메시지를 상기 대표 요소 반송파에서 송신하여 업링크 동기를 설정한다.

【도면의 간단한 설명】

<16> 도 1은 다수의 요소 반송파가 구성되는 예를 보여주는 도면이다.

도 2는 동기화 과정에서의 TA(Timing Advance)와 관련된 예를 보여주는 도면이다.

도 3은 사용자 단말과 기지국 사이의 랜덤 액세스 과정을 보여주는 도면이다.

도 4는 본 명세서의 일 실시 예에 의한 업링크 동기를 획득하는 과정을 보여주는 도면이다.

도 5는 본 명세서의 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다.

도 6은 본 발명의 또 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다.



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도 7은 본 명세서의 일 실시 예에 의한 기지국에서 단말의 요청에 의해 단말이 업링크 동기 획득을 할 수 있도록 하는 도면이다.

도 8은 본 명세서의 일 실시 예에 의한 UE에서 업링크 타이밍 그룹을 이용하여 업링크 동기화를 획득하는 과정을 보여주는 도면이다.

도 9는 본 명세서의 일 실시 예에 의한 기지국의 구성을 보여주는 도면이다.

도 10은 본 명세서의 일 실시 예에 의한 UE의 구성을 보여주는 도면이다.

【발명을 실시하기 위한 구체적인 내용】

<17> 이하, 본 명세서에서는 일부 실시 예들을 예시적인 도면을 통해 상세하게 설명한다. 각 도면의 구성요소들에 참조부호를 부가함에 있어서, 동일한 구성요소들에 대해서는 비록 다른 도면상에 표시되더라도 가능한 한 동일한 부호를 가지도록 하고 있음에 유의해야 한다. 또한, 본 명세서의 실시 예를 설명함에 있어, 관련된 공지 구성 또는 기능에 대한 구체적인 설명이 본 명세서의 요지를 흐릴 수 있다고 판단되는 경우에는 그 상세한 설명은 생략한다.

<18> 또한, 본 명세서의 구성 요소를 설명하는 데 있어서, 제 1, 제 2, A, B, (a), (b) 등의 용어를 사용할 수 있다. 이러한 용어는 그 구성 요소를 다른 구성요소와 구별하기 위한 것일 뿐, 그 용어에 의해 해당 구성 요소의 본질이나 차례 또는 순서 등이 한정되지 않는다. 어떤 구성 요소가 다른 구성요소에 "연결", "결합" 또는 "접속"된다고 기재된 경우, 그 구성 요소는 그 다른 구성요소에 직접적으로 연결되거나 접속될 수 있지만, 각 구성 요소 사이에 또 다른 구성 요소가



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"연결", "결합" 또는 "접속"될 수도 있다고 이해되어야 할 것이다.

<19> 또한 본 명세서는 무선 통신 네트워크를 대상으로 설명하며, 무선 통신 네트워크에서 이루어지는 작업은 해당 무선 통신 네트워크를 관할하는 시스템(예를 들어 기지국)에서 네트워크를 제어하고 데이터를 송신하는 과정에서 이루어지거나, 해당 무선 네트워크에 결합한 단말에서 작업이 이루어질 수 있다.

<20> 무선통신 시스템은 음성, 패킷 데이터 등과 같은 다양한 통신 서비스를 제공하기 위해 널리 배치된다.

<21> 무선통신 시스템은 단말(User Equipment, UE) 및 기지국(Base Station, BS)을 포함한다.

<22> 본 명세서에서의 단말은 무선 통신에서의 사용자 단말을 의미하는 포괄적 개념으로서, WCDMA 및 LTE, HSPA 등에서의 UE(User Equipment)는 물론, GSM에서의 MS(Mobile Station), UT(User Terminal), SS(Subscriber Station), 무선기기(wireless device) 등을 모두 포함하는 개념으로 해석되어야 할 것이다.

<23> 기지국 또는 셀(cell)은 일반적으로 단말과 통신하는 고정된 지점(fixed station)을 말하며, 노드-B(Node-B), eNB(evolved Node-B), BTS(Base Transceiver System), 액세스 포인트(Access Point) 등 다른 용어로 불릴 수 있다.

<24> 즉, 본 명세서에서 기지국 또는 셀은 CDMA에서의 BSC(Base Station Controller), WCDMA의 Node B 등이 커버하는 일부 영역을 나타내는 포괄적인 의미로 해석되어야 하며, 메가셀, 매크로셀, 마이크로셀, 피코셀, 펨토셀 등 다양한 커



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버리지 영역을 모두 포괄하는 의미이다.

<25> 본 명세서에서 단말과 기지국은 본 명세서에서 기술되는 기술 또는 기술적 사상을 구현하는데 사용되는 두가지 송수신 주체로 포괄적인 의미로 사용되며 특정하게 지칭되는 용어 또는 단어에 의해 한정되지 않는다.

<26> 무선통신 시스템에 적용되는 다중 접속 기법에는 제한이 없다. CDMA(Code Division Multiple Access), TDMA(Time Division Multiple Access), FDMA(Frequency Division Multiple Access), OFDMA(Orthogonal Frequency Division Multiple Access), OFDM-FDMA, OFDM-TDMA, OFDM-CDMA와 같은 다양한 다중 접속 기법을 사용할 수 있다.

<27> 상향링크 전송 및 하향링크 전송은 서로 다른 시간을 사용하여 전송되는 TDD(Time Division Duplex) 방식이 사용될 수 있고, 또는 서로 다른 주파수를 사용하여 전송되는 FDD(Frequency Division Duplex) 방식이 사용될 수 있다.

<28> 본 명세서의 일실시 예는 GSM, WCDMA, HSPA를 거쳐 LTE(Long Term Evolution) 및 LTE-advanced로 진화하는 비동기 무선통신과, CDMA, CDMA-2000 및 UMB로 진화하는 동기식 무선통신 등의 자원할당에 적용될 수 있다. 본 명세서에서 제시하는 실시 예는 특정한 무선통신 분야에 한정되거나 제한되어 해석되어서는 아니되며, 본 명세서의 기술적 사상이 적용될 수 있는 모든 기술분야를 포함하는 것으로 해석되어야 할 것이다.

<29> 도 1은 본 발명이 적용되는 다수의 요소 반송파들을 사용하는 시스템의 예를



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보여주는 도면이다.

<30> 도 1을 참조하면, 본 발명이 적용되는 무선통신 시스템은, 최근 논의중인 차세대 통신 시스템으로써, LTE-A(LTE-Advanced)시스템을 일 예로 든다. 상기 LTE-A(LTE-Advanced)시스템은, 시스템 요구 사항 즉, LTE-A에서 요구하는 높은 데이터 전송률을 만족시키기 위한 대역폭(Bandwidth)를 확장하기 위한 방안으로써, 다수개의 단위 반송파인 요소반송파 또는 컴포넌트 캐리어(Component Carrier, CC라 칭함)의 사용을 정의하고 있다. 여기서, 하나의 CC는 최대 20MHz의 대역폭을 가질 수 있으며, 해당 서비스에 따라 20MHz이내에서 자원 할당이 가능하다.

<31> 또한, 상기 하나의 요소 반송파들(Component Carriers)을 최대 5개까지 묶어 하나의 시스템 대역으로 사용하는 캐리어 집합체(carrier aggregation, 이하 "CA"라 함)의 사용을 정의할 수 있다. 따라서, 차세대 통신 시스템에서는 최대 100MHz까지 대역폭을 확장시켜 서비스 품질을 지원한다. 이때, 각 요소 반송파들에 의해 결정될 수 있는, 즉, 할당 가능한 주파수 대역은 실제 CA의 스케줄링에 따라 연속적(contiguous)일 수도 있고, 불연속적(non-contiguous)일 수도 있다.

<32> 즉, 본 명세서에서는 다수의 요소 반송파(component carrier)를 구별하기 위하여 CC로 표시하고 CC0, CC1과 같이 지시할 수 있다. 그러나, 이러한 요소 반송파에 포함되는 숫자가 요소 반송파의 순서 또는 해당 요소 반송파의 주파수 대역의 위치에 일치하는 것은 아니다.

<33> 도 1에서는 제 1 요소 반송파(CC1, 110), 제 2 요소 반송파(CC2, 120), 제 3 요소 반송파(CC3, 130), 제 4 요소 반송파(CC4, 140)로 구성되어 있으며, 각각의



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요소 반송파는 스케줄러에 따라 업링크 또는 다운링크가 상이하게 할당될 수도 있고, 또는 동일한 업링크와 다운링크가 함께 할당되어 사용될 수도 있다.

<34> 한편, 무선 통신 환경에서는 송신기에서 전파가 전파되어 수신기에서 전달되는 동안에 전파지연(propagation delay)를 겪게 된다. 따라서 송수신기 모두 정확히 송신기에서 전파가 전파되는 시간을 알고 있다 하더라도 수신기에 신호가 도착하는 시간은 송수신기간 거리, 주변 전파 환경 등에 의해 영향을 받게 되고 수신기가 이동하는 경우 시간에 따라 변하게 된다. 만일 수신기가 송신기가 전달하는 신호가 수신되는 시점을 정확히 알 수 없는 경우 신호 수신이 실패하거나 수신하더라도 왜곡된 신호를 수신하게 되어 통신이 불가능하게 된다.

<35> 따라서, 무선 통신 시스템에서는 기지국과 UE간 동기가 다운링크/업링크를 막론하고, 정보 신호를 수신하기 위해 반드시 선결되어야 한다. 즉, 동기획득 절차는 통신 시스템에서 매우 중요한 절차이며 이를 유지하는 것 또한 시스템 안정성 및 통신 품질에 큰 영향을 주게 된다.

<36> 한편, 동기의 종류는 프레임 동기, 정보심벌 동기, 샘플링 주기 동기 등 으로 다양하며, 이 중에서 샘플링 주기 동기의 경우 물리적 신호를 구분하기 위해 가장 기본적으로 획득하여야 하는 동기라 할 수 있다.

<37> 기지국에서 UE에게 전송하는 방향의 통신링크인 다운링크 전송에서 동기 획득은 UE에서 기지국의 신호를 기반으로 이루어진다. 기지국은 UE에서 다운링크 동기 획득이 용이하도록 상호 약속된 특정 신호를 전송하며 이를 기반으로 UE에는 기지국에서 보내온 특정 신호가 전송된 시간을 정확히 분별할 수 있어야 한다. 다운

링크의 경우 하나의 기지국이 다수의 UE에게 동시에 동일한 동기 신호를 전송하므로 UE각각이 독립적으로 동기신호를 통하여 동기를 획득할 수 있다.

<38> 그러나 업링크의 경우 기지국은 다수의 UE로 부터 송신된 신호를 수신하게 되므로 어느 하나의 UE를 기준으로 동기를 획득할 수가 없다. 따라서 다운링크와 다른 동기획득 절차가 필요하다.

<39> 따라서, 각 UE와 기지국간 거리가 상이한 경우 서로 다른 전송지연 시간을 갖게 되고, 각각 획득한 다운링크 동기를 기준으로 업링크 정보를 송신하는 경우, 각 UE의 정보가 서로 다른 시간에 해당 기지국에서 수신되게 된다.

<40> 즉, 무선 통신 시스템에서 사용하는 전송방식이 서로 다른 시간에 각 UE의 업링크 정보가 수신되더라도 이를 분리하여 수신할 수 있는 CDMA와 같은 방식을 사용하는 경우에는 복잡도를 증가시키기는 하지만 큰 문제 없이 정보를 수신할 수 있으나, OFDMA 또는 FDMA를 기반으로 하는 무선 통신 시스템에서는 기지국에서 모든 UE의 업링크 송신정보를 동시에 수신하여 한꺼번에 복조하는 방식으로 운영되므로 정확한 시간에 수신될수록 수신 성능이 높아지며 기지국에서 각 UE 신호의 수신시간의 차이가 커질수록 수신성능은 급격히 열화된다.

<41> 따라서, 기존 LTE와 같은 OFDMA 또는 SC-FDMA을 업링크 전송방식으로 사용하고 있는 시스템에서는 다운링크에서의 전송지연시간과 업링크에서의 전송지연시간을 획득하기 위해 각 UE마다 랜덤 접속방식 등을 이용하여 Timing Alignment 값을 계산하고 이를 각 UE에게 알려주어 업링크 동기를 획득하도록 하고 있다.



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<42> 도 2는 본 발명이 적용되는 동기화 과정에서의 TA(Timing Advance)와 관련된 예를 보여주는 도면이다.

<43> 일반적으로, 기지국과 단말이 통신을 수행하기 위해서는 다운링크 라디오 프레임i(210)가 송신되는 시점과 일치하도록 업링크 라디오 프레임i(220)을 송신해야 한다. 그런데, 사용자 단말과 기지국사이에는 전파 지연 등으로 인해 시간차가 발생한다.

<44> 따라서 이러한 전파 지연을 고려하여 다운링크 프레임 i(210)보다 조금 일찍 단말로 하여금 업링크 라디오 프레임i(220)을 송신하여 기지국의 단말간의 동기를 맞추는 방안으로써 TA(Timing Advance)가 적용될 수 있다. 상기 TA를 계산하는 수식을 살펴보면 다음과 같다.

<45> [수학식 1]

【0046】

$$\mathrm{TA} = \left(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}\right) \cdot T_{\mathrm{s}} \quad \text{seconds}$$

<47> 여기서, $N_{TA}$는 기지국으로부터 TA 명령 정보에 따라 제어되는 가변적인 값이며, $N_{TAoffset}$은 프레임 구조에 따라 고정되어 설정되는 값이다. 한편 $T_s$는 샘플링 주기를 의미한다. 도 2에서 알 수 있듯이, 업링크 동기화를 이루기 위하여 사용자 단말은 기지국에서 제공하는 TA 명령 정보를 수신하여 이를 기반으로 TA를 진행할 수 있다. 따라서, 기지국과의 무선 통신을 위한 동기를 획득한다.



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<48> 도 3은 본 발명이 적용되는 사용자 단말과 기지국 사이의 랜덤 액세스 과정을 보여주는 도면이다.

<49> 도 3을 참조하면, 사용자 단말(User Equipment, UE)(380)은 기지국(390)과 데이터를 송수신하기 위하여 업링크 동기를 필요로 한다. 업링크 동기를 위해 기지국(390)으로부터 동기에 필요한 정보를 수신하는 과정을 진행할 수 있다. 도 3은 동기에 필요한 정보를 수신하기 위한 랜덤 액세스 과정(Random Access Procedure)를 진행하는 과정을 보여준다. 랜덤 액세스 과정은 사용자 단말이 네트워크에 핸드오버 등을 통해 새로이 결합하는 경우에도 적용할 수 있고 네트워크에 결합한 후, 동기화 또는 상태 변경(RRC_IDLE에서 RRC_CONNECTED)과 같이 다양한 상황에서 진행할 수 있다.

<50> 사용자 단말(380)은 먼저 랜덤 액세스 프리엠블(Random access preamble)을 생성하기 위해 프리엠블 시그니처(preamble signature)를 무작위(random, 랜덤)로 선택한다. 그리고 선택한 프리엠블을 기지국(390)에 송신한다(S310). 프리엠블 시그니처 선택시 경쟁 기반(contention-based)으로 진행할 수 있다. 한편 무 경쟁 기반(contention-free)로 진행하는 방식도 사용할 수 있다. 이 경우, 기지국은 미리 예약한 랜덤 액세스 프리엠블을 단말에게 알려주며 해당 단말은 수신된 정보를 기반으로 선택한 프리엠블을 기지국(390)에게 송신한다(S310). 이 경우, 경쟁 기반 방식에서 필요한 CR 메시지와 같은 절차는 수행하지 않아도 된다.

<51> 여기서, 상기 사용자 단말(380)은 프리엠블 선택 또는 RACH 전송을 위해 임시 선택한 주파수 자원과 전송 시점을 고려하여 RA-RNTI(Random Access-Radio



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Network Temporary Identifier)을 인지할 수 있다.

<52> 기지국(390)은 수신된 UE의 프리엠블에 대하여 랜덤 액세스 응답(Random access response, RAR)을 수행하는데, 이때, 물리 다운링크 데이터 채널(Physical downlink shared channel, PDSCH)를 통해 상기 랜덤 액세스 응답 메시지를 송신한다.

<53> 상기 RAR메시지를 통해 송신하는 정보는, 일 예로, 기지국에 의해 수신된 UE 프리엠블의 식별정보, 기지국의 식별자(ID), 임시 C-RANI(Cell Radio Network Temporary Identifier), 상기 UE 프리엠블을 수신한 타임 슬롯에 대한 정보, 그리고 TA 정보 등이 포함될 수 있다. 이에, 업링크 동기화를 위한 타이밍 정보가 상기 RAR메시지를 통해 수신되므로, 사용자 단말(380)은 기지국(390)과의 업링크 동기화를 수행할 수 있다. 사용자 단말(380)은 S320 단계에서 수신한 TA 정보를 이용하여 결정된 스케쥴 시점에서 데이터 전송(Scheduled transmission)을 수행한다(S330). 물리 업링크 데이터 채널(Physical uplink shared channel, PUSCH)를 통해 동기화시킨 데이터를 송신하며, HARQ(Hybrid Automatic Repeat reQuest)을 수행할 수도 있다.

<54> 상기 S330 단계에서 송신되는 메시지는 일 예로, RRC 연결 요청(RRC Connection Request), 트래킹 영역 변경(Tracking Area update), 스케줄링 요청(Scheduling request) 등을 포함할 수 있다. 또한, 상기 메시지 중 하나는, 임시 C-RNTI, C-RNTI (if the UE already has one), 또는 UE 식별자 정보 등을 포함할 수 있다.

<55> 한편 S310~330 과정에서 충돌(collision)이 발생할 수 있으므로, 기지국(390)은 CR메시지(Contention resoulution message)를 송신하면(S340), UE(380)는 i) UE(380)이 수신한 메시지가 자신의 것인지 확인하고 ACK를 보내거나, ii) 수신한 메시지가 다른 UE의 것으로 확인하고 응답 데이터를 보내지 않는다. 물론 다운링크 할당을 놓치거나 메시지를 디코딩 하지 못하는 경우에도 응답 데이터를 보내지 않게 된다. 또한, 상기 CR메시지(Contention resoulution message)는 C-RNTI 또는 UE 식별자 정보 등을 포함할 수 있다.

<56> 하나의 반송파를 사용하는 경우의 TA를 획득하는 과정과는 달리, 본 발명이 적용되는 다수의 요소 반송파를 운영하는 무선 시스템에서는 도 1과 같이 각 요소 반송파간 중심 주파수의 위치가 크게 이격되어 있거나, 각 요소 반송파를 지원하는 망 내 장치가 동일하지 않는 등의 경우, 각 요소 반송파간에 TA의 값은 서로 상이할 가능성이 높아진다.

<57> 따라서, 단일 반송파에서 사용하던 동기 획득 방안을 그대로 이용하는 경우, 다수의 요소 반송파의 모든 요소 반송파에 대한 업링크 동기를 획득하기 어렵게 된다. 그러므로 사용자 단말은 사용가능 요소 반송파 중에서 업링크 동기를 획득한 일부 요소 반송파에 한하여, 안정적인 업링크 통신을 수행하게 된다.

<58> 또한, 만일 사용자 단말이, 업링크 동기 기준이 서로 상이한 요소 반송파에 대하여 동일한 업링크 동기 기준을 통해 정보를 전송할 경우, 전송 오류가 발생할 확률이 매우 높고 이를 복구하기 위한 시간 및 자원낭비를 초래할 수 있다. 이러한 경우, 시스템에서 요구되는 응용프로그램에 대한 업링크 QoS(Quality of Service)



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를 만족시키기 어려울 수 있다.

<59> 또한, 만일 무선 통신시스템에서 다수의 요소 반송파를 운용하는 경우, 단일 UE에 대하여 각 요소 반송파의 특성 및 무선 망 내 지원방식에 따라 다운링크에서의 전송지연시간이 서로 상이할 수 있으며, 이로 인해 각 요소 반송파 또는 동일한 TA값을 갖는 요소 반송파를 집합으로 구성하는 경우 각 요소 반송파 집합별 업링크 동기기준이 서로 상이하게 되어 이로 인한 업링크 성능열화가 발생할 수 있다.

<60> 따라서, 본 발명은 다수의 요소 반송파들을 사용하는 무선 통신 시스템에서 각 요소 반송파마다 또는 적어도 하나 이상의 요소 반송파로 구성된 요소 반송파 그룹간의 업링크 동기 기준이 상이한 경우, 사용자 단말에서 각 요소 반송파의 타입, 중심 주파수 위치 및 망 서비스 형태 등에 따라 해당 요소 반송파 또는 요소 반송파 그룹의 업링크 동기를 획득하는 방안을 제공하고자 한다.

<61> 이하 사용자 단말은 UE로, 기지국은 eNB로 기재하여 설명을 진행하고자 한다.

<62> 도 4는 본 명세서의 일 실시 예에 의한 업링크 동기를 획득하는 과정을 보여주는 도면이다.

<63> 도 4에서는 eNB가 UE에게 다수의 요소 반송파에 관련된 정보를 송신하면 UE가 요소 반송파들 중에서 타이밍과 관련된 그룹을 설정하고, 대표 요소 반송파를 통해 RAP(Random Access Procedure)를 진행하는 과정을 보여준다.

<64> 상기 도 4를 참조하면, UE(480)와 eNB(490)가 연결된 상태(RRC_CONNECTED)인



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경우 S410 단계를 진행한다. 만약 무선 자원 제어 연결 상태가 IDLE이거나 재설정이 필요한 경우에는 S405 단계를 먼저 진행하고 S410 단계를 진행한다.

<65> S405 단계는 무선 자원 제어 연결을 진행하는 단계이다. 이는 eNB(490)와 UE(480)가 무선자원제어연결 상태가 IDLE 모드인 경우, 또는 무선자원제어연결을 재설정해야 하는 경우 eNB(490)는 해당 UE의 요소 반송파 집합을 정의하여 전송할 수 없다. 따라서, 무선자원제어연결을 진행할 적어도 하나 이상의 요소 반송파를 선택하여 요소 반송파 집합 정보를 구성 하여 무선자원제어연결을 진행한다(S405). 무선자원제어연결을 진행할 적어도 하나 이상의 요소 반송파를 선택하기 위해 다음 중 하나의 방법을 이용할 수 있다.

<66> i) UE(480)가 측정(measurement)한 정보를 기반으로 무선자원제어연결을 시도할 가장 적합한 요소 반송파 선택할 수 있다.

<67> ii) UE(480) 내부 메모리에 저장되어 있는 시스템에서 고정적으로 설정한 정보 이용하여 무선자원제어연결을 시도할 수 있다.

<68> iii) eNB(490)에서 시스템 정보를 통해 UE(480)에게 전송한 정보를 이용하여 무선자원제어연결을 시도할 수 있다.

<69> iv) UE(480)내부 메모리에 저장되어 있는 유효한 요소 반송파들의 시스템 정보 이용하여 해당 요소 반송파들을 통해 무선자원제어연결을 시도할 수 있다.

<70> 상기 방법들 중 하나를 통해 무선자원제어연결 진행이 완료되어 eNB(490)와 UE의 무선자원제어연결 상태가 설정된 상태(RRC_CONNECTED 모드)가 되었다면 S410



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의 절차를 진행한다.

<71> eNB(490)는 해당 UE(480)의 하드웨어 성능, eNB(490)의 가용 주파수 자원 등을 고려하여 UE(480)에게 다수의 요소 반송파(CC)를 사용하도록 허용할 수 있으며 이를 집합으로 정의할 수 있다. eNB(490)은 UE(480)의 사용하도록 허용된 요소 반송파 집합 정보를 UE(480)에게 전송한다(S410).

<72> 앞서 살펴본 바와 같이, UE(480)와 eNB(490)는 S405 단계 또는 이전부터 RRC_CONNECTED를 유지하고 있는 상태, 즉 UE(480)의 무선자원제어연결이 설정된 업링크 요소 반송파의 업링크 동기가 유지되고 있는 경우이다. UE(480)는 eNB(490)으로부터 상기와 같은 기준으로 결정된 요소 반송파 집합 정보를 수신한다. 상기 요소 반송파 집합 정보의 송수신 방식은, 일 실시 예로 eNB(490)가 무선자원제어 재구성 메시지 내에 상기 요소 반송파 집합 정보를 포함하여 UE(480)에게 송신할 수도 있으며, 그 이외의 메시지가 사용될 수도 있다.

<73> UE(480)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들에 대한 시스템 정보(system information: 이하 SI)를 수신한다 (S420).

<74> 만약, 요소 반송파 집합 내에 요소 반송파들 중에서 해당 요소 반송파의 시스템 정보를 해당 요소 반송파로 전송할 수 없는 요소 반송파(예를 들어, 확장 요소 반송파 (extension component carrier: 이하 ECC))가 존재하는 경우, 시스템 정보를 수신할 수 있는 요소 반송파 또는 제어정보 형태로 변환된 시스템 정보를 수신할 수 있는 요소 반송파를 통해 수신할 수 있다. 이 방법 이외에 현 단계에서는 해당 요소 반송파에 대한 시스템 정보를 수신하지 않고 진행할 수 있다.



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<75> UE(480)는 수신된 시스템 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들을 원소로 하는 업링크 타이밍 그룹(Uplink timing group, UL timing group)을 설정한다(S432). 상기 업링크 타이밍 그룹을 구성하는 과정에서 고려할 사항은 다음과 같다.

<76> 먼저 다수의 요소 반송파들 중에서 서로 다른 그룹으로 할당할 것인지를 판단하는 방식으로는 다음과 같은 조건을 고려할 수 있다. 즉, 다음의 적어도 하나 이상의 조건을 만족하는 요소 반송파는 그룹 설정 시 다른 그룹으로 설정할 수 있다.

<77> a-i) 요소 반송파들의 중심 주파수 값의 차이가 임계치 이상 범위인 요소 반송파 들은 서로 다른 그룹으로 할당한다 중심 주파수가 크게 차이날 경우, 무선 신호의 전파 과정에서 발생하는 지연이 달라지며 이에 따른 TA 값도 차이가 커질 가능성이 높아진다.

<78> a-ii) 서로 다른 빔포밍(beamforming)이 되는 요소 반송파들 간에도 서로 다른 그룹으로 할당한다. 빔포밍이 다르면 TA 값이 달라질 가능성이 높아진다.

<79> a-iii) 업링크 동기 갱신 요청이 있을 때마다 갱신하도록 설정된 요소 반송파들도 서로 다른 그룹으로 할당한다. 상기 설정은 eNB(490)에 의해 설정된 시스템 정보 내에 포함되어 전송될 수도 있으며 그 이외의 메시지 내에 포함되어 전송 될 수도 있다.

<80> a-iv) 매크로 셀(Macro cell)에서 서비스 하지 않는 요소 반송파이거나 펨토



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셀(femto cell), 피코셀(pico cell), 마이크로 셀(micro cell), 릴레이(relay), 리피터(repeater) 등에 의해 매크로 셀과 중첩된 공간에서 서비스 되는 요소 반송파들과 매크로 셀 에 의해 서비스 되는 요소 반송파 간에도 그 특성이 상이하므로 서로 다른 그룹으로 설정할 수 있다.

<81> a-v) eNB(490)으로부터 업링크 동기 갱신 요청이 있는 요소 반송파 역시 동기가 변화된 요소 반송파이므로 다른 그룹으로 할당할 수 있다.

<82> 상기 설명한 바와 같이, 업링크 타이밍 그룹으로 설정하는 조건은 앞서 살펴본 a-i)~ a-v)가 일 실시 예가 될 수 있으나, 이외에도 무선의 전파 특성과 소정 측정치 등을 고려하여 하나의 그룹으로 설정하거나, 또는 상이한 그룹으로 설정할 수 있다.

<83> 한편, 아래의 조건을 만족하는 경우는, 하나의 그룹으로 설정할 수 있다.

<84> b-i) 요소 반송파들의 중심 주파수 값의 차이가 임계치 이내 범위인 요소 반송파 간에는 전파 특성이 유사할 수 있으므로 하나의 그룹으로 할 수 있다.

<85> b-ii) 동일한 빔 포밍이 되는 요소 반송파들 간 하나의 그룹으로 할 수 있다.

<86> b-iii) 동일한 무선 망 내 장치에서 사용되는 요소 반송파들 간에 하나의 그룹으로 설정할 수 있다.

<87> b-iv) 또한, 상기 서로 상이한 그룹에 속하도록 하는 조건(a)을 만족하지 않는 요소 반송파들을 하나의 그룹으로 생성할 수 있다.



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<88> UE(480)에서 그룹을 생성하는 방식으로는 두 가지 방식, 즉 상이한 그룹에 속하는 요소 반송파를 구별하여 그룹을 생성하는 방식과 동일한 그룹에 속하도록 요소 반송파를 구별하여 그룹을 생성하는 방식으로 나뉘어 지며, 상기 두 방식을 혼용할 수 있고 어느 하나의 방식으로 진행할 수 있다 각각의 방식을 적용하는 과정에서 판단할 조건은 앞서 살펴본 바와 같다.

<89> 업링크 타이밍 그룹이 생성되면, UE(480)는 각 그룹 내 대표 요소 반송파(delegate CC)를 설정한다(S434). 이때, 대표 요소 반송파를 설정하는 기준은, 업링크 동기 획득을 위한 TA값을 획득이 가능한 요소 반송파 중에서 다음을 조건을 고려하여 설정할 수 있다.

<90> c-i) 가장 낮은 중심 주파수 값을 갖는 요소 반송파,

<91> c-ii) 가장 평균에 가까운 중심 주파수 값을 갖는 요소 반송파,

<92> c-iii) 가장 높은 중심 주파수 값을 갖는 요소 반송파,

<93> c-iv) 주파수 대역이 가장 넓은 요소 반송파,

<94> 중에서 하나를 대표 요소 반송파로 설정할 수 있다.

<95> 한편, 각각의 업링크 타이밍 그룹별 대표 요소 반송파를 설정하는 방법은, 모든 그룹에 대하여 동일한 기준으로 설정할 수 있고, 또는 각 타이밍 그룹별로 구별되는 조건만 만족하는 다른 기준을 설정할 수 있다. 즉, 대표 요소 반송파의 선택은, 각 그룹의 네트워크 상태, 그룹을 구성하는 요소 반송파들의 특징 등을 고려하여 선택할 수 있다.



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<96> S432, S434 단계를 완료하여 업링크 타이밍 그룹과 해당 그룹의 대표 요소 반송파를 설정한 후, UE(480)은 업링크 동기 획득을 위하여, 각 그룹 내 대표 요소 반송파들을 통해, 즉, 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 자원 중 하나를 선택하여 설정한 프리엠블을 전송한다(S440). 해당 프리엠블의 전송은 eNB(490)에 의해 설정된 시간/주파수 자원에서 UE(480)가 순차적으로 또는 동시에 또는 랜덤하게 프리엠블을 선택된 CC를 통해 전송하는 것을 포함할 수 있다.

<97> 한편, 업링크 동기 획득이 필요한 상황은 다음과 같다. 또는 다음의 상황이 아니어도, UE(480)에서 필요 여부를 판단하여 랜덤 액세스 프리엠블을 생성하여 eNB(490)로 송신할 수 있다.

<98> d-i) eNB(490)이 다운링크 동기에 대한 전체 재설정을 요구하는 경우,

<99> d-ii) 모든 업링크 데이터의 전송을 초기화하고 재시도하는 경우,

<100> d-iii) UE(480) TimeAlignment timer가 만료되었을 경우,

<101> UE(480)는 사용 가능한 전체 요소 반송파 그룹들에 대하여 업링크 동기 획득을 위한 프리엠블을 송신할 수 있다.

<102> 또한, UE(480)는 사용 가능한 일부 요소 반송파 그룹에 대하여 업링크 동기 획득을 필요로 할 수 있다. 이러한 조건은 아래와 같다.

<103> e-i) 요소 반송파 그룹이 최초로 설정되어 해당 그룹 내에 TA값이 존재하지 않는 경우,

<104> e-ii) UE(480)의 그룹 내 요소 반송파들을 통한 업링크 전송 데이터에 대한 응답이 모두 없을 경우,

<105> e-iii) eNB(490)과 UE(480)간 RRC 연결을 재구성(re-configuration)한 경우,

<106> e-iv) UE(480)가 물리적으로 다른 eNB(490)으로 특정 요소 반송파 그룹이 핸드오버 하는 경우,

<107> e-v) eNB(490)이 다운링크 동기에 대한 특정 요소 반송파 그룹에 대하여 재설정을 요구하는 경우,

<108> e-vi) 요소 반송파 TA 타이머(CC TimeAlignment timer)가 만료되었을 경우 (상기 타이머는 각 요소 반송파 또는 그룹마다 설정 가능한 타이머임)에는 해당 요소 반송파가 포함된 요소 반송파의 그룹에 대해 업링크 동기 획득을 진행할 수 있다.

<109> 일 예로, 상기 S432, S434 단계에서 요소 반송파 CC1, CC2, CC3, CC4, CC5가 있고, CC1, CC2는 그룹1, CC3, CC4, CC5는 그룹 2로 설정되었으며, 그룹 1의 대표 요소 반송파가 CC1이며, 그룹 2의 대표 요소 반송파가 CC3인 경우, UE(480)에서 사용 가능한 전체 요소 반송파 그룹들에 대해 업링크 동기가 필요할 경우 CC1과 CC3을 통해 랜덤 액세스 프리엠블을 송신할 수 있다. 한편, 일부 요소 반송파 그룹에서 동기 획득이 필요한 상황에서 그룹 2에 대해 동기 획득이 필요할 경우, CC3을 통해 랜덤 액세스 프리엠블을 송신할 수 있다.

<110> 또한, 만일 업링크를 통하여 데이터 송신 중인 상황에서 업링크 동기를 재설



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정하여야 하는 경우에는, UE(480)는 다음과 같은 동작(예를 들어 업링크 데이터 전송 초기화)을 우선적으로 수행한 후, 업링크 동기를 확보하기 위한 절차로 HARQ 버퍼들 초기화, PUCCH(Physical Uplink Control Channel)/SRS(Sounding Reference Signal) 해제, SPS(Semi-Persistent Scheduling) 할당/허용 초기화 등을 진행할 수 있다.

<111> eNB(490)은 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파 그룹(대표 요소 반송파)에 대하여 그룹 별 TA값을 계산한다. 그리고 eNB(490)은 UE(480)의 업링크할당(UL grant) 정보와 업링크 타이밍 그룹(대표 요소 반송파)의 TA값을 랜덤 액세스 응답(random access response) 메시지를 통해 UE(480)에게 전송한다(S450).

<112> 그 후, UE(480)는 CR(contention resolution) 절차(S460)를 통해 수신한 TA값이 유효하다고 판단되면 해당 TA값을 그룹 내 다른 요소 반송파에 적용하여 업데이트 한다(S470).

<113> 앞서 살펴본 바와 같이, 전체 그룹에 대해 업링크 동기 획득 절차를 진행한 경우, CC1, CC3에 대한 TA 값을 그룹 1, 2에 포함된 요소 반송파들에 적용할 수 있다. 만약 그룹 2에 대해 CC3의 TA 값을 수신한 경우, 그룹 2에 포함된 요소 반송파들에 적용할 수 있다.

<114> 도 5는 본 명세서의 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다. 여기서, 도 5는 기지국인 eNB(590)에서 업링크 타이밍 그룹을 설정하는 경우를 보여준다.

<115> 도 5를 참조하면, eNB(590)가 업링크 타이밍 정보를 송신하기에 앞서, eNB(590)은 UE의 모드(RRC_CONNECTED/ RRC_IDLE)를 확인한다. UE와 연결되어 있지 않는 경우, 무선 자원 제어 연결을 진행할 수 있으며(S505), 이는 도 4의 S405과정과 동일하게 적용 가능하다.

<116> 또한, eNB(590)에서 그룹을 생성하는 방식은 도 4에 언급한 a) 또는 b) 조건을 참조할 수 있다.

<117> 따라서, eNB(590)은 해당 UE(580)의 요소 반송파 집합 정보와 상기 설정한 업링크 타이밍 그룹 정보를 UE(580)에게 전송한다(S510). 여기서, 상기 업링크 타이밍 그룹 정보는, 상기 요소 반송파 집합 정보(CC set info.) 메시지 에 포함되어 UE(580)에 전송될 수도 있으며, 그와 별개로 독립적으로 설정된 메시지를 이용하여 전송될 수도 있다. 별개로 설정된 메시지인 경우에 대해서는 도 6을 참조하여 설명하고자 한다. 한편, UE별로 제공되는 요소 반송파 집합 정보 전송 메시지(CC set infomation message)는 RRC (L3) 메시지일 수도 있으며 L1 시그널링일 수도 있으며 L2 시그널링 일 수도 있다.

<118> UE(580)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들의 시스템 정보(system information: 이하 SI)를 수신한다(S520). 이때, UE(580)는 eNB(590)에 의해 S508 단계에서 생성된 업링크 타이밍 그룹을 그대로 이용하거나, 혹은 현재의 네트워크 상황에 맞추어 도 4의 S432와 같이 업링크 타이밍 그룹을 일부 수정할 수 있다. 이는 UE(580)가 eNB(590)에 의해 생성된 그룹이 실제 UE(580)의 환경에 적합하지 않는 경우에, 상기 업링크 타이밍 그룹을 추가 수정할 수 있음



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을 포함한다.

<119> 즉, 업링크 타이밍 그룹 정보를 수신한 후, 혹은 업링크 타이밍 그룹 정보를 변경하거나 새로이 생성한 후, UE(580)는 각각의 업링크 타이밍 그룹에 대해 대표 요소 반송파를 선택한다(S534). 업링크 타이밍 그룹에 대한 대표 요소 반송파의 선택시 고려할 조건들은 도 4의 S434에서 살펴본 바와 같다

<120> S534에서 업링크 타이밍 그룹별로 대표 요소 반송파를 선택하는 과정이 완료한 후, 업링크 동기 획득이 필요한 상황이 발생하게 되면, 각 그룹 내 대표 요소 반송파들은 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 자원 중 하나를 선택하여 선택한 프리엠블을 전송한다(S540).

<121> 여기서, UE(580)는 업링크 타이밍 정보를 얻기 위한 랜덤 액세스 프리엠블을 송신하는 메시지(Random access preamble transmit message) 등을 보낼 수 있다. 또한, 해당 프리엠블을 전송하는 방법은 eNB(590)에 의해 설정된 시간/주파수 자원에서 UE(580)에 의해 순차적으로 또는 동시에 또는 랜덤하게 선택되어 전송될 수 있다.

<122> 한편, UE(580)에 의해 업링크 동기 획득이 필요한 상황은 d 조건을 참조할 수 있다. 또한, UE(580)는 사용 가능한 전체 요소 반송파 그룹들에 대하여 업링크 동기 획득을 위해 프리엠블을 송신할 수 있다. 한편, UE(580)는 사용 가능한 일부 요소 반송파 그룹에 대하여 업링크 동기 획득을 필요로 할 수 있다.



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<123> eNB(590)는 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파 그룹(대표 요소 반송파) 마다 그룹 별 TA값을 계산하고, 해당 TA값을 업링크할당(UL grant) 정보와 함께 랜덤 액세스 응답(random access response) 정보에 포함시켜 UE(580)에게 전송한다(S550).

<124> 일 실시 예로 eNB(590)는 S508 단계에서 설정하였던 업링크 타이밍 그룹을 고려하여 TA 값을 계산하여 전송할 수 있다. 또한, 특정 요소 반송파를 통해 상기 랜덤 액세스 응답메시지를 송신할 수 있고, 해당 업링크 타이밍 그룹 내의 모든 요소 반송파들을 통해 랜덤 액세스 응답메시지를 송신할 수 있다.

<125> UE(580)는 CR(contention resolution) 절차(S560)를 통해 수신한 TA 값이 유효하다고 판단되면 해당 TA값을 그룹 내 다른 요소 반송파에 적용하여 업링크 타이밍 그룹별 TA를 업데이트 한다(S570).

<126> 도 6은 본 발명의 또다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다. 여기서, 도 6은 기지국인 eNB(690)에서 업링크 타이밍 그룹을 설정하고 그룹 정보를 별도의 메시지를 이용하여 송신하는 경우를 보여준다.

<127> eNB(690)는 UE(680)의 모드(RRC_CONNECTED/ RRC_IDLE)를 확인한다. UE(680)와 연결되어 있지 않는 경우, 무선 자원 제어 연결을 진행할 수 있으며(S605), 이는 도 4의 S405, 도 5의 S505 과정과 동일하다.

<128> eNB(690)는 해당 UE(680)의 하드웨어 성능, eNB(690)의 가용 주파수 자원 등을 고려하여 UE(680)에게 다수의 요소 반송파(CC)를 사용하도록 허용할 수 있으며



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이를 집합으로 정의할 수 있다. eNB(690)은 해당 UE(680)의 요소 반송파 집합 정보를 UE(680)에게 전송한다(S610). UE별로 제공되는 요소 반송파 집합 정보 전송 메시지(CC set infomation message)는 RRC (L3) 메시지 등에서 사용되는 메시지 일 수도 있으며 L1 시그널링일 수도 있으며 L2 시그널링 일 수도 있다.

<129> 앞서 살펴본 바와 같이, UE(680)와 eNB(690)는 S605 단계 또는 이전부터 RRC_CONNECTED를 유지하고 있는 상태, 즉 UE(680)의 무선자원제어연결이 설정된 업링크 요소 반송파의 업링크 동기가 유지되고 있는 경우이다. UE(680)는 eNB(690)으로부터 상기와 같은 기준으로 결정된 요소 반송파 집합 정보를 수신한다. 요소 반송파 집합 정보의 수신 방식의 일 실시 예로 eNB(690)는 무선자원제어 재구성 메시지 내에 요소 반송파 집합 정보를 포함하여 송신할 수도 있으며 그 이외의 메시지가 될 수도 있다.

<130> UE(680)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들의 시스템 정보(system information: 이하 SI)를 수신한다(S620).

<131> eNB(690)는 UE(580)에 할당된 요소 반송파들에 대하여 업링크 타이밍 그룹을 생성한다(S624). 상기 eNB(690)에서 업링크 타이밍 그룹을 설정하는 과정은 앞서 a, b조건들을 고려하여 서로 다른 그룹으로 또는 동일한 그룹으로 설정할 수 있다.

<132> eNB(690)은 그룹을 생성하는 두 가지 방식, 즉, 상이한 그룹에 속하는 요소 반송파를 구별하여 그룹을 생성하는 방식과 동일한 그룹에 속하도록 요소 반송파를



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구별하여 그룹을 생성하는 방식을 혼용할 수 있고 어느 하나의 방식으로 진행할 수 있다 각각의 방식을 적용하는 과정에서 판단할 조건은 앞서 살펴본 바와 같다.

<133> eNB(690)는 설정한 업링크 타이밍 그룹 정보를 UE(680)에게 전송한다(S626). 상기 업링크 타이밍 그룹 정보는, 요소 반송파 집합 정보(CC set info.) 메시지 등에 포함되지 않고 별개로 독립적으로 설정된 메시지를 이용하여 송신된다. 상기 업링크 타이밍 그룹 정보는PDCCH 채널, RRC 시그널링, 브로드캐스트 채널과 같은 채널을 통해 전송되며, L2 (MAC 엘레먼트 컨트롤) 메시지를 통해 전송될 수 있다.

<134> 상기 요소 반송파 집합 정보 메시지를 메시지를 수신한 UE(680)는 수신한 업링크 타이밍 그룹을 그대로 이용하거나, 현재의 네트워크 상황에 맞추어 업링크 타이밍 그룹을 일부 수정할 수 있다. 이는 eNB(690)에서 생성한 그룹이 실제 UE(680)의 환경에 적합하지 않는 경우 UE(680)가 수정을 할 수 있는 경우를 포함한다. 업링크 타이밍 그룹 정보를 수신한 후, 혹은 업링크 타이밍 그룹 정보를 변경하거나 새로이 생성한 후, UE(680)는 각각의 업링크 타이밍 그룹에 대해 대표 요소 반송파를 선택한다(S634). 상기 업링크 타이밍 그룹에 대한 대표 요소 반송파의 선택 시 고려할 조건들은 도 4의 S434, 도 5의 S534에서 살펴본 바와 같다.

<135> S634에서 업링크 타이밍 그룹별로 대표 요소 반송파를 선택하는 과정이 완료한 후, 업링크 동기 획득이 필요한 상황이 발생하게 되면, 각 그룹 내 대표 요소 반송파들은 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 랜덤 접속을 위해 할당된 자원들 중 하나를 선택하여 해당 프리엠블을 전송한다(S640). 해당 프리엠블을 전송하는 방법은 eNB(690)에 의해 설



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정된 시간/주파수 자원에서 UE(680)에 의해 순차적으로 또는 동시에 또는 랜덤하게 선택되어 전송될 수 있다.

<136> eNB(690)는 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파(대표 요소 반송파) 마다 TA값을 계산하고 해당 값을 업링크할당(UL grant) 정보와 함께 랜덤 액세스 응답(random access response) 정보에 포함시켜 UE(680)에게 전송한다(S650). 일 실시 예로 eNB(690)가 S624 단계에서 설정하였던 업링크 타이밍 그룹을 고려하여 TA 값을 계산하여 미리 전송할 수 있다. 한편, eNB(690)는 특정 요소 반송파를 통해 랜덤 액세스 응답메시지를 송신할 수 있고 해당 업링크 타이밍 그룹 내의 모든 요소 반송파들을 통해 랜덤 액세스 응답메시지를 송신할 수 있다.

<137> UE(680)는 CR(contention resolution) 절차(S660)를 통해 수신한 TA 값이 유효하다고 판단되면, 해당 업링크 타이밍 그룹 별 TA값을 해당 그룹 내 다른 요소 반송파에 적용하여 업데이트를 수행한다(S670).

<138> 상기 도 6에서 설명한 바와 같이, UE(680)는 eNB(690)로부터 설정된 업링크 타이밍 그룹을 수신하고, 해당 그룹의 대표값을 통해 랜덤 액세스 절차를 수행한다. 그 후, 랜덤 액세스 절차에 따른 프리엠블에 대응하여 상기 타이밍 그룹의 TA값을 수신하여 동기 획득을 위한 업링크 타이밍 조절을 수행한다.

<139> 도 7은 본 명세서의 일 실시 예에 의한 기지국에서 단말의 요청에 의해 단말이 업링크 동기 획득을 할 수 있도록 지원하는 도면을 설명한 것이다.

<140> 도 7을 참조하면, 기지국인 eNB는 UE의 RRC 모드를 확인한다(S702). eNB와



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UE의 무선 자원 제어(RRC)의 연결 상태가 RRC_CONNECTED인 경우(S704), eNB는 다음 단계(S710)로 진행한다.

<141> 만약, RRC_CONNECTED가 아닌 경우에는, S705로 진행한다. S705에서 eNB는 UE로부터 RRC 연결 요청이 존재하는지를 확인할 수 있다. eNB는 UE로부터 RRC 연결 요청을 수신하고(S705), RRC 연결을 완료한다(S706). 이때, eNB는 UE로부터 RRC 연결 요청 메시지를 수신하고, RRC 연결 설정 메시지를 전송하며, 최종적으로 UE로부터 RRC 연결 설정 완료 메시지를 수신하여 RRC 연결을 완료한다.

<142> eNB는 RRC_CONNECTED UE에 대하여 사용 가능한 적어도 하나의 CC를 포함하는 CC 집합을 설정하고, 상기 설정된 CC 집합 정보를 UE로 송신한다(S710).

<143> 그리고 eNB는 상기 UE의 CC집합 정보를 기반으로 집합 내의 적어도 하나의 특정 요소 반송파에 대한 SI를 송신한다(S720). 여기서, 상기 CC 집합 정보는 RRC 메시지를 통해 전송가능하다. 또한, 상기 설정된 CC 집합의 SI는 브로드캐스트 채널을 통해 전송 가능하다.

<144> eNB는 업링크 타이밍 그룹 생성을 수행하는 주체가 eNB인지 확인한다(S722). 만약 eNB에서 업링크 타이밍 그룹을 생성하는 경우, 상기 UE의 CC집합 정보를 고려하여 업링크 타이밍 그룹을 생성하고, 생성된 업링크 타이밍 그룹에 대한 정보를 UE에 송신한다(S726). 물론 업링크 타이밍 그룹을 생성하여 이에 대한 정보는, S710의 CC 집합 정보를 설정하여 송신하는 시점과 같이 진행하거나 CC 집합 정보와 함께 업링크 타이밍 그룹의 정보를 송신할 수 있다.



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<145> 한편, eNB는 UE로부터 랜덤 액세스 프리엠블을 수신한다(S740). S740은 업링크 타이밍 그룹 생성을 수행하는 주체가 UE인 경우를 포함할 수 있다. 즉, UE가 S710의 사용 가능한 CC 집합 정보와, S720의 해당 CC의 SI 정보를 참조하여 업링크 타이밍 그룹을 생성하고, 생성된 타이밍 그룹별로 대표 요소 반송파를 설정하여, 해당 대표 요소 반송파를 통해 랜덤 액세스 프리엠블을 송신하는 동작을 포함한다. 따라서, eNB는 UE로부터 송신된 프리엠블을 수신하게 된다.

<146> 그 후, eNB는 수신된 프리엠블에 대하여 랜덤 액세스 응답 메시지를 송신하는데, 이 경우, 상기 UE에 할당된 업링크 할당 정보와 각 업링크 타이밍 그룹 별TA 정보를 함께 송신한다(S750). 여기서, 상기 업링크 타이밍 그룹 별 TA 정보는, 그룹 인덱스에 대응하여 TA 값을 포함하는 테이블 형태로 전송될 수 있다. 또한, 정해진 기준 TA값에 대응하여 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 형태로 전송될 수 있다. 이때, 상기 그룹 별 오차는 정해진 단위 값에 대응하여 정수배의 크기로 표기될 수 있다. 또는 그룹 별 오차를 구체적으로 명시할 수도 있다. 또는 정해진 규칙에 따라 TA를 나타내는 지시자 형태로 전송되는 것을 포함할 수 있다.

<147> 그리고, eNB는 UE에 CR(Contention Resolution) 메시지를 송신한다(S760). 이는 UE 로 하여금 수신한 TA 값의 유효성을 확인하여 해당 그룹의 TA 값을 업데이트 할 수 있도록 동작함을 포함한다.

<148> 도 8은 본 명세서의 일 실시 예에 의한 UE에서 업링크 타이밍 그룹을 이용하여 업링크 동기화를 획득하는 과정을 보여주는 도면이다.



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<149> 도 8을 참조하면, UE는 RRC 모드를 확인한다(S802). 만약, RRC_CONNECTED가 아닌 경우, 즉, IDLE 모드인 경우에는 UE는 RRC 연결 설정 과정을 수행한다.

<150> 이에, UE는 RRC 연결을 설정할 특정 요소 반송파를 선택하고(S806), 선택한 특정 요소 반송파로 RRC 연결 요청(RRC Conneciton Request) 메시지를 전송하고, eNB로부터 RRC 연결 설정(RRC Conneciton setup) 메시지를 선택한 특정 요소 반송파를 통해 수신한 후, 최종적으로 eNB로RRC 연결 설정 완료(RRC Conneciton setup complete) 메시지를 전송하여 RRC 연결 설정을 완료한다(S808).

<151> RRC 모드를 확인한 결과, UE가 RRC_CONNECTED 인 경우(S804), 업링크가 지속적으로 유지되고 있는지 확인한다(S810).

<152> 업링크가 유지되고 있지 않다면, S812 단계로 진행한다. S812에서 UE는 eNB로부터 RRC 연결 재구성(RRC Conneciton setup Reconfiguration) 메시지를 수신하는지 확인한다(S812).

<153> 여기서, UE의 RRC 모드가 IDLE 모드인 경우, 또는 RRC 연결 재구성을 수행하는 경우, eNB은 해당 UE의 요소 반송파 집합을 정의하여 전송할 수 없다. 따라서, UE는 f-i) UE가 measurement한 정보를 기반으로 RRC Connection을 시도할 가장 적합한 요소 반송파 선택, f-ii) UE의 내부 메모리에 저장되어 있는 시스템에서 고정적으로 설정한 정보 이용, f-iii) 기지국에서 시스템 정보를 통해 UE에게 전송한 정보 이용, f-iv) UE 내부 메모리에 저장되어 있는 유효한 요소 반송파들의 시스템 정보 이용 중 하나를 사용하여, RRC연결을 진행할 적어도 하나 이상의 요소 반송파



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를 선택하고, 요소 반송파 집합 정보를 구성할 수 있다. 한편, RRC 연결이 완료되어 UE의 모드가 RRC Connected 모드가 되었다면 S830으로 진행한다.

<154> 만일, UE가 핸드오버를 진행하고 있다면 수신한 RRC 연결 재구성 메시지를 확인하여(S814), 모빌리티 제어 정보 (Mobility Control Information, MCI)을 확인한다(S816). 그리고, 확인한 MCI 정보를 기반으로 목표 기지국(T-eNB)로부터 해당 CC의 동기 획득을 위한 정보를 확인한다(S818). 즉, UE는 목표 기지국(T-eNB)로부터 업링크 동기화를 획득할 수 있다. 만일, UE가 핸드오버를 진행하고 있지 않다면 수신한 RRC 연결 재구성 메시지만을 확인하고(S814), S816 및 S818절차를 진행하지 않는다.

<155> 다시 설명하여, 업링크 동기화를 획득하는 과정에서, 만일 UE가 핸드오버하고 있지 않는 경우에 UE는 소스 기지국과 해당 요소 반송파의 업링크 동기를 획득하기 위한 절차를 진행하여 업링크 동기를 획득한다. 한편, 일 예로, UE가 핸드오버하고 있는 경우, UE는 해당 요소 반송파의 업링크 동기를 획득하기 위한 절차를 소스 기지국으로부터 전송받은 목표 기지국의 요소 반송파의 시스템 정보를 기반으로 업링크 동기를 획득하기 위한 절차를 진행하여 업링크 동기를 획득한다. 바람직하기로는 랜덤 접속 절차를 이용할 수도 있으며 그 이외의 절차가 적용될 수도 있다.

<156> 그 후, UE는 소스 기지국(S-eNB) 또는 목표 기지국(T-eNB)과의 동기를 맞추기 위하여 임의의 프리엠블을 선택하여 소스 기지국(S-eNB) 또는 목표 기지국(T-eNB)로 전송한다(S820). 상기 UE의 프리엠블 전송에 따라 소스 기지국(S-eNB) 또는

목표 기지국(T-eNB)로부터 랜덤 액세스 응답 메시지를 수신할 수 있다. 여기에는 상기 UE를 위한 업링크 할당 정보과 업링크 동기를 맞추기 위한 적어도 하나 이상의 CC를 포함하는 그룹 별 TA 정보가 포함되어 있다(S822).

<157> UE는 CR(Contention Resolution) 과정을 통해 상기 S822에서 수신한 TA가 유효한지 검증하고(S824), 상기 TA가 유효하다고 판단하는 경우, 수신한 TA값에 따라 적어도 하나 이상의 CC를 포함하는 업링크 타이밍 그룹을 업데이트한다(S826).

<158> 한편, RRC 재구성 메시지를 수신하지 않은 경우에는 S820 단계로 진행하여 해당 동작을 수행한다.

<159> 업링크가 유지되거나 UE가 업링크 동기화를 획득한 상황에서, UE는 eNB로부터 요소 반송파들의 집합 정보를 수신한다(S830). 또한, 수신한 CC 집합에 대한 SI 정보를 수신한다(S832).

<160> 그 후, UE는 업링크 타이밍 그룹 정보를 수신하였는지 확인한다(S840). 이때, 업링크 타이밍 그룹 정보가 eNB에서 생성되는 경우, UE는 상기 CC 집합 정보 수신 과정, 혹은 별도의 메시지를 통해 상기 업링크 타이밍 그룹 정보를 수신할 수 있다. 상기 업링크 타이밍 그룹 정보에는 각 그룹별 대표 CC정보도 포함될 수 있다. 만일 상기 업링크 타이밍 그룹 정보에 각 그룹별 대표 CC정보가 포함되어 있다면, S852절차를 진행하지 않으나 만일 상기 업링크 타이밍 그룹 정보에 각 그룹별 대표 CC정보가 포함되어 있지 않다면, UE는 수신한 업링크 타이밍 그룹 정보를 확인하여, 해당 업링크 타이밍 그룹에서 대표 CC를 설정한다(S852). 상기 대표 CC는 도 4의 c 조건을 고려하여 설정될 수 있다. 또한, 각 업링크 타이밍 그룹의 TA



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조정을 위한 대표 CC는 모든 그룹에 동일한 기준을 적용하여 설정될 수도 있고, 각 업링크 타이밍 그룹의 특성을 고려하여 상이한 기준을 적용하여 설정될 수도 있다.

<161> 한편, 업링크 타이밍 그룹 정보를 수신하지 않았거나, 수신한 업링크 타이밍 그룹 정보가 현재 UE가 위치한 무선 상황 또는 UE에 적합하지 않은 경우, UE는 수신한 CC 집합 정보를 고려하여 업링크 타이밍 그룹 정보를 설정한다(S850). 그리고, 설정한 업링크 타이밍 그룹 내에서 상기 타이밍 그룹을 대표하는 특정 CC를 설정한다(S852).

<162> UE는 대표 CC를 통해 프리엠블을 선택하여 송신한다(S854). 이는 대표 요소 반송파가 설정된 후, TA를 업데이트할 상황이 발생한 경우에도 적용될 수 있다.

<163> 그리고 UE는 eNB로부터 랜덤 액세스 응답 메시지를 수신한다. 이 때, UE의 업링크 할당 정보와 각 업링크 그룹 별 TA 정보를 수신한다(S856). 여기서, UE는 상기 업링크 타이밍 그룹 별 그룹 인덱스에 대응하는 테이블 형태의 TA 값을 확인할 수 있다. 또한, UE는 정해진 기준 TA값에 대응하여 각 타이밍 그룹 별 단위 오차를 포함하는 형태의 TA차이 값을 확인할 수 있다. 또한, 정해진 단위 값에 대응하여 정수배의 크기로 정해지는 업링크 타이밍 그룹 별 오차를 확인할 수도 있다. 또한 구체적으로 명시된 각 업링크 타이밍 그룹 별 오차를 확인할 수도 있다. 또한 정해진 규칙에 따라 지시자 형태로 정해진 TA 지시자를 확인할 수도 있다.

<164> 그 후, UE는 CR(Contention Resolution) 과정을 통해 수신한 TA가 유효한지 검증한다(S860).



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<165> 확인한 TA가 유효함을 확인한 경우, UE는 업링크 타이밍 그룹별 TA값을 업데이트 한다(S870).

<166> 여기서, 본 명세서의 일 예에 따라UE는 업링크 타이밍 그룹 별 TA를 업데이트 한 결과를 대표 CC를 통해 eNB에 전송할 수도 있다. 즉, eNB과의 보다 정확한 동기 획득을 위하여 TA 값 확인 절차를 추가로 더 진행할 수도 있다.

<167> 도 9는 본 명세서의 일 실시 예에 의한 송신장치의 구성을 보여주는 도면이다.

<168> 도 9를 참조하면 송신장치(900)는 UE 의 RRC 모드를 확인하는 연결 모드 확인부(905), UE가 사용 가능한 적어도 하나 이상의 CC를 포함하여 CC 집합을 결정하는 CC집합 결정부(920), 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부(930), 송수신부(950)을 포함한다.

<169> 보다 구체적으로, 상기 RRC 모드 확인부(905)는 UE와 eNB의 연결 상태를 확인하여, 연결이 되지 않은 상태, 즉, UE RRC_IDLE이거나, 또는 업링크 동기화가 이루어지지 않은 경우, UE의 연결 상태를 RRC_CONNECTED로 상태를 변경하거나 업링크 동기화가 이루어지도록 할 수 있다.

<170> 일 예로, 상기 RRC 모드 확인부(905)는 송수신부(950)을 통해 UE로부터 전송된 RRC 연결 요청(RRC Conneciton Request) 메시지를 수신하고, RRC 연결 설정 메시지를 UE로 전송하도록 동작한다. 또한, UE로부터 RRC 연결 설정 완료 메시지를 수신하여 RRC 연결 설정을 완료한 후, UE RRC_CONNECTED 모드를 확인할 수 있다.



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<171> 요소 반송파 집합 결정부(920)는 UE가 사용할 수 있는 적어도 하나 이상의 CC들을 확인하여 UE의 CC 집합을 설정한다. 이때, 상기 UE를 위한 CC 집합은 사용(구성)될 수 있는 CC들간의 업링크 동기 시간 차이, 각 CC의 타입 정보, 각 CC의 중심 주파수 위치, 각 CC의 서비스 지원 형태, 및 각 CC를 위한 네트워크 서비스 등을 고려하여 UE의 CC 집합을 설정할 수 있다.

<172> 업링크 타이밍 그룹 생성부(930)는 상기 요소 반송파 집합 결정부(920)에서 결정된 CC 집합을 반영하여 UE의 업링크 타이밍 그룹을 생성한다. 여기서, 타이밍 그룹은, 요소 반송파들간의 중심 주파수 값의 차이와 임계치를 비교하거나, 동일/상이한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 업링크 동기 갱신 요청에 따라 갱신된 요소 반송파들인지, 또는 매크로(Macro) 셀에서 서비스 하지 않는 요소 반송파이나 매크로보다 작은 셀(femto cell, pico cell, micro cell, relay, repeater) 등에 의해 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여 결정할 수 있다.

<173> 상기 송수신부(950)은 UE에게 CC 집합 정보와 업링크 타이밍 그룹 정보를 송신한다. 이 때, 송수신부(950)는 도 5와 같이 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 송신할 수 있고, 또는 도 6과 같이 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 구분하여 송신할 수 있다. 또한, 송수신부(950)는 CC 집합 정보를 송신한 후, 추가적으로 시스템 정보(SI)를 송신할 수도 있다. 따라서, UE로 하여금 상기 CC 집합 정보와, SI 정보를 기반으로 업링크 타이밍 그룹을 설정하도록 제공할 수도 있다.



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<174> 한편, 송수신부(950)는 UE로부터 동기화를 요청하는 메시지, 예를 들어 랜덤 액세스 프리엠블(Random Access Preamble)을 포함하는 메시지를 수신할 수 있다. 즉, 상기 업링크 타이밍 그룹에 대응하여 UE에 의해 결정된 대표 요소 반송파를 통해 전송되는 랜덤 액세스 프리엠블을 확인하여 각 업링크 타이밍 그룹에 대한 TA 값을 전송하는 것을 포함한다.

<175> 또한, 송수신부(950)는 UE 로부터 전송되는 랜덤 액세스 프리엠블 메시지를 통해 업링크 타이밍 그룹 생성부(930)로 하여금 결정된 업링크 타이밍 그룹에 대하여 전체 또는 일부를 수정하도록 제공할 수 있다.

<176> 제어부(910)는 상기 수신한 랜덤 액세스 프리엠블에 대하여 동기화와 관련된 정보, 예를 들어, 업링크 할당, 동기화 관련된 TA정보 등을 포함한 메시지를 생성하여 UE에 송신하도록 송수신부(950)을 제어한다. 이때, 상기 TA 정보를 포함하는 메시지는 앞서 살펴본 랜덤 액세스 응답 메시지를 포함한다. 동기화와 관련된 정보는 앞서 업링크 전송 시간을 앞당기는데 필요한 정보인 TA 정보를 포함한다. 따라서, 상기 제어부(910)는 상기 송수신부(950)로 하여금 업링크 타이밍 그룹에 대하여 동기화 정보를 생성하여 송신하도록 제어할 수 있다.

<177> 여기서, 상기 제어부(910)은 각 업링크 타이밍 그룹 별 TA 정보를, 그룹 인덱스에 대응하여 TA 값을 포함하는 테이블 형태로 생성할 수 있고, 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 TA 값을 생성할 수 있고, 각 타이밍 그룹 별 오차는 정해진 단위 값에 대응하여 정수배의 크기를 가지도록 생성할 수 있고, 또는 타이밍 그룹 별 오차를 구체적으로 명시할 수도 있다. 또는 정해진 규칙에 따라 TA를



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나타내는 지시자 형태로 전송하도록 송수신부(950)을 제어할 수 있다.

<178> 또한, 제어부(910)는 모든 구성 요소를 제어할 수 있으며, 일부 구성요소들은 독립적으로 동작할 수 있다. 도 9의 구성요소들은 하나 또는 둘 이상의 모듈에 포함되어 구성될 수 있고, 둘 이상의 모듈에서 하나의 기능을 구현하도록 구성될 수도 있다.

<179> 도 10은 본 명세서의 일 실시 예에 의한 수신장치의 구성을 보여주는 도면이다.

<180> 도 10을 참조하면, 수신장치(1000)는, 연결모드 확인부(1005), CC 집합 확인부(1007), 제어부(1010), 업링크 타이밍 조정부(1020), 업링크 타이밍 그룹 생성부(1030) 및 송수신부(1050)을 포함한다.

<181> 연결 모드 확인부(1005)는 eNB와의 연결 상태를 확인한다. 즉, UE RRC_IDLE이거나 eNB와 업링크 동기화가 이루어지지 않은 경우, UE로 하여금 RRC_CONNECTED로 상태를 변경하거나 업링크 동기화가 이루어지도록 할 수 있다.

<182> 일 예로, 상기 RRC 모드 확인부(905)는 송수신부(950)을 통해 eNB로 RRC 연결 요청(RRC Conneciton Request) 메시지를 전송하고, eNB로부터 RRC 연결 설정 메시지를 수신하여, RRC 연결 설정 완료 메시지를 통해 RRC 연결 설정을 완료하도록 한다.

<183> 송수신부(1050)는 eNB과 정보를 송수신하는 기능을 한다. 일 예로, 송수신부(1050)는 eNB으로부터 CC 집합 정보와 동기화와 관련된 정보를 수신한다. 상기 CC

집합 정보를 수신한 후, eNB으로부터 CC 집합내의 CC들에 대한 SI도 수신할 수 있다. SI 정보는 CC의 주파수 대역 정보, 실제 가용한 주파수 크기 정보등을 포함한다.

<184> 요소 반송파 집합 확인부(1007)는 CC 집합 정보로부터 UE가 사용할 수 있는 적어도 하나 이상의 CC들을 확인한다. 상기 CC 집합은 UE가 사용할 수 있는 CC들간의 업링크 동기 시간 차이, 각 CC의 타입 정보, 각 CC의 중심 주파수 위치, 각 CC의 서비스 지원 형태, 및 각 CC를 위한 네트워크 서비스 등을 고려하여 결정된 것이다.

<185> 업링크 타이밍 그룹 생성부(1030)는 상기 요소 반송파 집합 결정부(920)에서 결정된 CC 집합을 반영하여 UE의 업링크 타이밍 그룹을 생성한다. 여기서, 업링크 타이밍 그룹은, 도 9에 설명한 조건 사항들을 반영하여 UE에 의해 설정 가능하다. 또한, 업링크 타이밍 그룹 생성부(1030)는 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정할 수 있다.

<186> 일 예로, 업링크 타이밍 그룹 생성부(1030)가 송수신부(1050)를 통해 eNB로부터 CC 집합 정보와 함께 요소 반송파들에 대한 업링크 타이밍 그룹 정보를 수신한 경우에는, 수신한 업링크 타이밍 그룹에서 대표 요소 반송파를 선택한다. 물론 송수신부(1050)를 통해 CC집합 정보와 구분하여 별도의 시그널링르 통해 상기 업링크 타이밍 그룹 정보를 수신할 수도 있다.

<187> 따라서, 업링크 타이밍 그룹 생성부(1030)는 상기 송수신부(1050)에서 요소 반송파들에 대한 업링크 타이밍 그룹 정보를 수신하지 않았거나, 또는 eNB에서 생



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성한 업링크 타이밍 그룹 정보가 자신의 네트워크 상황에 적합하지 않은 경우에는, 새로이 업링크 타이밍 그룹을 생성할 수 있다.

<188> 또한, 제어부(1010)는 상기 송수신부(1050)를 통해 동기화를 요청하는 메시지를 상기 대표 요소 반송파를 통해 eNB로 송신하고, 상기 대표 요소 반송파를 통해 동기화와 관련된 정보를 eNB로 수신하도록 제어한다. 일 예로, 송수신부(1050)로 하여금 UE에 의해 선택된 랜덤 액세스 프리엠블(Random Access Preamble)을 포함하는 메시지를 전송하고, eNB로부터 전송되는 랜덤 액세스 응답 메시지을 수신하도록 제어할 수 있다. 또한, eNB와의 RRC 재구성 및 동기 획득을 위한 메시지를 송수신하도록 제어할 수 있다.

<189> 또한, 제어부(1010)는 상기 랜덤 액세스 응답 메시지를 통해 업링크 타이밍 그룹 생성부(930)로 하여금 결정된 업링크 타이밍 그룹에 대하여 전체 또는 일부를 수정하도록 제어할 수 있다.

<190> 특히, 상기 제어부(1010)는 상기 랜덤 액세스 응답 메시지에 포함되어 있는 상기 설정된 업링크 타이밍 그룹에 대응하여 각 업링크 타이밍 그룹에 대한 TA 값을 확인하도록 제어할 수 있다. 또한, 상기 UE의 업링크 전송을 위한 할당된 주파수 자원 정보를 확인하도록 제어할 수 있다.

<191> 업링크 타이밍 조정부(1020)는 제어부(1010)에 의해 확인된 TA 값을 확인하여 상기 대표 요소 반송파가 포함된 해당 업링크 타이밍 그룹의 모든 요소 반송파에 대하여 TA 값을 적용한다. 즉, eNB와의 동기화를 위하여 해당 업링크 타이밍 그룹에 TA값을 적용한다. 여기서, 각 업링크 타이밍 그룹 별 TA 정보는, 그룹 인덱스



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에 대응하여 TA 값을 포함하는 테이블 형태로 존재할 수 있고, 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 TA 값으로 존재할 수도 있고, 각 타이밍 그룹 별 오차가 정해진 단위 값에 대응하여 정수배의 크기를 가지도록 존재할 수도 있고, 또는 구체적으로 명시된 타이밍 그룹 별 오차로 존재할 수도 있고, 정해진 규칙에 따라 TA를 나타내는 지시자 형태로 존재할 수도 있다. 따라서, 업링크 타이밍 조정부(1020)는 각 업링크 타이밍 그룹에 확인된 TA를 적용하여 동기를 획득한다.

<192> 또한, 예를 들어, TA 정보가 동기화 정보에 포함된 경우, 업링크 타이밍 그룹의 모든 요소 반송파에 대하여 동일하게 TA 정보를 설정할 수도 있다.

<193> 상기 언급한, 제어부(1010)는 모든 구성 요소를 제어할 수 있으며, 일부 구성요소들은 독립적으로 동작할 수 있다. 도 10의 구성요소들은 하나 또는 둘 이상의 모듈에 포함되어 구성될 수 있고, 둘 이상의 모듈에서 하나의 기능을 구현하도록 구성될 수도 있다.

<194> 따라서, 본 발명의 일 실시 예를 이용하면, 다수의 요소 반송파를 사용 시 각 요소 반송파 또는 요소 반송파 그룹간의 서로 다른 업링크 동기를 획득하는 것이 가능하므로 UE에서 다수의 요소 반송파를 동시에 사용하여 업링크로 정보를 전송하는 경우 동기 획득 오류로 인한 데이터 전송 오류 및 기지국에서의 정보 수신 지연을 줄이는 효과가 있다.

<195> 또한, 본 발명은 다수의 요소 반송파들의 각 요소 반송파마다 업링크 동기 기준이 서로 상이한 경우, 이동통신단말기(user equipment: 이하 UE)에서 각 요소 반송파의 타입, 중심 주파수 위치 및 서비스 형태에 따라 업링크 동기를 획득할 수



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있는 장점을 가진다.

<196> 이상의 설명은 본 발명의 기술 사상을 예시적으로 설명한 것에 불과한 것으로서, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자라면 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 다양한 수정 및 변형이 가능할 것이다. 따라서, 본 발명에 개시된 실시 예들은 본 발명의 기술 사상을 한정하기 위한 것이 아니라 설명하기 위한 것이고, 이러한 실시 예에 의하여 본 발명의 기술 사상의 범위가 한정되는 것은 아니다. 본 발명의 보호 범위는 아래의 청구범위에 의하여 해석되어야 하며, 그와 동등한 범위 내에 있는 모든 기술 사상은 본 발명의 권리범위에 포함되는 것으로 해석되어야 할 것이다.

【특허청구범위】

【청구항 1】

다수의 요소 반송파를 운영하는 기지국에서

UE가 사용할 요소 반송파 집합을 설정하는 단계;

상기 UE에게 상기 요소 반송파 집합 정보를 송신하는 단계;

상기 UE로부터 동기화를 요청하는 메시지를 수신하는 단계;

상기 수신한 메시지에 따라 상기 UE에 동기화와 관련된 정보를 송신하는 단계를 포함하며,

상기 요소 반송파 집합을 설정하는 단계 이후에, 상기 요소 반송파 집합에 포함되는 요소 반송파에 대하여 상기 동기화를 위한 업링크 타이밍 그룹을 생성하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 2】

제 1항에 있어서,

상기 요소 반송파 집합 정보를 송신하는 단계는

상기 업링크 타이밍 그룹에 대한 정보를 상기 요소 반송파 집합 정보와 함께 송신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 3】

제 1항에 있어서,

상기 요소 반송파 집합 정보를 송신하는 단계 이후에

상기 업링크 타이밍 그룹 정보를 송신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 4】

제 1항에 있어서,

상기 동기화와 관련된 정보는, 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 5】

제 1항에 있어서,

상기 동기화와 관련된 정보를 송신하는 단계는

상기 업링크 타이밍 그룹에 대한 동기화 정보를 송신하는 단계를 포함하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는,

상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리

정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 6】

기지국으로부터 요소 반송파 집합 정보를 수신하는 단계;

업링크 타이밍 그룹의 수신 여부를 확인하는 단계;

상기 업링크 타이밍 그룹의 수신을 확인한 경우, 상기 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정하는 단계;

동기화를 요청하는 메시지를 상기 설정한 대표 요소 반송파을 통해 송신하는 단계;

상기 기지국으로부터 동기화와 관련된 정보를 수신하는 단계; 및

상기 수신한 동기화와 관련된 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나의 요소 반송파에 적용하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 7】

제 6항에 있어서,

상기 업링크 타이밍 그룹의 미수신을 확인한 경우, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 업링크 타이밍 그룹을 생성하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 8】

제 6항에 있어서,

상기 요소 반송파 집합 정보를 수신하는 단계는

상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 수신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 9】

제 6항에 있어서,

상기 요소 반송파 집합 정보를 수신하는 단계 이후에

상기 업링크 타이밍 그룹 정보를 수신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 10】

제 6항에 있어서,

상기 동기화와 관련된 정보는 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 11】

제 6항에 있어서,

상기 동기화와 관련된 정보를 수신하는 단계는

상기 업링크 타이밍 그룹에 대한 동기화 정보를 수신하는 단계를 포함하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신

요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 12】

다수의 요소 반송파를 운영하는 기지국에 있어서,

UE가 사용할 요소 반송파 집합을 설정하는 요소 반송파 집합 결정부;

상기 요소 반송파 집합에 포함되는 각 요소 반송파를 고려하여 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부;

상기 요소 반송파 집합 정보와 상기 업링크 타이밍 정보를 상기 UE에게 송신하거나, 상기 UE로부터 동기화를 요청하는 메시지를 수신하는 송수신부; 및,

상기 UE의 동기화 요청 메시지를 고려하여 상기 업링크 타이밍 그룹의 동기화와 관련 정보를 조정하는 제어부를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 13】

제 12항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정

보와 함께 RRC 메시지를 통해 송신하는, 업링크 동기를 설정하는 장치.

【청구항 14】

제 12항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 구분하여 RRC 메시지를 통해 송신하는, 업링크 동기를 설정하는 장치.

【청구항 15】

제 12항에 있어서,

상기 동기화와 관련된 정보는, 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 16】

제 12항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 송신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인

지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 17】

다수의 요소 반송파를 운영하는 사용자 단말에 있어서,

기지국으로부터 요소 반송파 집합 정보를 수신하고, 상기 기지국으로부터 동기화와 관련된 정보를 수신하며, 동기화를 위한 요청하는 메시지를 상기 대표 요소 반송파을 통해 송신하는 송수신부;

상기 수신한 요소 반송파 집합 정보를 고려하여 대표 요소 반송파를 설정하는 요소 반송파 집합 확인부;

상기 수신한 요소 반송파 집합 정보와 상기 동기화와 관련된 정보를 고려하여 업링크 타이밍 그룹을 설정하는 업링크 타이밍 그룹 생성부;

상기 수신한 동기화와 관련된 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나의 요소 반송파에 적용하는 업링크 타이밍을 조정하는 업링크 타이밍 조정부를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 18】

제 17항에 있어서,

상기 업링크 타이밍 그룹 생성부는, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔 포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여 상기 업링크 타이밍 그룹을 생성함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 19】

제 17항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 RRC 메시지를 통해 수신함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 20】

제 17항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보와 상기 요소 반송파 집합 정

보를 구분하여 RRC 메시지를 통해 수신함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 21】

제 17항에 있어서,

상기 동기화와 관련된 정보는 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 22】

제 17항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 수신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

제출 일자 : 2010-02-10

【요약서】

【요약】

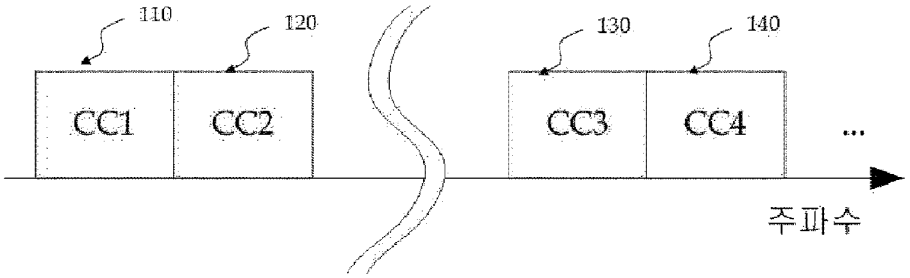
본 명세서에서는 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치를 제공한다. 본 명세서의 일 실시 예에 따른 , 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법은 사용자 단말과 연결을 수행한 후, 요소 반송파 집합 정보를 설정하고, 설정된 요소 반송파 집합에서 업링크 타이밍 그룹을 생성하여 업링크 타이밍 그룹 정보를 사용자 단말에 송신한다.

【대표도】

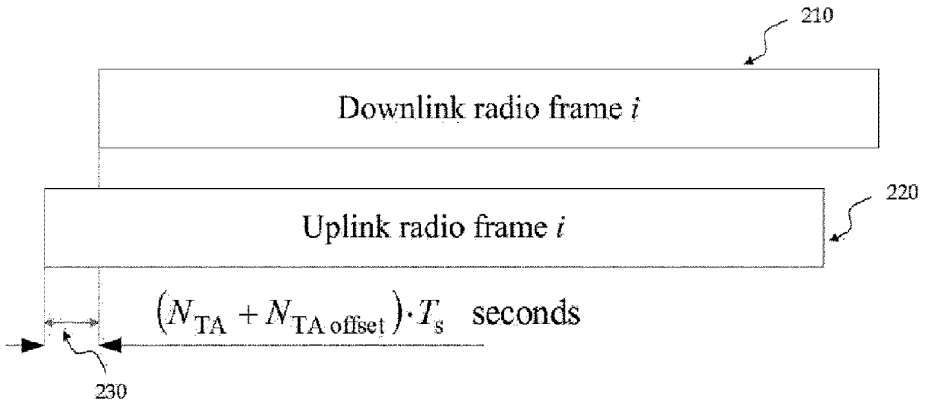
도 4

【도면】

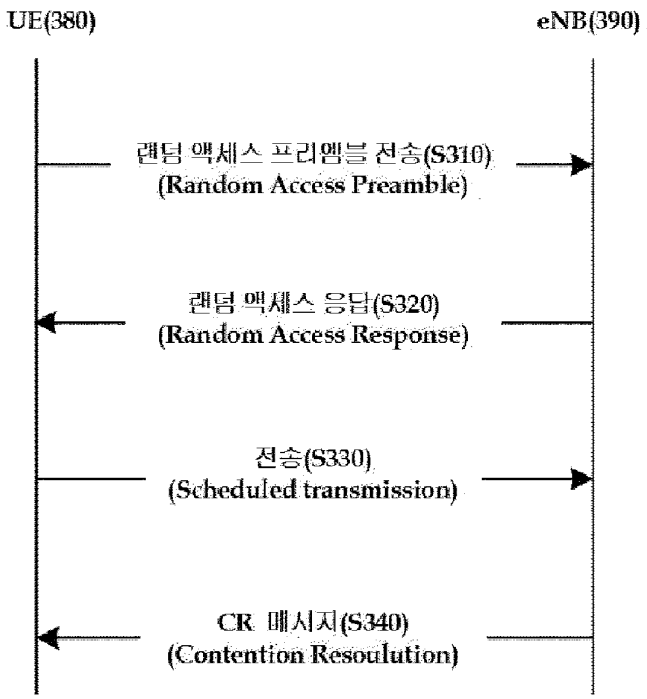
【도 1】


110
120
130
140
CC1
CC2
CC3
CC4
...
주파수

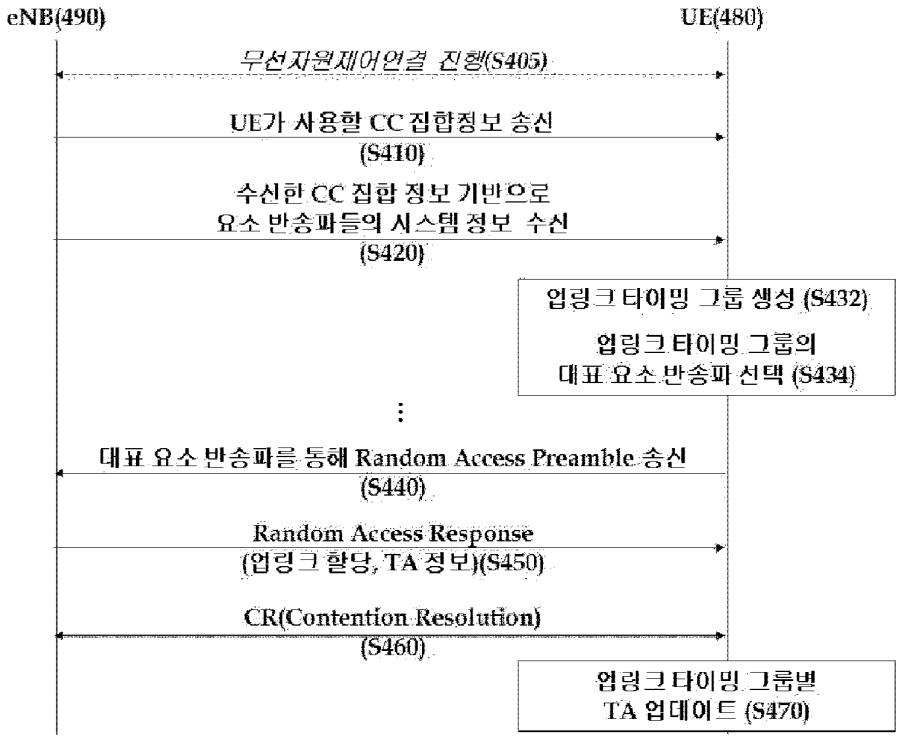
【도 2】


210
Downlink radio frame i
220
Uplink radio frame i
$(N_{TA} + N_{TA\,offset}) \cdot T_s$ seconds
230

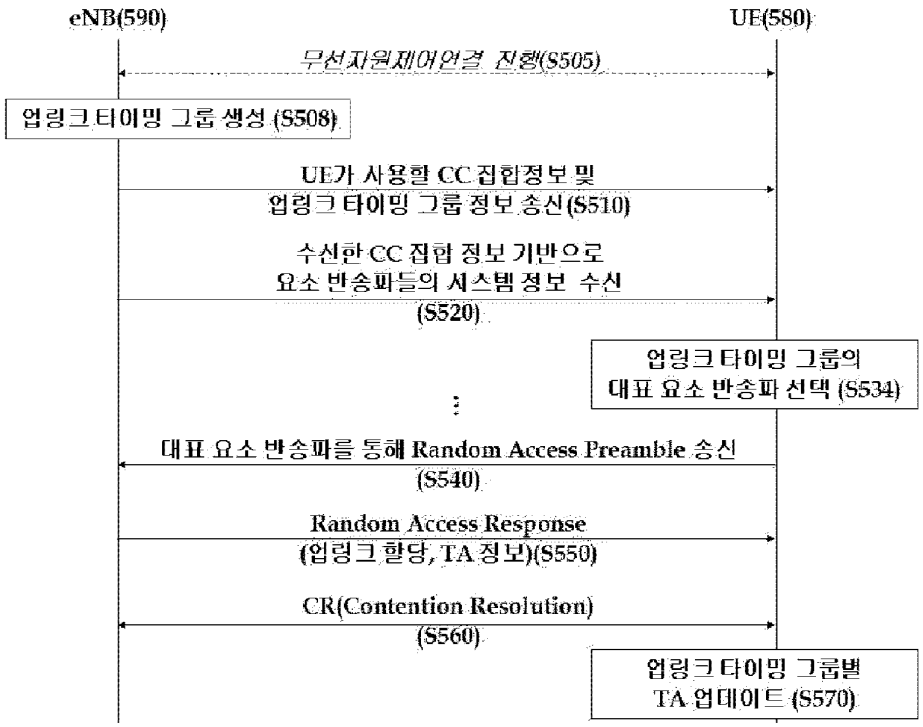
【도 3】


UE(380)
eNB(390)
랜덤 액세스 프리앰블 전송(S310)
(Random Access Preamble)
랜덤 액세스 응답(S320)
(Random Access Response)
전송(S330)
(Scheduled transmission)
CR 메시지(S340)
(Contention Resoulution)

【도 4】


eNB(490)
UE(480)
무선자원제어연결 진행(S405)
UE가 사용할 CC 집합정보 송신
(S410)
수신한 CC 집합 정보 기반으로
요소 반송파들의 시스템 정보 수신
(S420)
업링크 타이밍 그룹 생성 (S432)
업링크 타이밍 그룹의
대표 요소 반송파 선택 (S434)
대표 요소 반송파를 통해 Random Access Preamble 송신
(S440)
Random Access Response
(업링크 할당, TA 정보)(S450)
CR(Contention Resolution)
(S460)
업링크 타이밍 그룹별
TA 업데이트 (S470)

【도 5】



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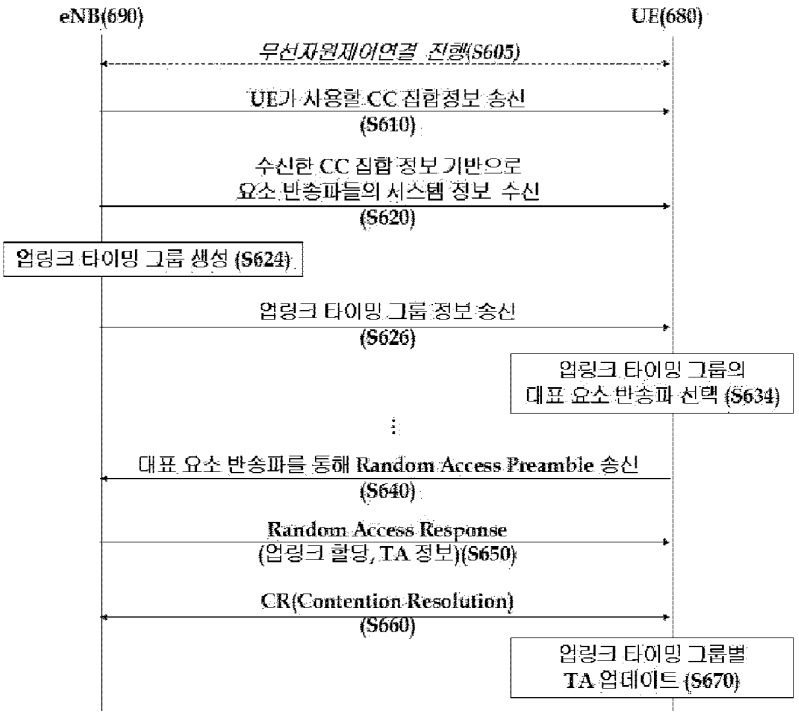
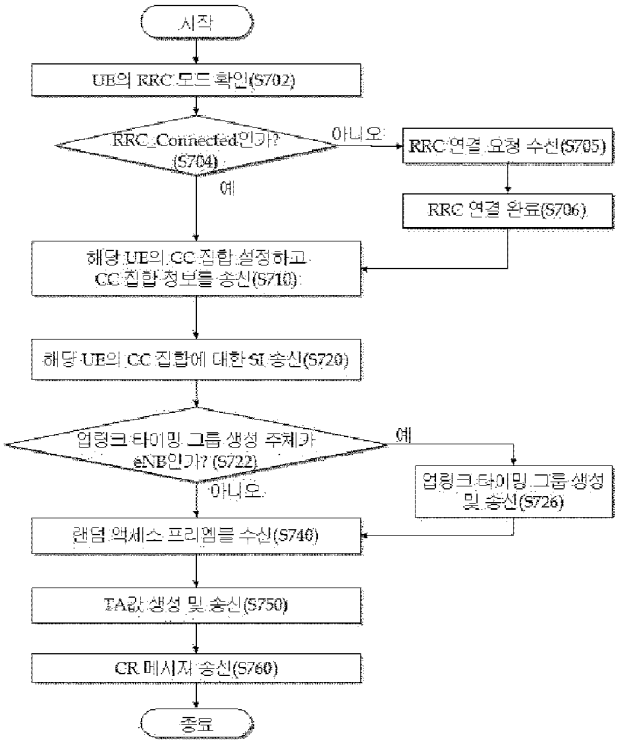
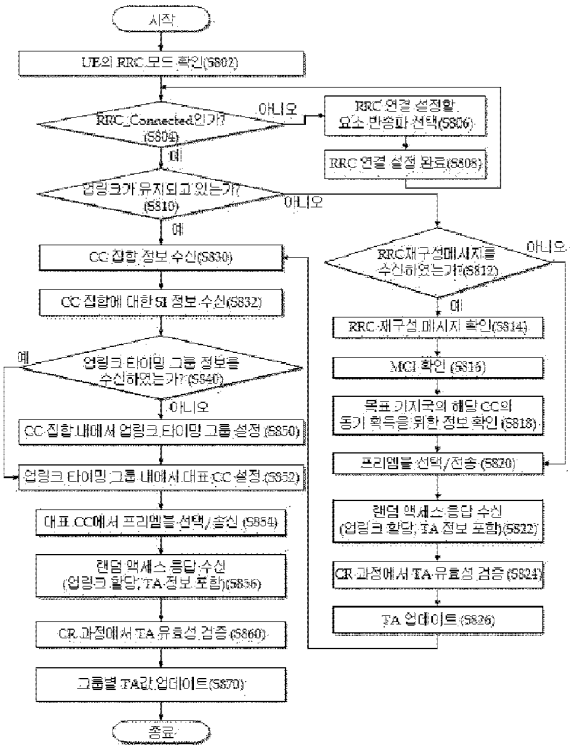
【도 6】


eNB(690)
UE(680)
무선자원제어연결 진행(S605)
UE가 사용할 CC 집합정보 송신
(S610)
수신한 CC 집합 정보 기반으로
요소 반송파들의 시스템 정보 수신
(S620)
업링크 타이밍 그룹 생성 (S624)
업링크 타이밍 그룹 정보 송신
(S626)
업링크 타이밍 그룹의
대표 요소 반송파 선택 (S634)
대표 요소 반송파를 통해 Random Access Preamble 송신
(S640)
Random Access Response
(업링크 할당, TA 정보)(S650)
CR(Contention Resolution)
(S660)
업링크 타이밍 그룹별
TA 업데이트 (S670)

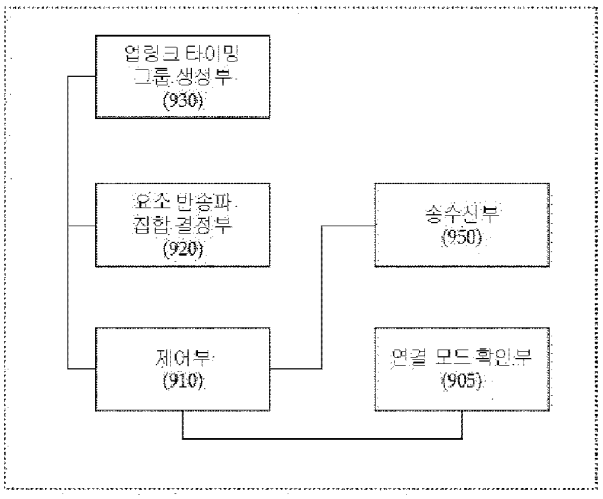
【도 7】


시작
UE의 RRC 모드 확인(S702)
RRC_Connected인가? (S704)
아니오
RRC 연결 요청 수신(S705)
RRC 연결 완료(S706)
예
해당 UE의 CC 집합 설정하고 CC 집합 정보를 송신(S710)
해당 UE의 CC 집합에 대한 SI 송신(S720)
업링크 타이밍 그룹 생성 주체가 eNB인가? (S722)
예
업링크 타이밍 그룹 생성 및 송신(S726)
아니오
랜덤 액세스 프리엠블 수신(S740)
TA값 생성 및 송신(S750)
CR 메시지 송신(S760)
종료

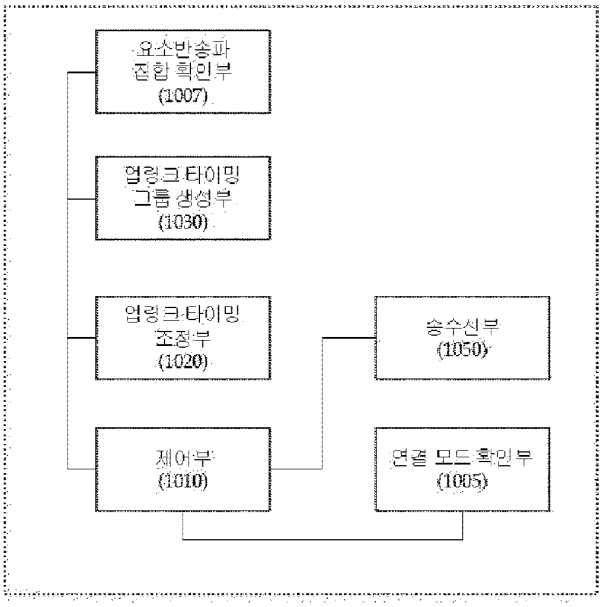
【도 8】


시작
UE의 RRC 모드 확인(S802)
RRC_Connected인가? (S804)
아니오
RRC 연결 설정할 요소 반송파 선택(S806)
RRC 연결 설정 완료(S808)
예
업링크가 유지되고 있는가? (S810)
아니오
예
CC 집합 정보 수신(S830)
CC 집합에 대한 SI 정보 수신(S832)
업링크 타이밍 그룹 정보를 수신하였는가? (S840)
예
아니오
CC 집합 내에서 업링크 타이밍 그룹 설정 (S850)
업링크 타이밍 그룹 내에서 대표 CC 설정 (S852)
대표 CC에서 프리앰블 선택/ 송신 (S854)
랜덤 액세스 응답 수신 (업링크 할당, TA 정보 포함)(S856)
CR 과정에서 TA 유효성 검증 (S860)
그룹별 TA값 업데이트(S870)
종료
RRC재구성메시지를 수신하였는가? (S812)
아니오
예
RRC 재구성 메시지 확인(S814)
MCI 확인 (S816)
목표 기지국의 해당 CC의 동기 획득을 위한 정보 확인 (S818)
프리앰블 선택/전송 (S820)
랜덤 액세스 응답 수신 (업링크 할당, TA 정보 포함)(S822)
CR 과정에서 TA 유효성 검증 (S824)
TA 업데이트 (S826)

【도 9】


업링크 타이밍 그룹 생성부 (930)
요소 반송파 집합 결정부 (920)
송수신부 (950)
제어부 (910)
연결 모드 확인부 (905)

【도 10】


요소반송파
결합 확인부
(1007)
업링크타이밍
그룹 생성부
(1030)
업링크타이밍
조정부
(1020)
승수신부
(1050)
제어부
(1010)
연결 모드 확인부
(1005)

대 한 민 국 특 허 청
KOREAN INTELLECTUAL PROPERTY OFFICE

별첨 사본은 아래 출원의 원본과 동일함을 증명함.

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Application Number

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Applicant(s) PANTECH CO.,LTD.

2015년 09월 01일

특 허 청
COMMISSIONER

제출 일자 : 2010-03-26

【서지사항】

【서류명】 특허출원서

【출원구분】 특허출원

【출원인】

【명칭】 주식회사 팬택

【출원인코드】 1-1998-004053-1

【대리인】

【성명】 송해모

【대리인코드】 9-2002-000179-4

【포괄위임등록번호】 2005-094061-4

【대리인】

【성명】 김은구

【대리인코드】 9-1999-000318-1

【포괄위임등록번호】 2009-049482-2

【발명의 국문명칭】 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치

【발명의 영문명칭】 METHOD AND APPARATUS FOR CONFIGURING UPLINK SYNCHRONIZATION IN COMPONENT CARRIER AGGREGATION

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【주민등록번호】 771104-1XXXXXX

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【주소】 경기도 안산시 상록구 이동 530-20번지

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【주민등록번호】 740410-1XXXXXX

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【주소】 서울특별시 동작구 상도2동 358-36 2/2

【국적】 KR

【우선권 주장】

【출원국명】 KR

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【출원일자】 2010.02.10

【증명서류】 첨부

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 송해모 (서명 또는 인)

대리인 김은구 (서명 또는 인)

【수수료】

| | | | |
|---|---|---|---|
| 【출원료】 | 0 | 면 | 38,000 원 |
| 【가산출원료】 | 81 | 면 | 0 원 |
| 【우선권주장료】 | 1 | 건 | 20,000 원 |
| 【심사청구료】 | 0 | 항 | 0 원 |
| 【합계】 | 58,000 원 | | |

# 【명세서】

## 【발명의 명칭】

다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치{METHOD AND APPARATUS FOR CONFIGURING UPLINK SYNCHRONIZATION IN COMPONENT CARRIER AGGREGATION}

## 【기술분야】

<1> 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치를 제공하는 것으로, 적어도 하나 이상의 요소 반송파에 대한 업링크 동기 그룹을 설정하는 방법 및 장치에 관한 것이다.

## 【배경기술】

<2> 무선 통신 시스템에서 사용자 단말과 기지국간의 동기화는 중요한 문제이다. 왜냐하면 동기화가 이루어지지 않으면, 사용자 단말과 기지국은 정상적인 정보를 교환할 수 없기 때문이다.

<3> 한편, 하나의 요소 반송파 또는 하나의 서비스 대역을 지원하는 기존의 무선 통신 시스템과 달리, 현재 무선 통신 시스템은 다수의 요소 반송파들을 사용하여 사용자 서비스 요구를 만족시키고자 한다. 그러나, 상기 다수의 요소 반송파들에 대하여 어떻게 동기화를 수행할 것인지에 대한 구체적인 논의가 정해지지 않은 상태이다.



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<4> 다시 설명하여, 통신을 수행하기 위하여 동기화는 네트워크의 효율에 큰 영향을 미치는 요소이며, 이러한 요소를 고려한 다수의 요소 반송파들이 존재하는 무선 통신 시스템에서의 효과적인 동기화 방안이 필요한 실정이다.

【발명의 내용】

【해결하려는 과제】

<5> 동기화 과정의 효율성은 네트워크의 효율성으로 직결되며, 전송의 안전성 역시 보장하게 되므로, 다수의 요소 반송파를 운용하는 무선 통신 네트워크 환경에서 업링크 동기를 설정하여 동기화 과정을 효율적으로 운용하고자 한다.

<6> 본 발명은, 무선 통신 시스템에서의 동기를 수행하는 장치 및 방법을 제공하고자 한다.

<7> 또한, 본 발명은, 무선 통신 시스템에서 다수의 요소 반송파들에 대한 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<8> 또한, 본 발명은, 무선 통신 시스템에서의 단말의 연결 상태를 고려하여 다수의 요소 반송파들에 대한 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<9> 또한, 본 발명은, 무선 통신 시스템에서 사용 가능한 다수의 요소 반송파들의 특성을 고려하여 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<10> 또한, 본 발명은, 무선 통신 시스템에서 다수의 요소 반송파들에 대한 업링



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크 타이밍 동기 그룹을 설정하는 단말 장치 및 방법을 제공하고자 한다.

<11> 또한, 본 발명은, 무선 통신 시스템에서의 랜덤 액세스 절차를 통해 다수의 요소 반송파들에 대한 동기 정보를 획득하여 기지국과의 동기를 설정 및 업데이트 하는 단말 장치 및 방법을 제공하고자 한다.

【과제의 해결 수단】

<12> 전술한 과제를 달성하기 위해, 본 명세서의 일 실시 예에 따른 , 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법은 사용자 단말과 연결을 수행한 후, 요소 반송파 집합 정보를 설정하고, 설정된 요소 반송파 집합에서 업링크 타이밍 그룹을 생성하여 업링크 타이밍 그룹 정보를 사용자 단말에 송신한다.

<13> 또한, 본 명세서의 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법은 기지국과 연결을 수행한 후, 요소 반송파 집합 정보을 수신하고 업링크 타이밍 그룹에 대하여 대표 요소 반송파를 설정하여, 동기화가 필요한 경우 동기화를 요청하는 메시지를 상기 대표 요소 반송파에서 송신한다.

<14> 또한, 본 명세서의 또 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 기지국은 사용자 단말과 연결을 수행한 후, 요소 반송파 집합 정보를 설정하고, 설정된 요소 반송파 집합에서 업링크 타이밍 그룹을 생성하여 업링크 타이밍 그룹 정



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보를 사용자 단말에 송신하여 업링크 동기를 설정한다.

<15> 또한, 본 명세서의 또 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 사용자 단말은 기지국과 연결을 수행한 후, 요소 반송파 집합 정보을 수신하고 업링크 타이밍 그룹에 대하여 대표 요소 반송파를 설정하여, 동기화가 필요한 경우 동기화를 요청하는 메시지를 상기 대표 요소 반송파에서 송신하여 업링크 동기를 설정한다.

<16> 또한, 본 명세서의 또 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법은 다수의 요소 반송파를 운영하는 기지국에서 UE가 사용할 요소 반송파 집합을 설정하는 단계, 상기 UE에게 상기 요소 반송파 집합 정보를 송신하는 단계, 상기 UE로부터 동기화를 요청하는 메시지를 동시에 수신하는 단계, 상기 수신한 메시지에 따라 상기 UE에 동기화와 관련된 정보를 동시에 송신하는 단계를 포함하며, 상기 요소 반송파 집합을 설정하는 단계 이후에, 상기 요소 반송파 집합에 포함되는 요소 반송파에 대하여 상기 동기화를 위한 업링크 타이밍 그룹을 생성하는 단계를 더 포함한다.

<17> 또한, 본 명세서의 또 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법은 기지국으로부터 요소 반송파 집합 정보를 수신하는 단계, 상기 요소 반송파 집합 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들에 대한 시스템 관련 정보를 수신하는 단계,상기 수신한 시스템 관련 정보에서 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 메시지를 상기 기지국으로 송신하는 단계, 상기 기지국으로



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부터 업링크 타이밍 그룹 정보를 수신하는 단계, 상기 수신한 업링크 타이밍 그룹과 관련된 다운링크 요소 반송파 중 전부 또는 일부의 요소 반송파를 통해 동기화와 관련된 정보를 동시에 수신하는 단계, 및 상기 동기화와 관련된 정보가 수신된 요소 반송파와 관련된 업링크 요소 반송파를 상기 수신한 업링크 타이밍 그룹 내의 대표 요소 반송파로 설정하는 단계를 포함한다.

<18> 또한, 본 명세서의 또 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 기지국은 UE가 사용할 요소 반송파 집합을 설정하는 요소 반송파 집합 결정부, 상기 요소 반송파 집합에 포함되는 각 요소 반송파를 고려하여 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부, 상기 요소 반송파 집합 정보와 상기 업링크 타이밍 정보를 상기 UE에게 동시에 송신하거나, 상기 UE로부터 동기화를 요청하는 메시지를 동시에 수신하는 송수신부, 및 상기 UE의 동기화 요청 메시지를 고려하여 상기 업링크 타이밍 그룹의 동기화와 관련 정보를 조정하는 제어부를 포함한다.

<19> 또한, 본 명세서의 또 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 사용자 단말은 기지국으로부터 요소 반송파 집합 정보를 수신하고, 상기 요소 반송파 집합 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들에 대한 시스템 관련 정보를 수신하며, 상기 기지국으로부터 동기화와 관련된 정보를 수신하며, 동기화를 위한 요청하는 메시지를 상기 대표 요소 반송파을 통해 상기 수신한 시스템 관련 정보에 의하여 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 송신하고, 상기 기지국으로부터 업링크 타이밍 그룹 정보를 수신하며, 상기 수신한 업링크 타이밍 그룹과 관련된 다운링크 요소 반송파 중 전부 또는 일부의



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요소 반송파를 통해 동기화와 관련된 정보를 동시에 수신하는 송수신부, 상기 동기화와 관련된 정보가 수신된 요소 반송파와 관련된 업링크 요소 반송파를 상기 수신한 업링크 타이밍 그룹 내의 대표 요소 반송파로 설정하는 상기 수신한 요소 반송파 집합 정보를 고려하여 대표 요소 반송파를 설정하는 요소 반송파 집합 확인부, 상기 수신한 요소 반송파 집합 정보와 상기 동기화와 관련된 정보를 고려하여 업링크 타이밍 그룹을 설정하는 업링크 타이밍 그룹 생성부, 상기 수신한 동기화와 관련된 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나의 요소 반송파에 적용하는 업링크 타이밍을 조정하는 업링크 타이밍 조정부를 포함한다.

【도면의 간단한 설명】

<20> 도 1은 다수의 요소 반송파가 구성되는 예를 보여주는 도면이다.

도 2는 동기화 과정에서의 TA(Timing Advance)와 관련된 예를 보여주는 도면이다.

도 3은 사용자 단말과 기지국 사이의 랜덤 액세스 과정을 보여주는 도면이다.

도 4는 본 명세서의 일 실시 예에 의한 업링크 동기를 획득하는 과정을 보여주는 도면이다.

도 5는 본 명세서의 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸



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도면이다.

도 6은 본 발명의 또 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다.

도 7은 본 명세서의 일 실시 예에 의한 기지국에서 단말의 요청에 의해 단말이 업링크 동기 획득을 할 수 있도록 하는 도면이다.

도 8a는 본 명세서의 일 실시 예에 의한 UE에서 업링크 타이밍 그룹을 이용하여 업링크 동기화를 획득하는 과정을 보여주는 도면이다.

도 8b는 본 명세서의 일 실시 예에 의한 UE에서 업링크 타이밍 그룹을 이용하여 업링크 동기화를 획득하는 과정을 보여주는 도면이다.

도 9는 본 명세서의 일 실시 예에 의한 기지국의 구성을 보여주는 도면이다.

도 10은 본 명세서의 일 실시 예에 의한 UE의 구성을 보여주는 도면이다.

【발명을 실시하기 위한 구체적인 내용】

<21> 이하, 본 명세서에서는 일부 실시 예들을 예시적인 도면을 통해 상세하게 설명한다. 각 도면의 구성요소들에 참조부호를 부가함에 있어서, 동일한 구성요소들에 대해서는 비록 다른 도면상에 표시되더라도 가능한 한 동일한 부호를 가지도록 하고 있음에 유의해야 한다. 또한, 본 명세서의 실시 예를 설명함에 있어, 관련된 공지 구성 또는 기능에 대한 구체적인 설명이 본 명세서의 요지를 흐릴 수 있다고 판단되는 경우에는 그 상세한 설명은 생략한다.

<22> 또한, 본 명세서의 구성 요소를 설명하는 데 있어서, 제 1, 제 2, A, B,



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(a), (b) 등의 용어를 사용할 수 있다. 이러한 용어는 그 구성 요소를 다른 구성 요소와 구별하기 위한 것일 뿐, 그 용어에 의해 해당 구성 요소의 본질이나 차례 또는 순서 등이 한정되지 않는다. 어떤 구성 요소가 다른 구성요소에 "연결", "결합" 또는 "접속"된다고 기재된 경우, 그 구성 요소는 그 다른 구성요소에 직접적으로 연결되거나 접속될 수 있지만, 각 구성 요소 사이에 또 다른 구성 요소가 "연결", "결합" 또는 "접속"될 수도 있다고 이해되어야 할 것이다.

<23> 또한 본 명세서는 무선 통신 네트워크를 대상으로 설명하며, 무선 통신 네트워크에서 이루어지는 작업은 해당 무선 통신 네트워크를 관할하는 시스템(예를 들어 기지국)에서 네트워크를 제어하고 데이터를 송신하는 과정에서 이루어지거나, 해당 무선 네트워크에 결합한 단말에서 작업이 이루어질 수 있다.

<24> 무선통신 시스템은 음성, 패킷 데이터 등과 같은 다양한 통신 서비스를 제공하기 위해 널리 배치된다.

<25> 무선통신 시스템은 단말(User Equipment, UE) 및 기지국(Base Station, BS)을 포함한다.

<26> 본 명세서에서의 단말은 무선 통신에서의 사용자 단말을 의미하는 포괄적 개념으로서, WCDMA 및 LTE, HSPA 등에서의 UE(User Equipment)는 물론, GSM에서의 MS(Mobile Station), UT(User Terminal), SS(Subscriber Station), 무선기기(wireless device) 등을 모두 포함하는 개념으로 해석되어야 할 것이다.

<27> 기지국 또는 셀(cell)은 일반적으로 단말과 통신하는 고정된 지점(fixed



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station)을 말하며, 노드-B(Node-B), eNB(evolved Node-B), BTS(Base Transceiver System), 액세스 포인트(Access Point) 등 다른 용어로 불릴 수 있다.

<28> 즉, 본 명세서에서 기지국 또는 셀은 CDMA에서의 BSC(Base Station Controller), WCDMA의 Node B 등이 커버하는 일부 영역을 나타내는 포괄적인 의미로 해석되어야 하며, 메가셀, 매크로셀, 마이크로셀, 피코셀, 펨토셀 등 다양한 커버리지 영역을 모두 포괄하는 의미이다.

<29> 본 명세서에서 단말과 기지국은 본 명세서에서 기술되는 기술 또는 기술적 사상을 구현하는데 사용되는 두가지 송수신 주체로 포괄적인 의미로 사용되며 특정하게 지칭되는 용어 또는 단어에 의해 한정되지 않는다.

<30> 무선통신 시스템에 적용되는 다중 접속 기법에는 제한이 없다. CDMA(Code Division Multiple Access), TDMA(Time Division Multiple Access), FDMA(Frequency Division Multiple Access), OFDMA(Orthogonal Frequency Division Multiple Access), OFDM-FDMA, OFDM-TDMA, OFDM-CDMA와 같은 다양한 다중 접속 기법을 사용할 수 있다.

<31> 상향링크 전송 및 하향링크 전송은 서로 다른 시간을 사용하여 전송되는 TDD(Time Division Duplex) 방식이 사용될 수 있고, 또는 서로 다른 주파수를 사용하여 전송되는 FDD(Frequency Division Duplex) 방식이 사용될 수 있다.

<32> 본 명세서의 일실시 예는 GSM, WCDMA, HSPA를 거쳐 LTE(Long Term Evolution) 및 LTE-advanced로 진화하는 비동기 무선통신과, CDMA, CDMA-2000 및



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UMB로 진화하는 동기식 무선통신 등의 자원할당에 적용될 수 있다. 본 명세서에서 제시하는 실시 예는 특정한 무선통신 분야에 한정되거나 제한되어 해석되어서는 아니되며, 본 명세서의 기술적 사상이 적용될 수 있는 모든 기술분야를 포함하는 것으로 해석되어야 할 것이다.

<33> 도 1은 본 발명이 적용되는 다수의 요소 반송파들을 사용하는 시스템의 예를 보여주는 도면이다.

<34> 도 1을 참조하면, 본 발명이 적용되는 무선통신 시스템은, 최근 논의중인 차세대 통신 시스템으로써, LTE-A(LTE-Advanced)시스템을 일 예로 든다. 상기 LTE-A(LTE-Advanced)시스템은, 시스템 요구 사항 즉, LTE-A에서 요구하는 높은 데이터 전송률을 만족시키기 위한 대역폭(Bandwidth)를 확장하기 위한 방안으로써, 다수개의 단위 반송파인 요소반송파 또는 컴포넌트 캐리어(Component Carrier, CC라 칭함)의 사용을 정의하고 있다. 여기서, 하나의 CC는 최대 20MHz의 대역폭을 가질 수 있으며, 해당 서비스에 따라 20MHz이내에서 자원 할당이 가능하다.

<35> 또한, 상기 하나의 요소 반송파들(Component Carriers)을 최대 5개까지 묶어 하나의 시스템 대역으로 사용하는 캐리어 집합체(carrier aggregation, 이하 "CA"라 함)의 사용을 정의할 수 있다. 따라서, 차세대 통신 시스템에서는 최대 100MHz까지 대역폭을 확장시켜 서비스 품질을 지원한다. 이때, 각 요소 반송파들에 의해 결정될 수 있는, 즉, 할당 가능한 주파수 대역은 실제 CA의 스케줄링에 따라 연속적(contiguous)일 수도 있고, 불연속적(non-contiguous)일 수도 있다.

<36> 즉, 본 명세서에서는 다수의 요소 반송파(component carrier)를 구별하기 위



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하여 CC로 표시하고 CC0, CC1과 같이 지시할 수 있다. 그러나, 이러한 요소 반송파에 포함되는 숫자가 요소 반송파의 순서 또는 해당 요소 반송파의 주파수 대역의 위치에 일치하는 것은 아니다.

<37> 도 1에서는 제 1 요소 반송파(CC1, 110), 제 2 요소 반송파(CC2, 120), 제 3 요소 반송파(CC3, 130), 제 4 요소 반송파(CC4, 140)로 구성되어 있으며, 각각의 요소 반송파는 스케줄러에 따라 업링크 또는 다운링크가 상이하게 할당될 수도 있고, 또는 동일한 업링크와 다운링크가 함께 할당되어 사용될 수도 있다.

<38> 한편, 무선 통신 환경에서는 송신기에서 전파가 전파되어 수신기에서 전달되는 동안에 전파지연(propagation delay)를 겪게 된다. 따라서 송수신기 모두 정확히 송신기에서 전파가 전파되는 시간을 알고 있다 하더라도 수신기에 신호가 도착하는 시간은 송수신기간 거리, 주변 전파 환경 등에 의해 영향을 받게 되고 수신기가 이동하는 경우 시간에 따라 변하게 된다. 만일 수신기가 송신기가 전달하는 신호가 수신되는 시점을 정확히 알 수 없는 경우 신호 수신이 실패하거나 수신하더라도 왜곡된 신호를 수신하게 되어 통신이 불가능하게 된다.

<39> 따라서, 무선 통신 시스템에서는 기지국과 UE간 동기가 다운링크/업링크를 막론하고, 정보 신호를 수신하기 위해 반드시 선결되어야 한다. 즉, 동기획득 절차는 통신 시스템에서 매우 중요한 절차이며 이를 유지하는 것 또한 시스템 안정성 및 통신 품질에 큰 영향을 주게 된다.

<40> 한편, 동기의 종류는 프레임 동기, 정보심벌 동기, 샘플링 주기 동기 등 으로 다양하며, 이 중에서 샘플링 주기 동기의 경우 물리적 신호를 구분하기 위해 가



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장 기본적으로 획득하여야 하는 동기라 할 수 있다.

<41> 기지국에서 UE에게 전송하는 방향의 통신링크인 다운링크 전송에서 동기 획득은 UE에서 기지국의 신호를 기반으로 이루어진다. 기지국은 UE에서 다운링크 동기 획득이 용이하도록 상호 약속된 특정 신호를 전송하며 이를 기반으로 UE에는 기지국에서 보내온 특정 신호가 전송된 시간을 정확히 분별할 수 있어야 한다. 다운링크의 경우 하나의 기지국이 다수의 UE에게 동시에 동일한 동기 신호를 전송하므로 UE각각이 독립적으로 동기신호를 통하여 동기를 획득할 수 있다.

<42> 그러나 업링크의 경우 기지국은 다수의 UE로 부터 송신된 신호를 수신하게 되므로 어느 하나의 UE를 기준으로 동기를 획득할 수가 없다. 따라서 다운링크와 다른 동기획득 절차가 필요하다.

<43> 따라서, 각 UE와 기지국간 거리가 상이한 경우 서로 다른 전송지연 시간을 갖게 되고, 각각 획득한 다운링크 동기를 기준으로 업링크 정보를 송신하는 경우, 각 UE의 정보가 서로 다른 시간에 해당 기지국에서 수신되게 된다.

<44> 즉, 무선 통신 시스템에서 사용하는 전송방식이 서로 다른 시간에 각 UE의 업링크 정보가 수신되더라도 이를 분리하여 수신할 수 있는 CDMA와 같은 방식을 사용하는 경우에는 복잡도를 증가시키기는 하지만 큰 문제 없이 정보를 수신할 수 있으나, OFDMA 또는 FDMA를 기반으로 하는 무선 통신 시스템에서는 기지국에서 모든 UE의 업링크 송신정보를 동시에 수신하여 한꺼번에 복조하는 방식으로 운영되므로 정확한 시간에 수신될수록 수신 성능이 높아지며 기지국에서 각 UE 신호의 수신시간의 차이가 커질수록 수신성능은 급격히 열화된다.



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<45> 따라서, 기존 LTE와 같은 OFDMA 또는 SC-FDMA을 업링크 전송방식으로 사용하고 있는 시스템에서는 다운링크에서의 전송지연시간과 업링크에서의 전송지연시간을 획득하기 위해 각 UE마다 랜덤 접속방식 등을 이용하여 Timing Alignment 값을 계산하고 이를 각 UE에게 알려주어 업링크 동기를 획득하도록 하고 있다.

<46> 도 2는 본 발명이 적용되는 동기화 과정에서의 TA(Timing Advance)와 관련된 예를 보여주는 도면이다.

<47> 일반적으로, 기지국과 단말이 통신을 수행하기 위해서는 다운링크 라디오 프레임i(210)가 송신되는 시점과 일치하도록 업링크 라디오 프레임i(220)을 송신해야 한다. 그런데, 사용자 단말과 기지국사이에는 전파 지연 등으로 인해 시간차가 발생한다.

<48> 따라서 이러한 전파 지연을 고려하여 다운링크 프레임 i(210)보다 조금 일찍 단말로 하여금 업링크 라디오 프레임i(220)을 송신하여 기지국의 단말간의 동기를 맞추는 방안으로써 TA(Timing Advance)가 적용될 수 있다. 상기 TA를 계산하는 수식을 살펴보면 다음과 같다.

<49> [수학식 1]

【0050】 $$\mathrm{TA} = \left(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}\right) \cdot T_{\mathrm{s}} \quad \mathrm{seconds}$$

<51> 여기서, $N_{TA}$는 기지국으로부터 TA 명령 정보에 따라 제어되는 가변적인 값이며, $N_{TAoffset}$은 프레임 구조에 따라 고정되어 설정되는 값이다. 한편 $T_s$는 샘플링 주



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기를 의미한다. 도 2에서 알 수 있듯이, 업링크 동기화를 이루기 위하여 사용자 단말은 기지국에서 제공하는 TA 명령 정보를 수신하여 이를 기반으로 TA를 진행할 수 있다. 따라서, 기지국과의 무선 통신을 위한 동기를 획득한다.

<52> 도 3은 본 발명이 적용되는 사용자 단말과 기지국 사이의 랜덤 액세스 과정을 보여주는 도면이다.

<53> 도 3을 참조하면, 사용자 단말(User Equipment, UE)(380)은 기지국(390)과 데이터를 송수신하기 위하여 업링크 동기를 필요로 한다. 업링크 동기를 위해 기지국(390)으로부터 동기에 필요한 정보를 수신하는 과정을 진행할 수 있다. 도 3은 동기에 필요한 정보를 수신하기 위한 랜덤 액세스 과정(Random Access Procedure)를 진행하는 과정을 보여준다. 랜덤 액세스 과정은 사용자 단말이 네트워크에 핸드오버 등을 통해 새로이 결합하는 경우에도 적용할 수 있고 네트워크에 결합한 후, 동기화 또는 상태 변경(RRC_IDLE에서 RRC_CONNECTED)과 같이 다양한 상황에서 진행할 수 있다.

<54> 사용자 단말(380)은 먼저 랜덤 액세스 프리엠블(Random access preamble)을 생성하기 위해 프리엠블 시그니처(preamble signature)를 무작위(random, 랜덤)로 선택한다. 그리고 선택한 프리엠블을 기지국(390)에 송신한다(S310). 프리엠블 시그니처 선택시 경쟁 기반(contention-based)으로 진행할 수 있다. 한편 무 경쟁 기반(contention-free)로 진행하는 방식도 사용할 수 있다. 이 경우, 기지국은 미리 예약한 랜덤 액세스 프리엠블을 단말에게 알려주며 해당 단말은 수신된 정보를 기반으로 선택한 프리엠블을 기지국(390)에게 송신한다(S310). 이 경우, 경쟁 기반



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방식에서 필요한 CR 메시지와 같은 절차는 수행하지 않아도 된다.

<55> 여기서, 상기 사용자 단말(380)은 프리엠블 선택 또는 RACH 전송을 위해 임시 선택한 주파수 자원과 전송 시점을 고려하여 RA-RNTI(Random Access-Radio Network Temporary Identifier)을 인지할 수 있다.

<56> 기지국(390)은 수신된 UE의 프리엠블에 대하여 랜덤 액세스 응답(Random access response, RAR)을 수행하는데, 이때, 물리 다운링크 데이터 채널(Physical downlink shared channel, PDSCH)를 통해 상기 랜덤 액세스 응답 메시지를 송신한다.

<57> 상기 RAR메시지를 통해 송신하는 정보는, 일 예로, 기지국에 의해 수신된 UE 프리엠블의 식별정보, 기지국의 식별자(ID), 임시 C-RANI(Cell Radio Network Temporary Identifier), 상기 UE 프리엠블을 수신한 타임 슬롯에 대한 정보, 그리고 TA 정보 등이 포함될 수 있다. 이에, 업링크 동기화를 위한 타이밍 정보가 상기 RAR메시지를 통해 수신되므로, 사용자 단말(380)은 기지국(390)과의 업링크 동기화를 수행할 수 있다. 사용자 단말(380)은 S320 단계에서 수신한 TA 정보를 이용하여 결정된 스케쥴 시점에서 데이터 전송(Scheduled transmission)을 수행한다(S330). 물리 업링크 데이터 채널(Physical uplink shared channel, PUSCH)를 통해 동기화 시킨 데이터를 송신하며, HARQ(Hybrid Automatic Repeat reQuest)을 수행할 수도 있다.

<58> 상기 S330 단계에서 송신되는 메시지는 일 예로, RRC 연결 요청(RRC Connection Request), 트래킹 영역 변경(Tracking Area update), 스케줄링 요청



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(Scheduling request) 등을 포함할 수 있다. 또한, 상기 메시지 중 하나는, 임시 C-RNTI, C-RNTI (if the UE already has one), 또는 UE 식별자 정보 등을 포함할 수 있다.

<59> 한편 S310~330 과정에서 충돌(collision)이 발생할 수 있으므로, 기지국(390)은 CR메시지(Contention resoulution message)를 송신하면(S340), UE(380)는 i) UE(380)이 수신한 메시지가 자신의 것인지 확인하고 ACK를 보내거나, ii) 수신한 메시지가 다른 UE의 것으로 확인하고 응답 데이터를 보내지 않는다. 물론 다운링크 할당을 놓치거나 메시지를 디코딩 하지 못하는 경우에도 응답 데이터를 보내지 않게 된다. 또한, 상기 CR메시지(Contention resoulution message)는 C-RNTI 또는 UE 식별자 정보 등을 포함할 수 있다.

<60> 하나의 반송파를 사용하는 경우의 TA를 획득하는 과정과는 달리, 본 발명이 적용되는 다수의 요소 반송파를 운영하는 무선 시스템에서는 도 1과 같이 각 요소 반송파간 중심 주파수의 위치가 크게 이격되어 있거나, 각 요소 반송파를 지원하는 망 내 장치가 동일하지 않는 등의 경우, 각 요소 반송파간에 TA의 값은 서로 상이할 가능성이 높아진다.

<61> 따라서, 단일 반송파에서 사용하던 동기 획득 방안을 그대로 이용하는 경우, 다수의 요소 반송파의 모든 요소 반송파에 대한 업링크 동기를 획득하기 어렵게 된다. 그러므로 사용자 단말은 사용가능 요소 반송파 중에서 업링크 동기를 획득한 일부 요소 반송파에 한하여, 안정적인 업링크 통신을 수행하게 된다.

<62> 또한, 만일 사용자 단말이, 업링크 동기 기준이 서로 상이한 요소 반송파에



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대하여 동일한 업링크 동기 기준을 통해 정보를 전송할 경우, 전송 오류가 발생할 확률이 매우 높고 이를 복구하기 위한 시간 및 자원낭비를 초래할 수 있다. 이러한 경우, 시스템에서 요구되는 응용프로그램에 대한 업링크 QoS(Quality of Service)를 만족시키기 어려울 수 있다.

<63> 또한, 만일 무선 통신시스템에서 다수의 요소 반송파를 운용하는 경우, 단일 UE에 대하여 각 요소 반송파의 특성 및 무선 망 내 지원방식에 따라 다운링크에서의 전송지연시간이 서로 상이할 수 있으며, 이로 인해 각 요소 반송파 또는 동일한 TA값을 갖는 요소 반송파를 집합으로 구성하는 경우 각 요소 반송파 집합별 업링크 동기기준이 서로 상이하게 되어 이로 인한 업링크 성능열화가 발생할 수 있다.

<64> 따라서, 본 발명은 다수의 요소 반송파들을 사용하는 무선 통신 시스템에서 각 요소 반송파마다 또는 적어도 하나 이상의 요소 반송파로 구성된 요소 반송파 그룹간의 업링크 동기 기준이 상이한 경우, 사용자 단말에서 각 요소 반송파의 타입, 중심 주파수 위치 및 망 서비스 형태 등에 따라 해당 요소 반송파 또는 요소 반송파 그룹의 업링크 동기를 획득하는 방안을 제공하고자 한다.

<65> 이하 사용자 단말은 UE로, 기지국은 eNB로 기재하여 설명을 진행하고자 한다.

<66> 도 4는 본 명세서의 일 실시 예에 의한 업링크 동기를 획득하는 과정을 보여주는 도면이다.

<67> 도 4에서는 eNB가 UE에게 다수의 요소 반송파에 관련된 정보를 송신하면 UE



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가 요소 반송파들 중에서 타이밍과 관련된 그룹을 설정하고, 대표 요소 반송파를 통해 RAP(Random Access Procedure)를 진행하는 과정을 보여준다.

<68> 상기 도 4를 참조하면, UE(480)와 eNB(490)가 연결된 상태(RRC_CONNECTED)인 경우 S410 단계를 진행한다. 만약 무선 자원 제어 연결 상태가 IDLE이거나 재설정이 필요한 경우에는 S405 단계를 먼저 진행하고 S410 단계를 진행한다.

<69> S405 단계는 무선 자원 제어 연결을 진행하는 단계이다. 이는 eNB(490)와 UE(480)가 무선자원제어연결 상태가 IDLE 모드인 경우, 또는 무선자원제어연결을 재설정해야 하는 경우 eNB(490)는 해당 UE의 요소 반송파 집합을 정의하여 전송할 수 없다. 따라서, 무선자원제어연결을 진행할 적어도 하나 이상의 요소 반송파를 선택하여 요소 반송파 집합 정보를 구성 하여 무선자원제어연결을 진행한다(S405). 무선자원제어연결을 진행할 적어도 하나 이상의 요소 반송파를 선택하기 위해 다음 중 하나의 방법을 이용할 수 있다.

<70> i) UE(480)가 측정(measurement)한 정보를 기반으로 무선자원제어연결을 시도할 가장 적합한 요소 반송파 선택할 수 있다.

<71> ii) UE(480) 내부 메모리에 저장되어 있는 시스템에서 고정적으로 설정한 정보 이용하여 무선자원제어연결을 시도할 수 있다.

<72> iii) eNB(490)에서 시스템 정보를 통해 UE(480)에게 전송한 정보를 이용하여 무선자원제어연결을 시도할 수 있다.

<73> iv) UE(480)내부 메모리에 저장되어 있는 유효한 요소 반송파들의 시스템 정



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보 이용하여 해당 요소 반송파들을 통해 무선자원제어연결을 시도할 수 있다.

<74> 상기 방법들 중 하나를 통해 무선자원제어연결 진행이 완료되어 eNB(490)와 UE의 무선자원제어연결 상태가 설정된 상태(RRC_CONNECTED 모드)가 되었다면 S410의 절차를 진행한다.

<75> eNB(490)는 해당 UE(480)의 하드웨어 성능, eNB(490)의 가용 주파수 자원 등을 고려하여 UE(480)에게 다수의 요소 반송파(CC)를 사용하도록 허용할 수 있으며 이를 집합으로 정의할 수 있다. eNB(490)은 UE(480)의 사용하도록 허용된 요소 반송파 집합 정보를 UE(480)에게 전송한다(S410).

<76> 앞서 살펴본 바와 같이, UE(480)와 eNB(490)는 S405 단계 또는 이전부터 RRC_CONNECTED를 유지하고 있는 상태, 즉 UE(480)의 무선자원제어연결이 설정된 업링크 요소 반송파의 업링크 동기가 유지되고 있는 경우이다. UE(480)는 eNB(490)으로부터 상기와 같은 기준으로 결정된 요소 반송파 집합 정보를 수신한다. 상기 요소 반송파 집합 정보의 송수신 방식은, 일 실시 예로 eNB(490)가 무선자원제어 재구성 메시지 내에 상기 요소 반송파 집합 정보를 포함하여 UE(480)에게 송신할 수도 있으며, 그 이외의 메시지가 사용될 수도 있다.

<77> UE(480)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들에 대한 시스템 정보(system information: 이하 SI)를 수신한다 (S420).

<78> 만약, 요소 반송파 집합 내에 요소 반송파들 중에서 해당 요소 반송파의 시스템 정보를 해당 요소 반송파로 전송할 수 없는 요소 반송파(예를 들어, 확장 요



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소 반송파 (extension component carrier: 이하 ECC))가 존재하는 경우, 시스템 정보를 수신할 수 있는 요소 반송파 또는 제어정보 형태로 변환된 시스템 정보를 수신할 수 있는 요소 반송파를 통해 수신할 수 있다. 이 방법 이외에 현 단계에서는 해당 요소 반송파에 대한 시스템 정보를 수신하지 않고 진행할 수 있다.

<79> UE(480)는 수신된 시스템 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들을 원소로 하는 업링크 타이밍 그룹(Uplink timing group, UL timing group)을 설정한다(S432). 상기 업링크 타이밍 그룹을 구성하는 과정에서 고려할 사항은 다음과 같다.

<80> 먼저 다수의 요소 반송파들 중에서 서로 다른 그룹으로 할당할 것인지를 판단하는 방식으로는 다음과 같은 조건을 고려할 수 있다. 즉, 다음의 적어도 하나 이상의 조건을 만족하는 요소 반송파는 그룹 설정 시 다른 그룹으로 설정할 수 있다.

<81> a-i) 요소 반송파들의 중심 주파수 값의 차이가 임계치 이상 범위인 요소 반송파 들은 서로 다른 그룹으로 할당한다 중심 주파수가 크게 차이날 경우, 무선 신호의 전파 과정에서 발생하는 지연이 달라지며 이에 따른 TA 값도 차이가 커질 가능성이 높아진다.

<82> a-ii) 서로 다른 빔포밍(beamforming)이 되는 요소 반송파들 간에도 서로 다른 그룹으로 할당한다. 빔포밍이 다르면 TA 값이 달라질 가능성이 높아진다.

<83> a-iii) 업링크 동기 갱신 요청이 있을 때마다 갱신하도록 설정된 요소 반송



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파들도 서로 다른 그룹으로 할당한다. 상기 설정은 eNB(490)에 의해 설정된 시스템 정보 내에 포함되어 전송될 수도 있으며 그 이외의 메시지 내에 포함되어 전송 될 수도 있다.

<84> a-iv) 매크로 셀(Macro cell)에서 서비스 하지 않는 요소 반송파이거나 펨토 셀(femto cell), 피코셀(pico cell), 마이크로 셀(micro cell), 릴레이(relay), 리피터(repeater) 등에 의해 매크로 셀과 중첩된 공간에서 서비스 되는 요소 반송파들과 매크로 셀 에 의해 서비스 되는 요소 반송파 간에도 그 특성이 상이하므로 서로 다른 그룹으로 설정할 수 있다.

<85> a-v) eNB(490)으로부터 업링크 동기 갱신 요청이 있는 요소 반송파 역시 동기가 변화된 요소 반송파이므로 다른 그룹으로 할당할 수 있다.

<86> 상기 설명한 바와 같이, 업링크 타이밍 그룹으로 설정하는 조건은 앞서 살펴본 a-i)~ a-v)가 일 실시 예가 될 수 있으나, 이외에도 무선의 전파 특성과 소정 측정치 등을 고려하여 하나의 그룹으로 설정하거나, 또는 상이한 그룹으로 설정할 수 있다.

<87> 한편, 아래의 조건을 만족하는 경우는, 하나의 그룹으로 설정할 수 있다.

<88> b-i) 요소 반송파들의 중심 주파수 값의 차이가 임계치 이내 범위인 요소 반송파 간에는 전파 특성이 유사할 수 있으므로 하나의 그룹으로 할 수 있다.

<89> b-ii) 동일한 빔 포밍이 되는 요소 반송파들 간 하나의 그룹으로 할 수 있다.



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<90> b-iii) 동일한 무선 망 내 장치에서 사용되는 요소 반송파들 간에 하나의 그룹으로 설정할 수 있다.

<91> b-iv) 또한, 상기 서로 상이한 그룹에 속하도록 하는 조건(a)을 만족하지 않는 요소 반송파들을 하나의 그룹으로 생성할 수 있다.

<92> UE(480)에서 그룹을 생성하는 방식으로는 두 가지 방식, 즉 상이한 그룹에 속하는 요소 반송파를 구별하여 그룹을 생성하는 방식과 동일한 그룹에 속하도록 요소 반송파를 구별하여 그룹을 생성하는 방식으로 나뉘어 지며, 상기 두 방식을 혼용할 수 있고 어느 하나의 방식으로 진행할 수 있다 각각의 방식을 적용하는 과정에서 판단할 조건은 앞서 살펴본 바와 같다.

<93> 업링크 타이밍 그룹이 생성되면, UE(480)는 각 그룹 내 대표 요소 반송파(delegate CC)를 설정한다(S434). 이때, 대표 요소 반송파를 설정하는 기준은, 업링크 동기 획득을 위한 TA값을 획득이 가능한 요소 반송파 중에서 다음을 조건을 고려하여 설정할 수 있다.

<94> c-i) 가장 낮은 중심 주파수 값을 갖는 요소 반송파,

<95> c-ii) 가장 평균에 가까운 중심 주파수 값을 갖는 요소 반송파,

<96> c-iii) 가장 높은 중심 주파수 값을 갖는 요소 반송파,

<97> c-iv) 주파수 대역이 가장 넓은 요소 반송파,

<98> 중에서 하나를 대표 요소 반송파로 설정할 수 있다.

<99> 한편, 각각의 업링크 타이밍 그룹별 대표 요소 반송파를 설정하는 방법은,



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모든 그룹에 대하여 동일한 기준으로 설정할 수 있고, 또는 각 타이밍 그룹별로 구별되는 조건만 만족하는 다른 기준을 설정할 수 있다. 즉, 대표 요소 반송파의 선택은, 각 그룹의 네트워크 상태, 그룹을 구성하는 요소 반송파들의 특징 등을 고려하여 선택할 수 있다.

<100> S432, S434 단계를 완료하여 업링크 타이밍 그룹과 해당 그룹의 대표 요소 반송파를 설정한 후, UE(480)은 업링크 동기 획득을 위하여, 각 그룹 내 대표 요소 반송파들을 통해, 즉, 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 자원 중 하나를 선택하여 설정한 프리엠블을 전송한다(S440). 해당 프리엠블의 전송은 eNB(490)에 의해 설정된 시간/주파수 자원에서 UE(480)가 순차적으로 또는 동시에 또는 랜덤하게 프리엠블을 선택된 CC를 통해 전송하는 것을 포함할 수 있다.

<101> 한편, 업링크 동기 획득이 필요한 상황은 다음과 같다. 또는 다음의 상황이 아니어도, UE(480)에서 필요 여부를 판단하여 랜덤 액세스 프리엠블을 생성하여 eNB(490)로 송신할 수 있다.

<102> d-i) eNB(490)이 다운링크 동기에 대한 전체 재설정을 요구하는 경우,

<103> d-ii) 모든 업링크 데이터의 전송을 초기화하고 재시도하는 경우,

<104> d-iii) UE(480) TimeAlignment timer가 만료되었을 경우,

<105> UE(480)는 사용 가능한 전체 요소 반송파 그룹들에 대하여 업링크 동기 획득을 위한 프리엠블을 송신할 수 있다.



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<106> 또한, UE(480)는 사용 가능한 일부 요소 반송파 그룹에 대하여 업링크 동기 획득을 필요로 할 수 있다. 이러한 조건은 아래와 같다.

<107> e-i) 요소 반송파 그룹이 최초로 설정되어 해당 그룹 내에 TA값이 존재하지 않는 경우,

<108> e-ii) UE(480)의 그룹 내 요소 반송파들을 통한 업링크 전송 데이터에 대한 응답이 모두 없을 경우,

<109> e-iii) eNB(490)과 UE(480)간 RRC 연결을 재구성(re-configuration)한 경우,

<110> e-iv) UE(480)가 물리적으로 다른 eNB(490)으로 특정 요소 반송파 그룹이 핸드오버 하는 경우,

<111> e-v) eNB(490)이 다운링크 동기에 대한 특정 요소 반송파 그룹에 대하여 재설정을 요구하는 경우,

<112> e-vi) 요소 반송파 TA 타이머(CC TimeAlignment timer)가 만료되었을 경우(상기 타이머는 각 요소 반송파 또는 그룹마다 설정 가능한 타이머임)에는 해당 요소 반송파가 포함된 요소 반송파의 그룹에 대해 업링크 동기 획득을 진행할 수 있다.

<113> 일 예로, 상기 S432, S434 단계에서 요소 반송파 CC1, CC2, CC3, CC4, CC5가 있고, CC1, CC2는 그룹1, CC3, CC4, CC5는 그룹 2로 설정되었으며, 그룹 1의 대표 요소 반송파가 CC1이며, 그룹 2의 대표 요소 반송파가 CC3인 경우, UE(480)에서 사용 가능한 전체 요소 반송파 그룹들에 대해 업링크 동기가 필요할 경우 CC1과 CC3



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을 통해 랜덤 액세스 프리엠블을 송신할 수 있다. 한편, 일부 요소 반송파 그룹에서 동기 획득이 필요한 상황에서 그룹 2에 대해 동기 획득이 필요할 경우, CC3을 통해 랜덤 액세스 프리엠블을 송신할 수 있다.

<114> 또한, 만일 업링크를 통하여 데이터 송신 중인 상황에서 업링크 동기를 재설정하여야 하는 경우에는, UE(480)는 다음과 같은 동작(예를 들어 업링크 데이터 전송 초기화)을 우선적으로 수행한 후, 업링크 동기를 확보하기 위한 절차로 HARQ 버퍼들 초기화, PUCCH(Physical Uplink Control Channel)/SRS(Sounding Reference Signal) 해제, SPS(Semi-Persistent Scheduling) 할당/허용 초기화 등을 진행할 수 있다.

<115> eNB(490)은 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파 그룹(대표 요소 반송파)에 대하여 그룹 별 TA값을 계산한다. 그리고 eNB(490)은 UE(480)의 업링크할당(UL grant) 정보와 업링크 타이밍 그룹(대표 요소 반송파)의 TA값을 랜덤 액세스 응답(random access response) 메시지를 통해 UE(480)에게 전송한다(S450).

<116> 그 후, UE(480)는 CR(contention resolution) 절차(S460)를 통해 수신한 TA 값이 유효하다고 판단되면 해당 TA값을 그룹 내 다른 요소 반송파에 적용하여 업데이트 한다(S470).

<117> 앞서 살펴본 바와 같이, 전체 그룹에 대해 업링크 동기 획득 절차를 진행한 경우, CC1, CC3에 대한 TA 값을 그룹 1, 2에 포함된 요소 반송파들에 적용할 수 있다. 만약 그룹 2에 대해 CC3의 TA 값을 수신한 경우, 그룹 2에 포함된 요소 반송파



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들에 적용할 수 있다.

<118> 도 5는 본 명세서의 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다. 여기서, 도 5는 기지국인 eNB(590)에서 업링크 타이밍 그룹을 설정하는 경우를 보여준다.

<119> 도 5를 참조하면, eNB(590)가 업링크 타이밍 정보를 송신하기에 앞서, eNB(590)은 UE의 모드(RRC_CONNECTED/ RRC_IDLE)를 확인한다. UE와 연결되어 있지 않는 경우, 무선 자원 제어 연결을 진행할 수 있으며(S505), 이는 도 4의 S405과정과 동일하게 적용 가능하다.

<120> 또한, eNB(590)에서 그룹을 생성하는 방식은 도 4에 언급한 a) 또는 b) 조건을 참조할 수 있다.

<121> 따라서, eNB(590)은 해당 UE(580)의 요소 반송파 집합 정보와 상기 설정한 업링크 타이밍 그룹 정보를 UE(580)에게 전송한다(S510). 여기서, 상기 업링크 타이밍 그룹 정보는, 상기 요소 반송파 집합 정보(CC set info.) 메시지 에 포함되어 UE(580)에 전송될 수도 있으며, 그와 별개로 독립적으로 설정된 메시지를 이용하여 전송될 수도 있다. 별개로 설정된 메시지인 경우에 대해서는 도 6을 참조하여 설명하고자 한다. 한편, UE별로 제공되는 요소 반송파 집합 정보 전송 메시지(CC set infomation message)는 RRC (L3) 메시지일 수도 있으며 L1 시그널링일 수도 있으며 L2 시그널링 일 수도 있다.

<122> UE(580)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들



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의 시스템 정보(system information: 이하 SI)를 수신한다(S520). 이때, UE(580)는 eNB(590)에 의해 S508 단계에서 생성된 업링크 타이밍 그룹을 그대로 이용하거나, 혹은 현재의 네트워크 상황에 맞추어 도 4의 S432와 같이 업링크 타이밍 그룹을 일부 수정할 수 있다. 이는 UE(580)가 eNB(590)에 의해 생성된 그룹이 실제 UE(580)의 환경에 적합하지 않는 경우에, 상기 업링크 타이밍 그룹을 추가 수정할 수 있음을 포함한다.

<123> 즉, 업링크 타이밍 그룹 정보를 수신한 후, 혹은 업링크 타이밍 그룹 정보를 변경하거나 새로이 생성한 후, UE(580)는 각각의 업링크 타이밍 그룹에 대해 대표 요소 반송파를 선택한다(S534). 업링크 타이밍 그룹에 대한 대표 요소 반송파의 선택시 고려할 조건들은 도 4의 S434에서 살펴본 바와 같다

<124> S534에서 업링크 타이밍 그룹별로 대표 요소 반송파를 선택하는 과정이 완료한 후, 업링크 동기 획득이 필요한 상황이 발생하게 되면, 각 그룹 내 대표 요소 반송파들은 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 자원 중 하나를 선택하여 선택한 프리엠블을 전송한다(S540).

<125> 여기서, UE(580)는 업링크 타이밍 정보를 얻기 위한 랜덤 액세스 프리엠블을 송신하는 메시지(Random access preamble transmit message) 등을 보낼 수 있다. 또한, 해당 프리엠블을 전송하는 방법은 eNB(590)에 의해 설정된 시간/주파수 자원에서 UE(580)에 의해 순차적으로 또는 동시에 또는 랜덤하게 선택되어 전송될 수 있다.



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<126> 한편, UE(580)에 의해 업링크 동기 획득이 필요한 상황은 d 조건을 참조할 수 있다. 또한, UE(580)는 사용 가능한 전체 요소 반송파 그룹들에 대하여 업링크 동기 획득을 위해 프리엠블을 송신할 수 있다. 한편, UE(580)는 사용 가능한 일부 요소 반송파 그룹에 대하여 업링크 동기 획득을 필요로 할 수 있다.

<127> eNB(590)는 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파 그룹(대표 요소 반송파) 마다 그룹 별 TA값을 계산하고, 해당 TA값을 업링크할당(UL grant) 정보와 함께 랜덤 액세스 응답(random access response) 정보에 포함시켜 UE(580)에게 전송한다(S550).

<128> 일 실시 예로 eNB(590)는 S508 단계에서 설정하였던 업링크 타이밍 그룹을 고려하여 TA 값을 계산하여 전송할 수 있다. 또한, 특정 요소 반송파를 통해 상기 랜덤 액세스 응답메시지를 송신할 수 있고, 해당 업링크 타이밍 그룹 내의 모든 요소 반송파들을 통해 랜덤 액세스 응답메시지를 송신할 수 있다.

<129> UE(580)는 CR(contention resolution) 절차(S560)를 통해 수신한 TA 값이 유효하다고 판단되면 해당 TA값을 그룹 내 다른 요소 반송파에 적용하여 업링크 타이밍 그룹별 TA를 업데이트 한다(S570).

<130> 도 6은 본 발명의 또 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다. 여기서, 도 6은 기지국인 eNB(690)에서 업링크 타이밍 그룹을 설정하고 그룹 정보를 별도의 메시지를 이용하여 송신하는 경우를 보여준다.

<131> eNB(690)는 UE(680)의 모드(RRC_CONNECTED/ RRC_IDLE)를 확인한다. UE(680)



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와 연결되어 있지 않는 경우, 무선 자원 제어 연결을 진행할 수 있으며(S605), 이는 도 4의 S405, 도 5의 S505 과정과 동일하다.

<132> eNB(690)는 해당 UE(680)의 하드웨어 성능, eNB(690)의 가용 주파수 자원 등을 고려하여 UE(680)에게 다수의 요소 반송파(CC)를 사용하도록 허용할 수 있으며 이를 집합으로 정의할 수 있다. eNB(690)은 해당 UE(680)의 요소 반송파 집합 정보를 UE(680)에게 전송한다(S610). UE별로 제공되는 요소 반송파 집합 정보 전송 메시지(CC set infomation message)는 RRC (L3) 메시지 등에서 사용되는 메시지 일 수도 있으며 L1 시그널링일 수도 있으며 L2 시그널링 일 수도 있다.

<133> 앞서 살펴본 바와 같이, UE(680)와 eNB(690)는 S605 단계 또는 이전부터 RRC_CONNECTED를 유지하고 있는 상태, 즉 UE(680)의 무선자원제어연결이 설정된 업링크 요소 반송파의 업링크 동기가 유지되고 있는 경우이다. UE(680)는 eNB(690)으로부터 상기와 같은 기준으로 결정된 요소 반송파 집합 정보를 수신한다. 요소 반송파 집합 정보의 수신 방식의 일 실시 예로 eNB(690)는 무선자원제어 재구성 메시지 내에 요소 반송파 집합 정보를 포함하여 송신할 수도 있으며 그 이외의 메시지가 될 수도 있다.

<134> UE(680)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들의 시스템 정보(system information: 이하 SI)를 수신한다(S620).

<135> eNB(690)는 UE(580)에 할당된 요소 반송파들에 대하여 업링크 타이밍 그룹을 생성한다(S624). 상기 eNB(690)에서 업링크 타이밍 그룹을 설정하는 과정은 앞서 a, b조건들을 고려하여 서로 다른 그룹으로 또는 동일한 그룹으로 설정할 수 있다.



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<136> eNB(690)은 그룹을 생성하는 두 가지 방식, 즉, 상이한 그룹에 속하는 요소 반송파를 구별하여 그룹을 생성하는 방식과 동일한 그룹에 속하도록 요소 반송파를 구별하여 그룹을 생성하는 방식을 혼용할 수 있고 어느 하나의 방식으로 진행할 수 있다 각각의 방식을 적용하는 과정에서 판단할 조건은 앞서 살펴본 바와 같다.

<137> eNB(690)는 설정한 업링크 타이밍 그룹 정보를 UE(680)에게 전송한다(S626). 상기 업링크 타이밍 그룹 정보는, 요소 반송파 집합 정보(CC set info.) 메시지 등에 포함되지 않고 별개로 독립적으로 설정된 메시지를 이용하여 송신된다. 상기 업링크 타이밍 그룹 정보는PDCCH 채널, RRC 시그널링, 브로드캐스트 채널과 같은 채널을 통해 전송되며, L2 (MAC 엘레먼트 컨트롤) 메시지를 통해 전송될 수 있다.

<138> 상기 요소 반송파 집합 정보 메시지를 메시지를 수신한 UE(680)는 수신한 업링크 타이밍 그룹을 그대로 이용하거나, 현재의 네트워크 상황에 맞추어 업링크 타이밍 그룹을 일부 수정할 수 있다. 이는 eNB(690)에서 생성한 그룹이 실제 UE(680)의 환경에 적합하지 않는 경우 UE(680)가 수정을 할 수 있는 경우를 포함한다. 업링크 타이밍 그룹 정보를 수신한 후, 혹은 업링크 타이밍 그룹 정보를 변경하거나 새로이 생성한 후, UE(680)는 각각의 업링크 타이밍 그룹에 대해 대표 요소 반송파를 선택한다(S634). 상기 업링크 타이밍 그룹에 대한 대표 요소 반송파의 선택시 고려할 조건들은 도 4의 S434, 도 5의 S534에서 살펴본 바와 같다.

<139> S634에서 업링크 타이밍 그룹별로 대표 요소 반송파를 선택하는 과정이 완료



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한 후, 업링크 동기 획득이 필요한 상황이 발생하게 되면, 각 그룹 내 대표 요소 반송파들은 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 랜덤 접속을 위해 할당된 자원들 중 하나를 선택하여 해당 프리엠블을 전송한다(S640). 해당 프리엠블을 전송하는 방법은 eNB(690)에 의해 설정된 시간/주파수 자원에서 UE(680)에 의해 순차적으로 또는 동시에 또는 랜덤하게 선택되어 전송될 수 있다.

<140> eNB(690)는 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파(대표 요소 반송파) 마다 TA값을 계산하고 해당 값을 업링크할당(UL grant) 정보와 함께 랜덤 액세스 응답(random access response) 정보에 포함시켜 UE(680)에게 전송한다(S650). 일 실시 예로 eNB(690)가 S624 단계에서 설정하였던 업링크 타이밍 그룹을 고려하여 TA 값을 계산하여 미리 전송할 수 있다. 한편, eNB(690)는 특정 요소 반송파를 통해 랜덤 액세스 응답메시지를 송신할 수 있고 해당 업링크 타이밍 그룹 내의 모든 요소 반송파들을 통해 랜덤 액세스 응답메시지를 송신할 수 있다.

<141> UE(680)는 CR(contention resolution) 절차(S660)를 통해 수신한 TA 값이 유효하다고 판단되면, 해당 업링크 타이밍 그룹 별 TA값을 해당 그룹 내 다른 요소 반송파에 적용하여 업데이트를 수행한다(S670).

<142> 상기 도 6에서 설명한 바와 같이, UE(680)는 eNB(690)로부터 설정된 업링크 타이밍 그룹을 수신하고, 해당 그룹의 대표값을 통해 랜덤 액세스 절차를 수행한다. 그 후, 랜덤 액세스 절차에 따른 프리엠블에 대응하여 상기 타이밍 그룹의 TA값을 수신하여 동기 획득을 위한 업링크 타이밍 조절을 수행한다.



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<143> 도 7은 본 명세서의 일 실시 예에 의한 기지국에서 단말의 요청에 의해 단말이 업링크 동기 획득을 할 수 있도록 지원하는 도면을 설명한 것이다.

<144> 도 7을 참조하면, 기지국인 eNB는 UE의 RRC 모드를 확인한다(S702). eNB와 UE의 무선 자원 제어(RRC)의 연결 상태가 RRC_CONNECTED인 경우(S704), eNB는 다음 단계(S710)로 진행한다.

<145> 만약, RRC_CONNECTED가 아닌 경우에는, S705로 진행한다. S705에서 eNB는 UE로부터 RRC 연결 요청이 존재하는지를 확인할 수 있다. eNB는 UE로부터 RRC 연결 요청을 수신하고(S705), RRC 연결을 완료한다(S706). 이때, eNB는 UE로부터 RRC 연결 요청 메시지를 수신하고, RRC 연결 설정 메시지를 전송하며, 최종적으로 UE로부터 RRC 연결 설정 완료 메시지를 수신하여 RRC 연결을 완료한다.

<146> eNB는 RRC_CONNECTED UE에 대하여 사용 가능한 적어도 하나의 CC를 포함하는 CC 집합을 설정하고, 상기 설정된 CC 집합 정보를 UE로 송신한다(S710).

<147> 그리고 eNB는 상기 UE의 CC집합 정보를 기반으로 집합 내의 적어도 하나의 특정 요소 반송파에 대한 SI를 송신한다(S720). 여기서, 상기 CC 집합 정보는 RRC 메시지를 통해 전송가능하다. 또한, 상기 설정된 CC 집합의 SI는 브로드캐스트 채널을 통해 전송 가능하다.

<148> eNB는 업링크 타이밍 그룹 생성을 수행하는 주체가 eNB인지 확인한다(S722). 만약 eNB에서 업링크 타이밍 그룹을 생성하는 경우, 상기 UE의 CC집합 정보를 고려하여 업링크 타이밍 그룹을 생성하고, 생성된 업링크 타이밍 그룹에 대한 정보를



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UE에 송신한다(S726). 물론 업링크 타이밍 그룹을 생성하여 이에 대한 정보는, S710의 CC 집합 정보를 설정하여 송신하는 시점과 같이 진행하거나 CC 집합 정보와 함께 업링크 타이밍 그룹의 정보를 송신할 수 있다.

<149> 한편, eNB는 UE로부터 랜덤 액세스 프리엠블을 수신한다(S740). S740은 업링크 타이밍 그룹 생성을 수행하는 주체가 UE인 경우를 포함할 수 있다. 즉, UE가 S710의 사용 가능한 CC 집합 정보와, S720의 해당 CC의 SI 정보를 참조하여 업링크 타이밍 그룹을 생성하고, 생성된 타이밍 그룹별로 대표 요소 반송파를 설정하여, 해당 대표 요소 반송파를 통해 랜덤 액세스 프리엠블을 송신하는 동작을 포함한다. 따라서, eNB는 UE로부터 송신된 프리엠블을 수신하게 된다.

<150> 그 후, eNB는 수신된 프리엠블에 대하여 랜덤 액세스 응답 메시지를 송신하는데, 이 경우, 상기 UE에 할당된 업링크 할당 정보와 각 업링크 타이밍 그룹 별TA 정보를 함께 송신한다(S750). 여기서, 상기 업링크 타이밍 그룹 별 TA 정보는, 그룹 인덱스에 대응하여 TA 값을 포함하는 테이블 형태로 전송될 수 있다. 또한, 정해진 기준 TA값에 대응하여 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 형태로 전송될 수 있다. 이때, 상기 그룹 별 오차는 정해진 단위 값에 대응하여 정수배의 크기로 표기될 수 있다. 또는 그룹 별 오차를 구체적으로 명시할 수도 있다. 또는 정해진 규칙에 따라 TA를 나타내는 지시자 형태로 전송되는 것을 포함할 수 있다.

<151> 그리고, eNB는 UE에 CR(Contention Resolution) 메시지를 송신한다(S760). 이는 UE 로 하여금 수신한 TA 값의 유효성을 확인하여 해당 그룹의 TA 값을 업데이



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트 할 수 있도록 동작함을 포함한다.

<152> 도 8a는 본 명세서의 일 실시 예에 의한 UE에서 업링크 타이밍 그룹을 이용하여 업링크 동기화를 획득하는 과정을 보여주는 도면이다.

<153> 도 8a를 참조하면, UE는 RRC 모드를 확인한다(S802). 만약, RRC_CONNECTED가 아닌 경우, 즉, IDLE 모드인 경우에는 UE는 RRC 연결 설정 과정을 수행한다.

<154> 이에, UE는 RRC 연결을 설정할 특정 요소 반송파를 선택하고(S806), 선택한 특정 요소 반송파로 RRC 연결 요청(RRC Conneciton Request) 메시지를 전송하고, eNB로부터 RRC 연결 설정(RRC Conneciton setup) 메시지를 선택한 특정 요소 반송파를 통해 수신한 후, 최종적으로 eNB로RRC 연결 설정 완료(RRC Conneciton setup complete) 메시지를 전송하여 RRC 연결 설정을 완료한다(S808).

<155> RRC 모드를 확인한 결과, UE가 RRC_CONNECTED 인 경우(S804), 업링크가 지속적으로 유지되고 있는지 확인한다(S810).

<156> 업링크가 유지되고 있지 않다면, S812 단계로 진행한다. S812에서 UE는 eNB로부터 RRC 연결 재구성(RRC Conneciton setup Reconfiguration) 메시지를 수신하는지 확인한다(S812).

<157> 여기서, UE의 RRC 모드가 IDLE 모드인 경우, 또는 RRC 연결 재구성을 수행하는 경우, eNB은 해당 UE의 요소 반송파 집합을 정의하여 전송할 수 없다. 따라서, UE는 f-i) UE가 measurement한 정보를 기반으로 RRC Connection을 시도할 가장 적합한 요소 반송파 선택, f-ii) UE의 내부 메모리에 저장되어 있는 시스템에서 고정



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적으로 설정한 정보 이용, f-iii) 기지국에서 시스템 정보를 통해 UE에게 전송한 정보 이용, f-iv) UE 내부 메모리에 저장되어 있는 유효한 요소 반송파들의 시스템 정보 이용 중 하나를 사용하여, RRC연결을 진행할 적어도 하나 이상의 요소 반송파를 선택하고, 요소 반송파 집합 정보를 구성할 수 있다. 한편, RRC 연결이 완료되어 UE의 모드가 RRC Connected 모드가 되었다면 S830으로 진행한다.

<158> 만일, UE가 핸드오버를 진행하고 있다면 수신한 RRC 연결 재구성 메시지를 확인하여(S814), 모빌리티 제어 정보 (Mobility Control Information, MCI)을 확인한다(S816). 그리고, 확인한 MCI 정보를 기반으로 목표 기지국(T-eNB)로부터 해당 CC의 동기 획득을 위한 정보를 확인한다(S818). 즉, UE는 목표 기지국(T-eNB)로부터 업링크 동기화를 획득할 수 있다. 만일, UE가 핸드오버를 진행하고 있지 않다면 수신한 RRC 연결 재구성 메시지만을 확인하고(S814), S816 및 S818절차를 진행하지 않는다.

<159> 다시 설명하여, 업링크 동기화를 획득하는 과정에서, 만일 UE가 핸드오버하고 있지 않는 경우에 UE는 소스 기지국과 해당 요소 반송파의 업링크 동기를 획득하기 위한 절차를 진행하여 업링크 동기를 획득한다. 한편, 일 예로, UE가 핸드오버하고 있는 경우, UE는 해당 요소 반송파의 업링크 동기를 획득하기 위한 절차를 소스 기지국으로부터 전송받은 목표 기지국의 요소 반송파의 시스템 정보를 기반으로 업링크 동기를 획득하기 위한 절차를 진행하여 업링크 동기를 획득한다. 바람직하기로는 랜덤 접속 절차를 이용할 수도 있으며 그 이외의 절차가 적용될 수도 있다.



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<160> 그 후, UE는 소스 기지국(S-eNB) 또는 목표 기지국(T-eNB)과의 동기를 맞추기 위하여 임의의 프리엠블을 선택하여 소스 기지국(S-eNB) 또는 목표 기지국(T-eNB)로 전송한다(S820). 상기 UE의 프리엠블 전송에 따라 소스 기지국(S-eNB) 또는 목표 기지국(T-eNB)로부터 랜덤 액세스 응답 메시지를 수신할 수 있다. 여기에는 상기 UE를 위한 업링크 할당 정보과 업링크 동기를 맞추기 위한 적어도 하나 이상의 CC를 포함하는 그룹 별 TA 정보가 포함되어 있다(S822).

<161> UE는 CR(Contention Resolution) 과정을 통해 상기 S822에서 수신한 TA가 유효한지 검증하고(S824), 상기 TA가 유효하다고 판단하는 경우, 수신한 TA값에 따라 적어도 하나 이상의 CC를 포함하는 업링크 타이밍 그룹을 업데이트한다(S826).

<162> 한편, RRC 재구성 메시지를 수신하지 않은 경우에는 S820 단계로 진행하여 해당 동작을 수행한다.

<163> 업링크가 유지되거나 UE가 업링크 동기화를 획득한 상황에서, UE는 eNB로부터 요소 반송파들의 집합 정보를 수신한다(S830). 또한, 수신한 CC 집합에 대한 SI 정보를 수신한다(S832).

<164> 그 후, UE는 업링크 타이밍 그룹 정보를 수신하였는지 확인한다(S840). 이때, 업링크 타이밍 그룹 정보가 eNB에서 생성되는 경우, UE는 상기 CC 집합 정보 수신 과정, 혹은 별도의 메시지를 통해 상기 업링크 타이밍 그룹 정보를 수신할 수 있다. 상기 업링크 타이밍 그룹 정보에는 각 그룹별 대표 CC정보도 포함될 수 있다. 만일 상기 업링크 타이밍 그룹 정보에 각 그룹별 대표 CC정보가 포함되어 있



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다면, S852절차를 진행하지 않으나 만일 상기 업링크 타이밍 그룹 정보에 각 그룹별 대표 CC정보가 포함되어 있지 않다면, UE는 수신한 업링크 타이밍 그룹 정보를 확인하여, 해당 업링크 타이밍 그룹에서 대표 CC를 설정한다(S852). 상기 대표 CC는 도 4의 c 조건을 고려하여 설정될 수 있다. 또한, 각 업링크 타이밍 그룹의 TA 조정을 위한 대표 CC는 모든 그룹에 동일한 기준을 적용하여 설정될 수도 있고, 각 업링크 타이밍 그룹의 특성을 고려하여 상이한 기준을 적용하여 설정될 수도 있다.

<165> 한편, 업링크 타이밍 그룹 정보를 수신하지 않았거나, 수신한 업링크 타이밍 그룹 정보가 현재 UE가 위치한 무선 상황 또는 UE에 적합하지 않은 경우, UE는 수신한 CC 집합 정보를 고려하여 업링크 타이밍 그룹 정보를 설정한다(S850). 그리고, 설정한 업링크 타이밍 그룹 내에서 상기 타이밍 그룹을 대표하는 특정 CC를 설정한다(S852).

<166> UE는 대표 CC를 통해 프리엠블을 선택하여 송신한다(S854). 이는 대표 요소 반송파가 설정된 후, TA를 업데이트할 상황이 발생한 경우에도 적용될 수 있다.

<167> 그리고 UE는 eNB로부터 렌덤 액세스 응답 메시지를 수신한다. 이 때, UE의 업링크 할당 정보와 각 업링크 그룹 별 TA 정보를 수신한다(S856). 여기서, UE는 상기 업링크 타이밍 그룹 별 그룹 인덱스에 대응하는 테이블 형태의 TA 값을 확인할 수 있다. 또한, UE는 정해진 기준 TA값에 대응하여 각 타이밍 그룹 별 단위 오차를 포함하는 형태의 TA차이 값을 확인할 수 있다. 또한, 정해진 단위 값에 대응하여 정수배의 크기로 정해지는 업링크 타이밍 그룹 별 오차를 확인할 수도 있다. 또한 구체적으로 명시된 각 업링크 타이밍 그룹 별 오차를 확인할 수도 있다. 또한



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정해진 규칙에 따라 지시자 형태로 정해진 TA 지시자를 확인할 수도 있다.

<168> 그 후, UE는 CR(Contention Resolution) 과정을 통해 수신한 TA가 유효한지 검증한다(S860).

<169> 확인한 TA가 유효함을 확인한 경우, UE는 업링크 타이밍 그룹별 TA값을 업데이트 한다(S870).

<170> 여기서, 본 명세서의 일 예에 따라UE는 업링크 타이밍 그룹 별 TA를 업데이트 한 결과를 대표 CC를 통해 eNB에 전송할 수도 있다. 즉, eNB과의 보다 정확한 동기 획득을 위하여 TA 값 확인 절차를 추가로 더 진행할 수도 있다.

<171> 도 8b 은 본 발명의 일 실시예에 따른 UE의 동작에 대한 도면이다. 여기서, 도 8b 은 초기 업링크 타이밍 그룹의 설정이 eNB에서 수행되는 경우 UE의 동작을 도시한 것이다.

<172> 도 8b 을 참조하면, UE는 eNB으로부터 CC 세트 정보를 수신한다(872). 상기 CC 세트 정보는 PCC(Primary Component Carrier)를 통하여(via) 수신될 수 있다. 상기 CC 세트 정보는, RRC메시지를 통해 전송될 수도 있다.

<173> UE는 상기 수신한 CC 세트 정보를 기반으로 CC 세트내 CC들에 대한 SI를 수신한다(874). 상기 SI는 브로드캐스팅 채널을 통하여 다수의 UE들에게 공통으로 전송될 수도 있으며 또는 RRC메시지를 통해 전용 채널 형태로 전송될 수도 있다. 상기 SI는 PCC를 통해 전송될 수 있다. 이에, UE는 상기 SI을 이용하여 CC 세트 내 업링크 CC들을 구성한다.



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<174> 또한, 상기 874 단계에서, UE는 eNB로부터 사용할 각 CC의 RAP 또는 시간/주파수 자원에 대한 정보를 수신할 수 있다. 상기 수신된 각 CC의 RAP 또는 시간/주파수 자원에 대한 정보를 이용하여 UE는 최초 업링크 타이밍 그룹을 설정할 수 있다. 상기 RAP 또는 시간/주파수 자원에 대한 정보는, PCC를 통해 상기 SI내에 포함되어 전송되거나, 또는 RRC 메시지 형태로 전송될 수 있다.

<175> UE는 수신된 SI내의 RACH정보와 CC 파라미터들을 기반으로 업링크 동기획득을 위하여 구성된 모든 업링크CC들을 통해 동시에 RAP를 전송할 수 있는지 확인한다(876).

<176> 여기서, 상기 UE는 eNB에 의해 설정된 '구성된 업링크 CC'들의 RACH 파라미터 중 상기 UE전용(specific) RACH 파라미터를 확인한다.

<177> 이 때, 상기 UE전용 RACH 파라미터 중, RAP정보가 설정되어 있는 경우, UE는 자신의 RAP정보를 확인하여 각 구성된 업링크 CC들로 전송할 RAP를 설정한다. 여기서, 상기 RAP 정보는 eNB가 UE구별을 위하여 UE마다 서로 상이하게 설정한 프리엠블 정보이다.

<178> 또는, 상기 UE전용 RACH 파라미터 중, 시간 / 주파수 자원 정보가 설정되어 있는 경우, UE는 자신의 시간 / 주파수 자원 정보를 확인하여 각 구성된 업링크 CC들로 전송할 RAP를 설정한다. 여기서, 상기 시간 / 주파수자원 정보는 eNB가 UE마다 서로 상이하게 설정한 정보이다.

<179> 상기 876단계의 확인 결과, 구성된 모든 업링크CC들을 통해 동시에 RAP를 전



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송 가능함을 확인한 UE는, 동시에 RAP를 전송한다(878).

<180> 반면에, 상기 876단계의 확인 결과, UE가 모든 업링크CC들을 통해 동시에 RAP를 전송할 수 없음을 확인한 경우, UE는 890 단계로 진행한다.

<181> 상기 RAP 동시 전송과 관련하여, UE는 다수 개의 업링크 CC들 중 각각의 업링크 CC의 SI내 존재하는 RACH 파라미터들을 확인하고, 상기 RACH 파라미터에 정의되어 있는 다수의 시간/주파수 자원들을 확인하여, 동일한 시간에 RACH를 전송할 RAP전송 시간(rach_t)을 선택할 수 있다. 상기 RAP전송 시간(rach_t)은 상기 UE에 의해 모든 업링크 CC들을 통해 상기 RAP들이 동일하게 전송되는 시간이다.

<182> 그런데, UE가 상기 RAP전송 시간(rach_t) 설정할 수 없는 경우, 즉, UE가 동일한 시간에 구성된 모든 업링크 CC을 통해 RAP를 전송할 수 없는 경우, UE는 eNB에게 RAP 자원 정보 요청 메시지를 전송한다(890).

<183> 일 예로, 모든 업링크 CC들의 RACH 파라미터를 확인하여 RAP를 전송할 수 있는 시간이 t0, t1제한되어 있다고 가정한다. 이러한 경우, UE는 CC1, CC3, CC4를 통해 t0 시간에 RAP를 전송 가능함을 확인/ t1 시간에서는 전송 불가능함을 확인하며, CC2를 통해 t1 시간에 RAP를 전송 가능함을 확인하고, t0 시간에서는 전송 불가능함을 확인한 경우, UE는 eNB로 RAP 자원 정보 요청 메시지를 전송할 수 있다.

<184> 그 후, 상기 RAP 자원 정보 요청에 대한 응답으로, UE는 eNB로부터 RAP 자원 정보 응답 메시지를 수신한다(892). 여기서, 상기 RAP 자원 정보 요청 메시지를 수신한 eNB는 상기 UE가 모든 CCs를 통해 동시에 RAP를 전송할 수 없음을 확인 가능



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하다. 따라서, eNB는 상기 UE의 RAP 전송시 사용할 전송 시간 주파수 자원 및 프레임블 종류를 RAP 자원 정보 응답 메시지에 포함하여 UE에게 전송한다.

<185> 이에, UE는 상기 RAP 자원 정보 응답 메시지내의 정보를 기반으로 구성된 모든 업링크 CC들을 통하여 RAP를 전송한다(894). 한편, 만일 eNB로부터 수신된 RAP 자원 정보 응답 메시지에 RAP 자원 정보가 존재하지 않는 경우, RAP를 전송해야 할 시점에서 구성된 모든 업링크 CC들을 통하여 동시에 RAP를 전송할 수 있는 최대한 빠른 시간을 선택한다. 이 때, 모든 CC에서 동일한 RAP를 선택하여 동시에 RAP를 전송할 수 있다.

<186> 그 후, eNB로부터 PCC를 통해 업링크 타이밍 그룹 정보를 수신한다(880). 즉, eNB는 UE로부터 전송된 RAP들을 확인하여 상기 UE가 업링크 타이밍 그룹의 설정을 요청하는 것을 확인하고, 상기 RAP를 통해 수신된 프리엠블들을 이용하여 TA 값을 계산한 후, 상기 계산된 TA 값을 기반으로 상기 UE의 업링크 타이밍 그룹을 생성한다. 상기 생성한 업링크 타이밍 그룹 정보를 상기 UE로 전송한다.

<187> 상기 업링크 타이밍 그룹 정보는 PCC를 통해 하향 링크 제어 채널(Physical Downlink Control Channel, 이하 'PDCCH'라 칭함), 매체 접근 제어(Media Access Control, 이하 'MAC'이라 칭함) 메시지의 제어 정보 형태, 또는 RRC 메시지를 통해 수신될 수 있다.

<188> UE는 eNB로부터 구성된 모든 업링크 CC들과 연결 설정되어 있는 다운링크 CC들 중 일부 또는 모든 다운링크 CC들에서 RAR를 동시에 수신할 수 있다(882). 상기 연결 설정은 무선통신시스템 내에서 고정적으로 설정될 수도 있으며, SI를 이용하



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여 eNB마다 설정될 수도 있으며, RRC 메시지를 통하여 UE 또는 UE그룹마다 설정될 수도 있다.

<189> 상기 RAR메시지는, 일 예로, eNB에 의해 수신된 UE 프리엠블의 식별정보, 기지국의 식별자(ID), 임시 C-RNTI(Cell Radio Network Temporary Identifier), 상기 UE 프리엠블을 수신한 타임 슬롯에 대한 정보, 업링크 그랜트 정보(UL grant), 그리고 업링크 동기화를 위한 타이밍 정보(TA) 등을 포함할 수 있다.

<190> 이에, UE는 상기 수신한 TA 정보를 이용하여 결정된 스케쥴 시점에서, 업링크 그랜트 정보에 포함되어 있는 시간 주파수 자원 정보를 이용하여 물리 업링크 데이터 채널(Physical uplink shared channel, PUSCH)를 통해 데이터를 송신하며, HARQ(Hybrid Automatic Repeat reQuest)을 수행할 수도 있다.

<191> UE는 RAR을 수신한 CC들에 대하여 TA 유효성을 동시에 검증할 수 있다(884). 이 때, 상기 UE전용 RACH 파라미터 중, RAP정보가 설정되어 있는 경우, UE는 TA 유효성 검증을 생략할 수 있다.

<192> 이미 언급한 바와 같이, UE는 eNB로부터 수신된 ACK 메시지에 포함된 C-RNTI, T_C-RNTI 또는 UE identity가 자신에 할당된 C-RNTI, T_C-RNTI 또는 UE identity와 동일한지를 확인하여, 상기 TA의 유효성을 동시에 검증할 수 있다. 여기서, UE는 C-RNTI, T_C-RNTI 또는 UE identity를 포함하는 L2/L3 메시지를 eNB로 전송하고, eNB로부터 L1/L2 메시지를 수신한다. 이는 ACK 메시지가 HARQ 동작에 기반한 것이기 때문이다.



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<193> UE는 RAR 수신을 통하여 eNB가 상기 RAR이 수신된 다운링크 CC와 연결 설정되어 있는 업링크 CC들을 그룹 내 대표 CC로 설정하였다는 것을 인지하고 상기 업링크 CC들을 그룹 내 대표 CC로 설정한다(886).

<194> UE는 각 그룹 내 다른 CC들에 대하여 상기 872 단계에서 수신한 대표 CC의 TA값을 반영하여 업데이트 한다(888).

<195> 도 9는 본 명세서의 일 실시 예에 의한 송신장치의 구성을 보여주는 도면이다.

<196> 도 9를 참조하면 송신장치(900)는 UE 의 RRC 모드를 확인하는 연결 모드 확인부(905), UE가 사용 가능한 적어도 하나 이상의 CC를 포함하여 CC 집합을 결정하는 CC집합 결정부(920), 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부(930), 송수신부(950)을 포함한다.

<197> 보다 구체적으로, 상기 RRC 모드 확인부(905)는 UE와 eNB의 연결 상태를 확인하여, 연결이 되지 않은 상태, 즉, UE RRC_IDLE이거나, 또는 업링크 동기화가 이루어지지 않은 경우, UE의 연결 상태를 RRC_CONNECTED로 상태를 변경하거나 업링크 동기화가 이루어지도록 할 수 있다.

<198> 일 예로, 상기 RRC 모드 확인부(905)는 송수신부(950)을 통해 UE로부터 전송된 RRC 연결 요청(RRC Conneciton Request) 메시지를 수신하고, RRC 연결 설정 메시지를 UE로 전송하도록 동작한다. 또한, UE로부터 RRC 연결 설정 완료 메시지를 수신하여 RRC 연결 설정을 완료한 후, UE RRC_CONNECTED 모드를 확인할 수 있다.



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<199> 요소 반송파 집합 결정부(920)는 UE가 사용할 수 있는 적어도 하나 이상의 CC들을 확인하여 UE의 CC 집합을 설정한다. 이때, 상기 UE를 위한 CC 집합은 사용(구성)될 수 있는 CC들간의 업링크 동기 시간 차이, 각 CC의 타입 정보, 각 CC의 중심 주파수 위치, 각 CC의 서비스 지원 형태, 및 각 CC를 위한 네트워크 서비스 등을 고려하여 UE의 CC 집합을 설정할 수 있다.

<200> 업링크 타이밍 그룹 생성부(930)는 상기 요소 반송파 집합 결정부(920)에서 결정된 CC 집합을 반영하여 UE의 업링크 타이밍 그룹을 생성한다. 여기서, 타이밍 그룹은, 요소 반송파들간의 중심 주파수 값의 차이와 임계치를 비교하거나, 동일/상이한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 업링크 동기 갱신 요청에 따라 갱신된 요소 반송파들인지, 또는 매크로(Macro) 셀에서 서비스 하지 않는 요소 반송파이나 매크로보다 작은 셀(femto cell, pico cell, micro cell, relay, repeater) 등에 의해 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여 결정할 수 있다.

<201> 상기 송수신부(950)은 UE에게 CC 집합 정보와 업링크 타이밍 그룹 정보를 송신한다. 이 때, 송수신부(950)는 도 5와 같이 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 송신할 수 있고, 또는 도 6과 같이 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 구분하여 송신할 수 있다. 또한, 송수신부(950)는 CC 집합 정보를 송신한 후, 추가적으로 시스템 정보(SI)를 송신할 수도 있다. 따라서, UE로 하여금 상기 CC 집합 정보와, SI 정보를 기반으로 업링크 타이밍 그룹을 설정하도록 제공할 수도 있다.



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<202> 한편, 송수신부(950)는 UE로부터 동기화를 요청하는 메시지, 예를 들어 랜덤 액세스 프리엠블(Random Access Preamble)을 포함하는 메시지를 수신할 수 있다. 즉, 상기 업링크 타이밍 그룹에 대응하여 UE에 의해 결정된 대표 요소 반송파를 통해 전송되는 랜덤 액세스 프리엠블을 확인하여 각 업링크 타이밍 그룹에 대한 TA 값을 전송하는 것을 포함한다.

<203> 또한, 송수신부(950)는 UE 로부터 전송되는 랜덤 액세스 프리엠블 메시지를 통해 업링크 타이밍 그룹 생성부(930)로 하여금 결정된 업링크 타이밍 그룹에 대하여 전체 또는 일부를 수정하도록 제공할 수 있다.

<204> 제어부(910)는 상기 수신한 랜덤 액세스 프리엠블에 대하여 동기화와 관련된 정보, 예를 들어, 업링크 할당, 동기화 관련된 TA정보 등을 포함한 메시지를 생성하여 UE에 송신하도록 송수신부(950)을 제어한다. 이때, 상기 TA 정보를 포함하는 메시지는 앞서 살펴본 랜덤 액세스 응답 메시지를 포함한다. 동기화와 관련된 정보는 앞서 업링크 전송 시간을 앞당기는데 필요한 정보인 TA 정보를 포함한다. 따라서, 상기 제어부(910)는 상기 송수신부(950)로 하여금 업링크 타이밍 그룹에 대하여 동기화 정보를 생성하여 송신하도록 제어할 수 있다.

<205> 여기서, 상기 제어부(910)은 각 업링크 타이밍 그룹 별 TA 정보를, 그룹 인덱스에 대응하여 TA 값을 포함하는 테이블 형태로 생성할 수 있고, 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 TA 값을 생성할 수 있고, 각 타이밍 그룹 별 오차는 정해진 단위 값에 대응하여 정수배의 크기를 가지도록 생성할 수 있고, 또는 타이밍 그룹 별 오차를 구체적으로 명시할 수도 있다. 또는 정해진 규칙에 따라 TA를



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나타내는 지시자 형태로 전송하도록 송수신부(950)을 제어할 수 있다.

<206> 또한, 제어부(910)는 모든 구성 요소를 제어할 수 있으며, 일부 구성요소들은 독립적으로 동작할 수 있다. 도 9의 구성요소들은 하나 또는 둘 이상의 모듈에 포함되어 구성될 수 있고, 둘 이상의 모듈에서 하나의 기능을 구현하도록 구성될 수도 있다.

<207> 도 10은 본 명세서의 일 실시 예에 의한 수신장치의 구성을 보여주는 도면이다.

<208> 도 10을 참조하면, 수신장치(1000)는, 연결모드 확인부(1005), CC 집합 확인부(1007), 제어부(1010), 업링크 타이밍 조정부(1020), 업링크 타이밍 그룹 생성부(1030) 및 송수신부(1050)을 포함한다.

<209> 연결 모드 확인부(1005)는 eNB와의 연결 상태를 확인한다. 즉, UE RRC_IDLE 이거나 eNB와 업링크 동기화가 이루어지지 않은 경우, UE로 하여금 RRC_CONNECTED 로 상태를 변경하거나 업링크 동기화가 이루어지도록 할 수 있다.

<210> 일 예로, 상기 RRC 모드 확인부(905)는 송수신부(950)을 통해 eNB로 RRC 연결 요청(RRC Conneciton Request) 메시지를 전송하고, eNB로부터 RRC 연결 설정 메시지를 수신하여, RRC 연결 설정 완료 메시지를 통해 RRC 연결 설정을 완료하도록 한다.

<211> 송수신부(1050)는 eNB과 정보를 송수신하는 기능을 한다. 일 예로, 송수신부(1050)는 eNB으로부터 CC 집합 정보와 동기화와 관련된 정보를 수신한다. 상기 CC



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집합 정보를 수신한 후, eNB으로부터 CC 집합내의 CC들에 대한 SI도 수신할 수 있다. SI 정보는 CC의 주파수 대역 정보, 실제 가용한 주파수 크기 정보등을 포함한다.

<212> 요소 반송파 집합 확인부(1007)는 CC 집합 정보로부터 UE가 사용할 수 있는 적어도 하나 이상의 CC들을 확인한다. 상기 CC 집합은 UE가 사용할 수 있는 CC들간의 업링크 동기 시간 차이, 각 CC의 타입 정보, 각 CC의 중심 주파수 위치, 각 CC의 서비스 지원 형태, 및 각 CC를 위한 네트워크 서비스 등을 고려하여 결정된 것이다.

<213> 업링크 타이밍 그룹 생성부(1030)는 상기 요소 반송파 집합 결정부(920)에서 결정된 CC 집합을 반영하여 UE의 업링크 타이밍 그룹을 생성한다. 여기서, 업링크 타이밍 그룹은, 도 9에 설명한 조건 사항들을 반영하여 UE에 의해 설정 가능하다. 또한, 업링크 타이밍 그룹 생성부(1030)는 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정할 수 있다.

<214> 일 예로, 업링크 타이밍 그룹 생성부(1030)가 송수신부(1050)를 통해 eNB로부터 CC 집합 정보와 함께 요소 반송파들에 대한 업링크 타이밍 그룹 정보를 수신한 경우에는, 수신한 업링크 타이밍 그룹에서 대표 요소 반송파를 선택한다. 물론 송수신부(1050)를 통해 CC집합 정보와 구분하여 별도의 시그널링르 통해 상기 업링크 타이밍 그룹 정보를 수신할 수도 있다.

<215> 따라서, 업링크 타이밍 그룹 생성부(1030)는 상기 송수신부(1050)에서 요소 반송파들에 대한 업링크 타이밍 그룹 정보를 수신하지 않았거나, 또는 eNB에서 생



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성한 업링크 타이밍 그룹 정보가 자신의 네트워크 상황에 적합하지 않은 경우에는, 새로이 업링크 타이밍 그룹을 생성할 수 있다.

<216> 또한, 제어부(1010)는 상기 송수신부(1050)를 통해 동기화를 요청하는 메시지를 상기 대표 요소 반송파를 통해 eNB로 송신하고, 상기 대표 요소 반송파를 통해 동기화와 관련된 정보를 eNB로 수신하도록 제어한다. 일 예로, 송수신부(1050)로 하여금 UE에 의해 선택된 랜덤 액세스 프리엠블(Random Access Preamble)을 포함하는 메시지를 전송하고, eNB로부터 전송되는 랜덤 액세스 응답 메시지을 수신하도록 제어할 수 있다. 또한, eNB와의 RRC 재구성 및 동기 획득을 위한 메시지를 송수신하도록 제어할 수 있다.

<217> 또한, 제어부(1010)는 상기 랜덤 액세스 응답 메시지를 통해 업링크 타이밍 그룹 생성부(930)로 하여금 결정된 업링크 타이밍 그룹에 대하여 전체 또는 일부를 수정하도록 제어할 수 있다.

<218> 특히, 상기 제어부(1010)는 상기 랜덤 액세스 응답 메시지에 포함되어 있는 상기 설정된 업링크 타이밍 그룹에 대응하여 각 업링크 타이밍 그룹에 대한 TA 값을 확인하도록 제어할 수 있다. 또한, 상기 UE의 업링크 전송을 위한 할당된 주파수 자원 정보를 확인하도록 제어할 수 있다.

<219> 업링크 타이밍 조정부(1020)는 제어부(1010)에 의해 확인된 TA 값을 확인하여 상기 대표 요소 반송파가 포함된 해당 업링크 타이밍 그룹의 모든 요소 반송파에 대하여 TA 값을 적용한다. 즉, eNB와의 동기화를 위하여 해당 업링크 타이밍 그룹에 TA값을 적용한다. 여기서, 각 업링크 타이밍 그룹 별 TA 정보는, 그룹 인덱스



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에 대응하여 TA 값을 포함하는 테이블 형태로 존재할 수 있고, 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 TA 값으로 존재할 수도 있고, 각 타이밍 그룹 별 오차가 정해진 단위 값에 대응하여 정수배의 크기를 가지도록 존재할 수도 있고, 또는 구체적으로 명시된 타이밍 그룹 별 오차로 존재할 수도 있고, 정해진 규칙에 따라 TA를 나타내는 지시자 형태로 존재할 수도 있다. 따라서, 업링크 타이밍 조정부(1020)는 각 업링크 타이밍 그룹에 확인된 TA를 적용하여 동기를 획득한다.

<220> 또한, 예를 들어, TA 정보가 동기화 정보에 포함된 경우, 업링크 타이밍 그룹의 모든 요소 반송파에 대하여 동일하게 TA 정보를 설정할 수도 있다.

<221> 상기 언급한, 제어부(1010)는 모든 구성 요소를 제어할 수 있으며, 일부 구성요소들은 독립적으로 동작할 수 있다. 도 10의 구성요소들은 하나 또는 둘 이상의 모듈에 포함되어 구성될 수 있고, 둘 이상의 모듈에서 하나의 기능을 구현하도록 구성될 수도 있다.

<222> 따라서, 본 발명의 일 실시 예를 이용하면, 다수의 요소 반송파를 사용 시 각 요소 반송파 또는 요소 반송파 그룹간의 서로 다른 업링크 동기를 획득하는 것이 가능하므로 UE에서 다수의 요소 반송파를 동시에 사용하여 업링크로 정보를 전송하는 경우 동기 획득 오류로 인한 데이터 전송 오류 및 기지국에서의 정보 수신 지연을 줄이는 효과가 있다.

<223> 또한, 본 발명은 다수의 요소 반송파들의 각 요소 반송파마다 업링크 동기 기준이 서로 상이한 경우, 이동통신단말기(user equipment: 이하 UE)에서 각 요소 반송파의 타입, 중심 주파수 위치 및 서비스 형태에 따라 업링크 동기를 획득할 수



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있는 장점을 가진다.

<224> 이상의 설명은 본 발명의 기술 사상을 예시적으로 설명한 것에 불과한 것으로서, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자라면 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 다양한 수정 및 변형이 가능할 것이다. 따라서, 본 발명에 개시된 실시 예들은 본 발명의 기술 사상을 한정하기 위한 것이 아니라 설명하기 위한 것이고, 이러한 실시 예에 의하여 본 발명의 기술 사상의 범위가 한정되는 것은 아니다. 본 발명의 보호 범위는 아래의 청구범위에 의하여 해석되어야 하며, 그와 동등한 범위 내에 있는 모든 기술 사상은 본 발명의 권리범위에 포함되는 것으로 해석되어야 할 것이다.

【특허청구범위】

【청구항 1】

다수의 요소 반송파를 운영하는 기지국에서

UE가 사용할 요소 반송파 집합을 설정하는 단계;

상기 UE에게 상기 요소 반송파 집합 정보를 송신하는 단계;

상기 UE로부터 동기화를 요청하는 메시지를 수신하는 단계;

상기 수신한 메시지에 따라 상기 UE에 동기화와 관련된 정보를 송신하는 단계를 포함하며,

상기 요소 반송파 집합을 설정하는 단계 이후에, 상기 요소 반송파 집합에 포함되는 요소 반송파에 대하여 상기 동기화를 위한 업링크 타이밍 그룹을 생성하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 2】

제 1항에 있어서,

상기 요소 반송파 집합 정보를 송신하는 단계는

상기 업링크 타이밍 그룹에 대한 정보를 상기 요소 반송파 집합 정보와 함께 송신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 3】

제 1항에 있어서,

상기 요소 반송파 집합 정보를 송신하는 단계 이후에

상기 업링크 타이밍 그룹 정보를 송신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 4】

제 1항에 있어서,

상기 동기화와 관련된 정보는, 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 5】

제 1항에 있어서,

상기 동기화와 관련된 정보를 송신하는 단계는

상기 업링크 타이밍 그룹에 대한 동기화 정보를 송신하는 단계를 포함하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는,

상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리

정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 6】

기지국으로부터 요소 반송파 집합 정보를 수신하는 단계;

업링크 타이밍 그룹의 수신 여부를 확인하는 단계;

상기 업링크 타이밍 그룹의 수신을 확인한 경우, 상기 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정하는 단계;

동기화를 요청하는 메시지를 상기 설정한 대표 요소 반송파을 통해 송신하는 단계;

상기 기지국으로부터 동기화와 관련된 정보를 수신하는 단계; 및

상기 수신한 동기화와 관련된 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나의 요소 반송파에 적용하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 7】

제 6항에 있어서,

상기 업링크 타이밍 그룹의 미수신을 확인한 경우, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 업링크 타이밍 그룹을 생성하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 8】

제 6항에 있어서,

상기 요소 반송파 집합 정보를 수신하는 단계는

상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 수신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 9】

제 6항에 있어서,

상기 요소 반송파 집합 정보를 수신하는 단계 이후에

상기 업링크 타이밍 그룹 정보를 수신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 10】

제 6항에 있어서,

상기 동기화와 관련된 정보는 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 11】

제 6항에 있어서,

상기 동기화와 관련된 정보를 수신하는 단계는

상기 업링크 타이밍 그룹에 대한 동기화 정보를 수신하는 단계를 포함하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신



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요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 12】

다수의 요소 반송파를 운영하는 기지국에 있어서,

UE가 사용할 요소 반송파 집합을 설정하는 요소 반송파 집합 결정부;

상기 요소 반송파 집합에 포함되는 각 요소 반송파를 고려하여 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부;

상기 요소 반송파 집합 정보와 상기 업링크 타이밍 정보를 상기 UE에게 송신하거나, 상기 UE로부터 동기화를 요청하는 메시지를 수신하는 송수신부; 및,

상기 UE의 동기화 요청 메시지를 고려하여 상기 업링크 타이밍 그룹의 동기화와 관련 정보를 조정하는 제어부를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 13】

제 12항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정



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보와 함께 RRC 메시지를 통해 송신하는, 업링크 동기를 설정하는 장치.

【청구항 14】

제 12항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 구분하여 RRC 메시지를 통해 송신하는, 업링크 동기를 설정하는 장치.

【청구항 15】

제 12항에 있어서,

상기 동기화와 관련된 정보는, 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 16】

제 12항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 송신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인



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지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 17】

다수의 요소 반송파를 운영하는 사용자 단말에 있어서,

기지국으로부터 요소 반송파 집합 정보를 수신하고, 상기 기지국으로부터 동기화와 관련된 정보를 수신하며, 동기화를 위한 요청하는 메시지를 상기 대표 요소 반송파을 통해 송신하는 송수신부;

상기 수신한 요소 반송파 집합 정보를 고려하여 대표 요소 반송파를 설정하는 요소 반송파 집합 확인부;

상기 수신한 요소 반송파 집합 정보와 상기 동기화와 관련된 정보를 고려하여 업링크 타이밍 그룹을 설정하는 업링크 타이밍 그룹 생성부;

상기 수신한 동기화와 관련된 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나의 요소 반송파에 적용하는 업링크 타이밍을 조정하는 업링크 타이밍 조정부를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 18】

제 17항에 있어서,

상기 업링크 타이밍 그룹 생성부는, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔 포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여 상기 업링크 타이밍 그룹을 생성함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 19】

제 17항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 RRC 메시지를 통해 수신함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 20】

제 17항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보와 상기 요소 반송파 집합 정

보를 구분하여 RRC 메시지를 통해 수신함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 21】

제 17항에 있어서,

상기 동기화와 관련된 정보는 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 22】

제 17항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 수신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 23】

다수의 요소 반송파를 운영하는 기지국에서

UE가 사용할 요소 반송파 집합을 설정하는 단계;

상기 UE에게 상기 요소 반송파 집합 정보를 송신하는 단계;

상기 UE로부터 동기화를 요청하는 메시지를 동시에 수신하는 단계;

상기 수신한 메시지에 따라 상기 UE에 동기화와 관련된 정보를 동시에 송신하는 단계를 포함하며,

상기 요소 반송파 집합을 설정하는 단계 이후에, 상기 요소 반송파 집합에 포함되는 요소 반송파에 대하여 상기 동기화를 위한 업링크 타이밍 그룹을 생성하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 24】

제23항에 있어서,

상기 요소 반송파 집합 정보를 송신하는 단계는

상기 업링크 타이밍 그룹에 대한 정보를 상기 요소 반송파 집합 정보와 함께 송신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 25】

제23항에 있어서,

상기 요소 반송파 집합 정보를 송신하는 단계 이후에

상기 업링크 타이밍 그룹 정보를 송신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 26】

제23항에 있어서,

상기 동기화와 관련된 정보는, 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 27】

제23항에 있어서,

상기 동기화와 관련된 정보를 동시에 송신하는 단계는

상기 업링크 타이밍 그룹에 대한 동기화 정보를 동시에 송신하는 단계를 포함하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는,

상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 28】

기지국으로부터 요소 반송파 집합 정보를 수신하는 단계;

상기 요소 반송파 집합 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들에 대한 시스템 관련 정보를 수신하는 단계;

상기 수신한 시스템 관련 정보에서 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 메시지를 상기 기지국으로 송신하는 단계;

상기 기지국으로부터 업링크 타이밍 그룹 정보를 수신하는 단계;

상기 수신한 업링크 타이밍 그룹과 관련된 다운링크 요소 반송파 중 전부 또는 일부의 요소 반송파를 통해 동기화와 관련된 정보를 동시에 수신하는 단계; 및

상기 동기화와 관련된 정보가 수신된 요소 반송파와 관련된 업링크 요소 반

송파를 상기 수신한 업링크 타이밍 그룹 내의 대표 요소 반송파로 설정하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 29】

제 28항에 있어서,

상기 시스템 관련 정보를 수신하는 단계 이후에

상기 요소 반송파 집합 정보 및 시스템 관련 정보에 기반하여 최초 업링크 타이밍 그룹을 생성하는 단계를 포함하며,

상기 동시에 동기화를 요청하는 메시지를 송신하는 단계는

상기 수신한 시스템 관련 정보에서 상기 최초 업링크 타이밍 그룹 내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 메시지를 송신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 30】

제 28항에 있어서,

상기 동기화와 관련된 정보를 수신하는 단계 이후에

상기 수신한 동기화와 관련된 정보에서 타이밍의 유효성을 검증하는 단계를

더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 31】

제 28항에 있어서,

동시에 동기화를 요청하는 메시지를 송신하는 단계는

상기 수신한 시스템 관련 정보에서 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 메시지를 송신할 수 있는지 확인하는 단계;

상기 확인 결과 동시에 동기화를 요청하는 메시지를 송신할 수 없는 경우

동기화를 요청하는 메시지를 송신하는데 필요한 자원 정보 요청 메시지를 기지국에 송신하는 단계; 및

상기 송신한 자원 정보 요청 메시지에 대한 응답 메시지를 수신하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 32】

제 29항에 있어서,

상기 최초 업링크 타이밍 그룹을 생성하는 단계는

상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 업링크 타이밍 그룹을 생성하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 33】

제 28항에 있어서,

상기 동기화와 관련된 정보는 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 34】

다수의 요소 반송파를 운영하는 기지국에 있어서,

UE가 사용할 요소 반송파 집합을 설정하는 요소 반송파 집합 결정부;

상기 요소 반송파 집합에 포함되는 각 요소 반송파를 고려하여 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부;

상기 요소 반송파 집합 정보와 상기 업링크 타이밍 정보를 상기 UE에게 동시에 송신하거나, 상기 UE로부터 동기화를 요청하는 메시지를 동시에 수신하는 송수신부; 및,

상기 UE의 동기화 요청 메시지를 고려하여 상기 업링크 타이밍 그룹의 동기화와 관련 정보를 조정하는 제어부를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 35】

제 34항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 RRC 메시지를 통해 송신하는, 업링크 동기를 설정하는 장치.

【청구항 36】

제 34항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 구분하여 RRC 메시지를 통해 송신하는, 업링크 동기를 설정하는 장치.

【청구항 37】

제 34항에 있어서,

상기 동기화와 관련된 정보는, 업링크 전송 시간을 앞당기는데 필요한 정보



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를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 38】

제 34항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 동시에 송신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 39】

다수의 요소 반송파를 운영하는 사용자 단말에 있어서,

기지국으로부터 요소 반송파 집합 정보를 수신하고, 상기 요소 반송파 집합 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들에 대한 시스템 관련 정보를



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수신하며, 상기 수신한 시스템 관련 정보에 의하여 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 송신하고, , 상기 기지국으로부터 업링크 타이밍 그룹 정보를 수신하며, 상기 수신한 업링크 타이밍 그룹과 관련된 다운링크 요소 반송파 중 전부 또는 일부의 요소 반송파를 통해 동기화와 관련된 정보를 동시에 수신하는 송수신부;

상기 동기화와 관련된 정보가 수신된 요소 반송파와 관련된 업링크 요소 반송파를 상기 수신한 업링크 타이밍 그룹 내의 대표 요소 반송파로 설정하는요소 반송파 집합 확인부;

상기 수신한 동기화와 관련된 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나의 요소 반송파에 적용하는 업링크 타이밍을 조정하는 업링크 타이밍 조정부를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 40】

제 39항에 있어서,

상기 요소 반송파 집합 정보 및 시스템 관련 정보에 기반하여 최초 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부를 더 포함하며,

상기 송수신부는

상기 수신한 시스템 관련 정보에서 상기 최초 업링크 타이밍 그룹 내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 메시지를 송신하는, 업링크

동기를 설정하는 장치.

【청구항 41】

제 40항에 있어서,

상기 업링크 타이밍 그룹 생성부는, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔 포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여 상기 업링크 타이밍 그룹을 생성함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 42】

제 39항에 있어서,

상기 송수신부는 상기 수신한 시스템 관련 정보에서 상기 요소 반송파 집합내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 메시지를 송신할 수 있는지 확인하여, 상기 확인 결과 동시에 동기화를 요청하는 메시지를 송신할 수 없는 경우 동기화를 요청하는 메시지를 송신하는데 필요한 자원 정보 요청 메시지를 기지국에 송신하고, 상기 송신한 자원 정보 요청 메시지에 대한 응답 메시지

를 수신하는, 업링크 동기를 설정하는 장치.

【청구항 43】

제 39항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보와 상기 요소 반송파 집합 정보를 구분하여 RRC 메시지를 통해 수신함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 44】

제 39항에 있어서,

상기 동기화와 관련된 정보는 업링크 전송 시간을 앞당기는데 필요한 정보를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 45】

제 39항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 동시에 수신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이

와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

제출 일자 : 2010-03-26

【요약서】

【요약】

본 명세서에서는 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치를 제공한다. 본 명세서의 일 실시 예에 따른 , 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법은 사용자 단말과 연결을 수행한 후, 요소 반송파 집합 정보를 설정하고, 설정된 요소 반송파 집합에서 업링크 타이밍 그룹을 생성하여 업링크 타이밍 그룹 정보를 사용자 단말에 송신한다.

【대표도】

도 4



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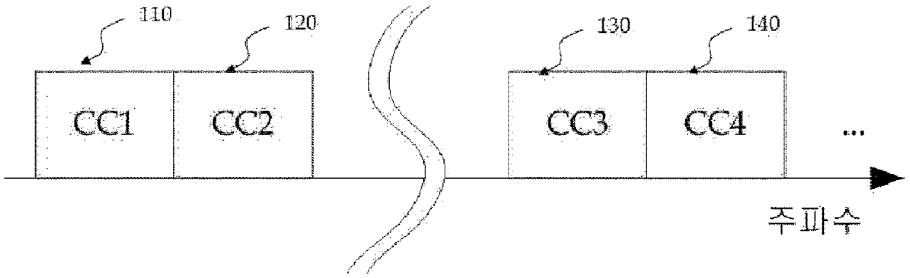
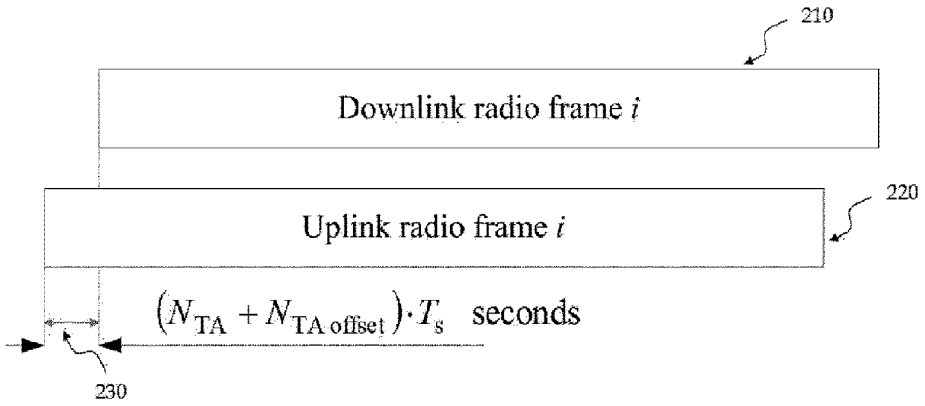
【도면】

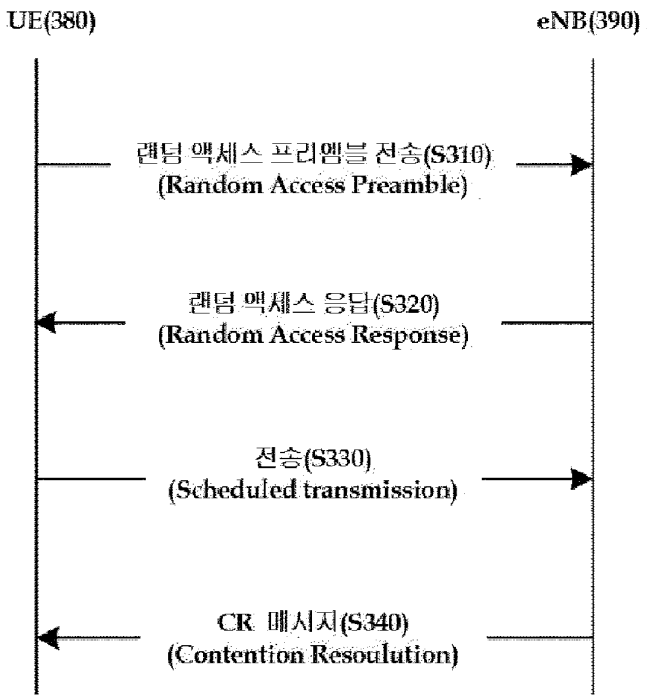
【도 1】


110
120
130
140
CC1
CC2
CC3
CC4
...
주파수

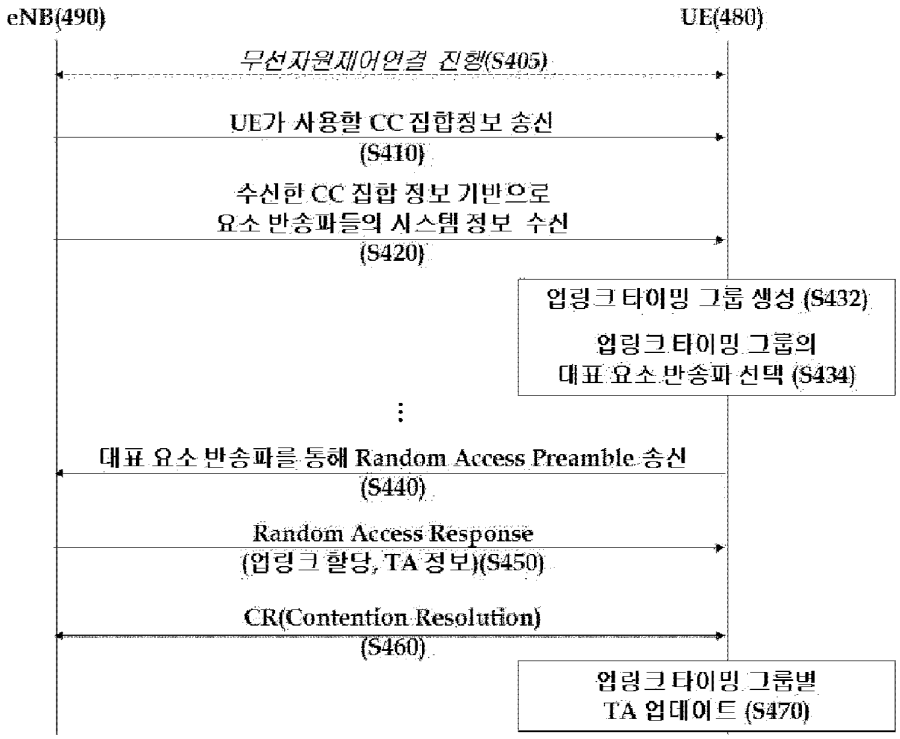
【도 2】


210
Downlink radio frame i
220
Uplink radio frame i
$(N_{TA} + N_{TA\,offset}) \cdot T_s$ seconds
230

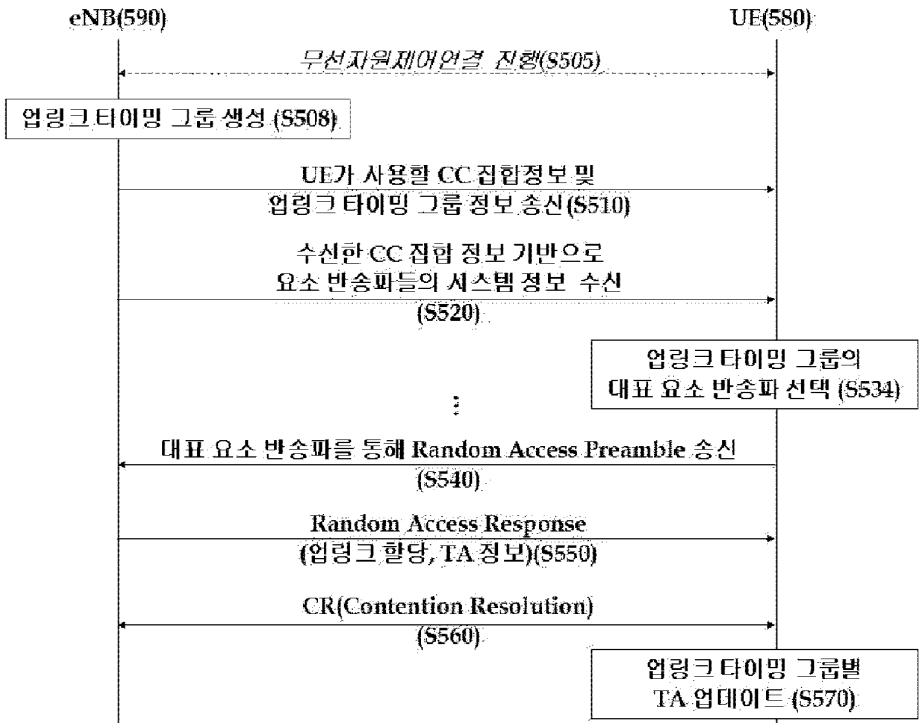
【도 3】


UE(380)
eNB(390)
랜덤 액세스 프리앰블 전송(S310)
(Random Access Preamble)
랜덤 액세스 응답(S320)
(Random Access Response)
전송(S330)
(Scheduled transmission)
CR 메시지(S340)
(Contention Resoulution)

【도 4】


eNB(490)
UE(480)
무선자원제어연결 진행(S405)
UE가 사용할 CC 집합정보 송신
(S410)
수신한 CC 집합 정보 기반으로
요소 반송파들의 시스템 정보 수신
(S420)
업링크 타이밍 그룹 생성 (S432)
업링크 타이밍 그룹의
대표 요소 반송파 선택 (S434)
대표 요소 반송파를 통해 Random Access Preamble 송신
(S440)
Random Access Response
(업링크 할당, TA 정보)(S450)
CR(Contention Resolution)
(S460)
업링크 타이밍 그룹별
TA 업데이트 (S470)

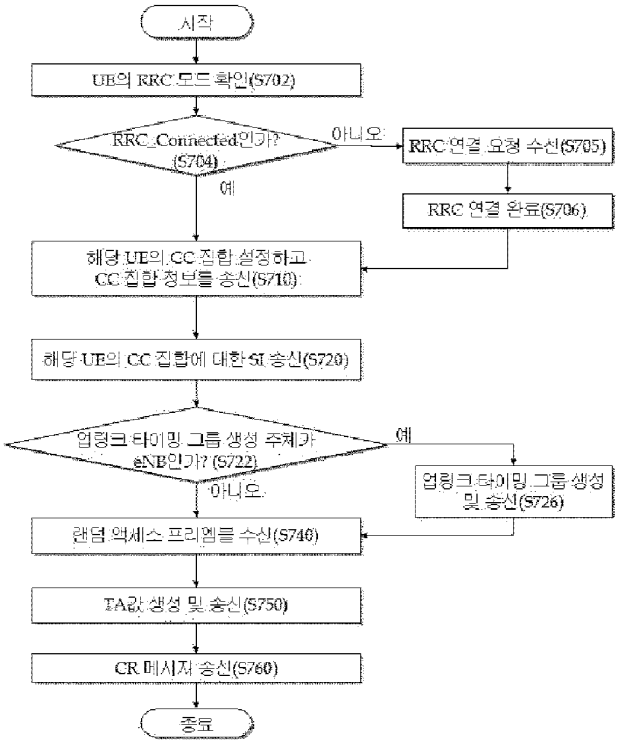
【도 5】


eNB(590)
UE(580)
무선자원제어연결 진행(S505)
업링크타이밍 그룹 생성 (S508)
UE가 사용할 CC 집합정보 및
업링크 타이밍 그룹 정보 송신(S510)
수신한 CC 집합 정보 기반으로
요소 반송파들의 시스템 정보 수신
(S520)
업링크 타이밍 그룹의
대표 요소 반송파 선택 (S534)
대표 요소 반송파를 통해 Random Access Preamble 송신
(S540)
Random Access Response
(업링크 할당, TA 정보)(S550)
CR(Contention Resolution)
(S560)
업링크 타이밍 그룹별
TA 업데이트 (S570)

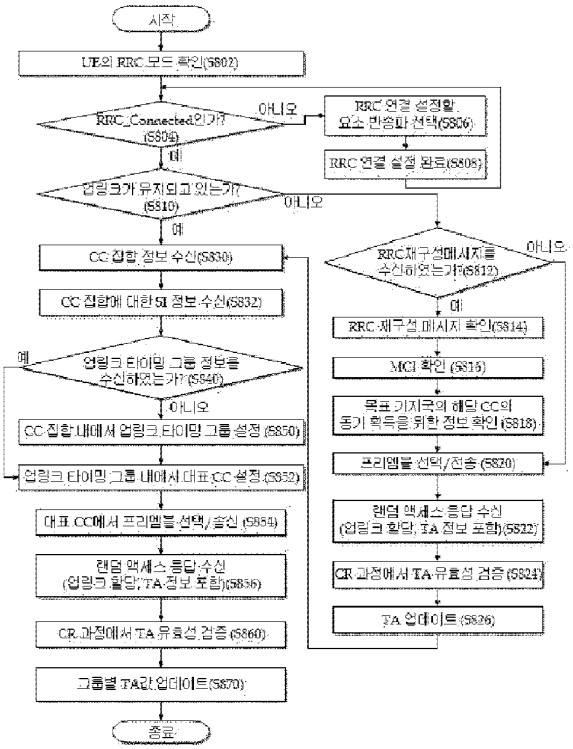
【도 6】

eNB(690)
UE(680)
무선자원제어연결 진행(S605)
UE가 사용할 CC 집합정보 송신
(S610)
수신한 CC 집합 정보 기반으로
요소 반송파들의 시스템 정보 수신
(S620)
업링크 타이밍 그룹 생성 (S624)
업링크 타이밍 그룹 정보 송신
(S626)
업링크 타이밍 그룹의
대표 요소 반송파 선택 (S634)
대표 요소 반송파를 통해 Random Access Preamble 송신
(S640)
Random Access Response
(업링크 할당, TA 정보)(S650)
CR(Contention Resolution)
(S660)
업링크 타이밍 그룹별
TA 업데이트 (S670)

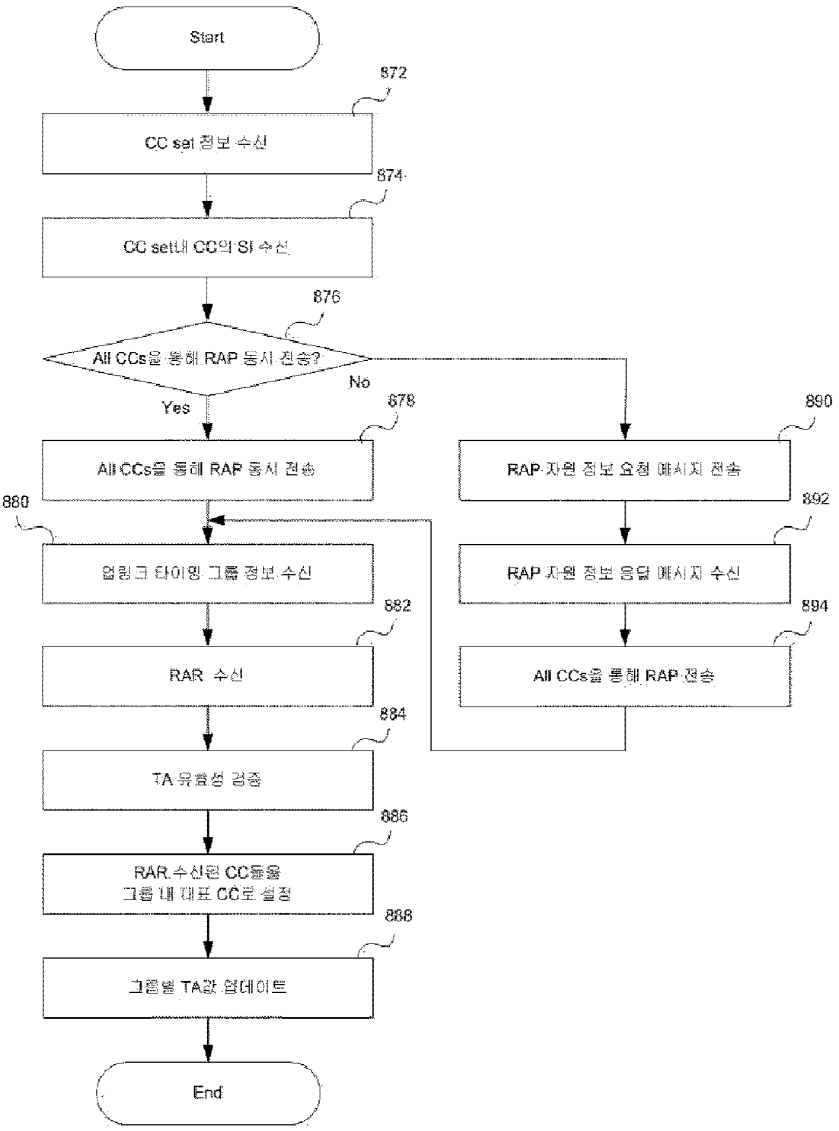
【도 7】


시작
UE의 RRC 모드 확인(S702)
RRC_Connected인가? (S704)
아니오
RRC 연결 요청 수신(S705)
RRC 연결 완료(S706)
예
해당 UE의 CC 집합 설정하고 CC 집합 정보를 송신(S710)
해당 UE의 CC 집합에 대한 SI 송신(S720)
업링크 타이밍 그룹 생성 주체가 eNB인가? (S722)
예
업링크 타이밍 그룹 생성 및 송신(S726)
아니오
랜덤 액세스 프리엠블 수신(S740)
TA값 생성 및 송신(S750)
CR 메시지 송신(S760)
종료

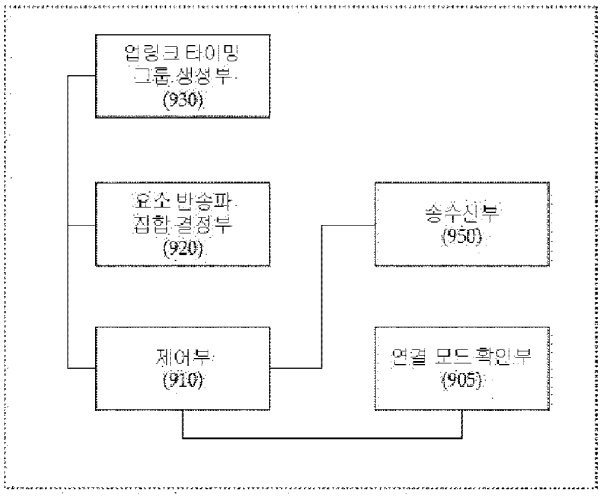
【도 8a】


시작
UE의 RRC 모드 확인(S802)
RRC_Connected인가? (S804)
아니오
RRC 연결 설정할 요소 반송파 선택(S806)
RRC 연결 설정 완료(S808)
예
업링크가 유지되고 있는가? (S810)
아니오
예
CC 집합 정보 수신(S830)
CC 집합에 대한 SI 정보 수신(S832)
예
업링크 타이밍 그룹 정보를 수신하였는가? (S840)
아니오
CC 집합 내에서 업링크 타이밍 그룹 설정 (S850)
업링크 타이밍 그룹 내에서 대표 CC 설정 (S852)
대표 CC에서 프리앰블 선택/ 송신 (S854)
랜덤 액세스 응답 수신 (업링크 할당, TA 정보 포함)(S856)
CR 과정에서 TA 유효성 검증 (S860)
그룹별 TA값 업데이트(S870)
종료
RRC재구성메시지를 수신하였는가? (S812)
아니오
예
RRC 재구성 메시지 확인(S814)
MCI 확인 (S816)
목표 기지국의 해당 CC의 동기 획득을 위한 정보 확인 (S818)
프리앰블 선택/ 전송 (S820)
랜덤 액세스 응답 수신 (업링크 할당, TA 정보 포함)(S822)
CR 과정에서 TA 유효성 검증 (S824)
TA 업데이트 (S826)

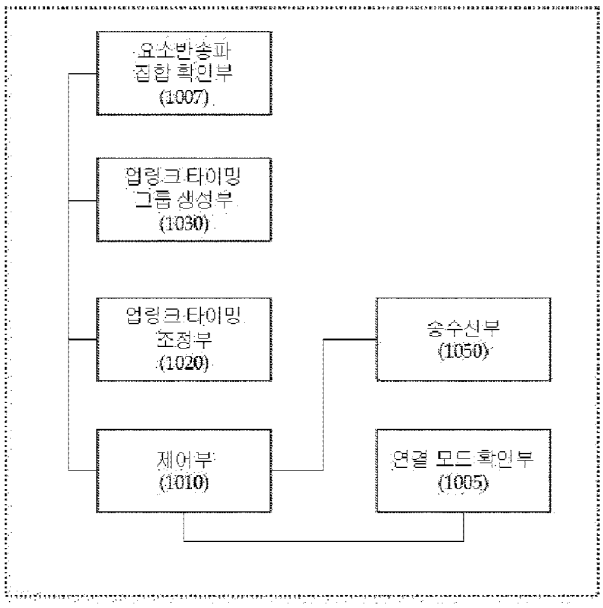
【도 8b】


Start
872
CC set 정보 수신
874
CC set내 CC의 SI 수신
876
All CCs을 통해 RAP 동시 전송?
Yes
No
878
All CCs을 통해 RAP 동시 전송
880
업링크 타이밍 그룹 정보 수신
882
RAR 수신
884
TA 유효성 검증
886
RAR 수신된 CC들을
그룹 내 대표 CC로 설정
888
그룹별 TA값 업데이트
End
890
RAP 자원 정보 요청 메시지 전송
892
RAP 자원 정보 응답 메시지 수신
894
All CCs을 통해 RAP 전송

【도 9】


업링크 타이밍 그룹 생성부 (930)
요소 반송파 집합 결정부 (920)
송수신부 (950)
제어부 (910)
연결 모드 확인부 (905)

【도 10】


요소반송파 집합 확인부 (1007)
업링크 타이밍 그룹 생성부 (1030)
업링크 타이밍 조정부 (1020)
송수신부 (1050)
제어부 (1010)
연결 모드 확인부 (1005)

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【대리인코드】 9-1999-000318-1

【포괄위임등록번호】 2009-049482-2

【대리인】

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【포괄위임등록번호】 2005-094061-4

【발명의 국문명칭】 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치

【발명의 영문명칭】 METHOD AND APPARATUS FOR CONFIGURING UPLINK SYNCHRONIZATION IN COMPONENT CARRIER AGGREGATION

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# 【명세서】

## 【발명의 명칭】

다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치{METHOD AND APPARATUS FOR CONFIGURING UPLINK SYNCHRONIZATION IN COMPONENT CARRIER AGGREGATION}

## 【기술분야】

<1> 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치를 제공하는 것으로, 적어도 하나 이상의 요소 반송파에 대한 업링크 동기 그룹을 설정하는 방법 및 장치에 관한 것이다.

## 【배경기술】

<2> 무선 통신 시스템에서 사용자 단말과 기지국간의 동기화는 중요한 문제이다. 왜냐하면 동기화가 이루어지지 않으면, 사용자 단말과 기지국은 정상적인 정보를 교환할 수 없기 때문이다.

<3> 한편, 하나의 요소 반송파 또는 하나의 서비스 대역을 지원하는 기존의 무선 통신 시스템과 달리, 현재 무선 통신 시스템은 다수의 요소 반송파들을 사용하여 사용자 서비스 요구를 만족시키고자 한다. 그러나, 상기 다수의 요소 반송파들에 대하여 어떻게 동기화를 수행할 것인지에 대한 구체적인 논의가 정해지지 않은 상태이다.

<4> 다시 설명하면, 통신을 수행하기 위하여 동기화는 네트워크의 효율에 큰 영



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향을 미치는 요소이며, 이러한 요소를 고려한 다수의 요소 반송파들이 존재하는 무선 통신 시스템에서의 효과적인 동기화 방안이 필요한 실정이다.

【발명의 내용】

【해결하려는 과제】

<5> 동기화 과정의 효율성은 네트워크의 효율성으로 직결되며, 전송의 안전성 역시 보장하게 되므로, 다수의 요소 반송파를 운용하는 무선 통신 네트워크 환경에서 업링크 동기를 설정하여 동기화 과정을 효율적으로 운용하고자 한다.

<6> 본 발명은, 무선 통신 시스템에서의 동기를 수행하는 장치 및 방법을 제공하고자 한다.

<7> 또한, 본 발명은, 무선 통신 시스템에서 다수의 요소 반송파들에 대한 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<8> 또한, 본 발명은, 무선 통신 시스템에서의 단말의 연결 상태를 고려하여 다수의 요소 반송파들에 대한 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<9> 또한, 본 발명은, 무선 통신 시스템에서 사용 가능한 다수의 요소 반송파들의 특성을 고려하여 동기 그룹을 설정하는 장치 및 방법을 제공하고자 한다.

<10> 또한, 본 발명은, 무선 통신 시스템에서 다수의 요소 반송파들에 대한 업링크 타이밍 동기 그룹을 설정하는 단말 장치 및 방법을 제공하고자 한다.



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<11> 또한, 본 발명은, 무선 통신 시스템에서의 랜덤 액세스 절차를 통해 다수의 요소 반송파들에 대한 동기 정보를 획득하여 기지국과의 동기를 설정 및 업데이트 하는 단말 장치 및 방법을 제공하고자 한다.

【과제의 해결 수단】

<12> 전술한 과제를 달성하기 위해, 본 명세서의 일 실시 예에 따른, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법은 사용자 단말이 사용할 요소 반송파 집합을 설정하는 단계, 상기 사용자 단말에게 상기 요소 반송파 집합 정보를 송신하는 단계, 상기 사용자 단말로부터 동기화를 요청하는 동기화 요청 메시지를 동시에 또는 이격하여 하나 이상의 대표 요소 반송파를 통하여 수신하는 단계, 및 상기 동기화 요청 메시지에 따라 상기 사용자 단말에 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보를 송신하는 단계를 포함하며, 상기 대표 요소 반송파는 상기 기지국 또는 상기 사용자 단말이 생성한 업링크 타이밍 그룹의 대표 요소 반송파인 것을 특징으로 한다.

<13> 또한, 본 명세서의 다른 실시 예에 따른 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법은 사용자 단말이 기지국으로부터 요소 반송파 집합 정보를 수신하는 단계, 상기 기지국 또는 상기 사용자 단말이 생성한 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정하는 단계, 동기화를 요청하는 동기화 요청 메시지를 상기 하나 이상의 대표 요소 반송파를 통하여 동시에 또는



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이격하여 송신하는 단계, 상기 기지국으로부터 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보를 수신하는 단계, 및 상기 수신한 업링크 동기화 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나 이상의 요소 반송파에 적용하는 단계를 포함한다.

<14> 또한, 본 명세서의 또다른 실시 예에 따른 업링크 동기를 설정하는 장치는, 다수의 요소 반송파를 운영하는 기지국에 있어서, 사용자 단말이 사용할 요소 반송파 집합을 설정하는 요소 반송파 집합 결정부, 상기 요소 반송파 집합 정보와 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보를 상기 사용자 단말에게 송신하거나, 상기 사용자 단말로부터 동기화를 요청하는 동기화 요청 메시지를 하나 이상의 대표 요소 반송파를 통하여 동시에 또는 이격하여 수신하는 송수신부, 및, 상기 사용자 단말의 동기화 요청 메시지에 따라 상기 사용자 단말의 상기 업링크 동기화 정보를 조정하는 제어부를 포함하며, 상기 대표 요소 반송파는 상기 기지국 또는 상기 사용자 단말이 생성한 업링크 타이밍 그룹의 대표 요소 반송파인 것을 특징으로 한다.

<15> 또한, 본 명세서의 또다른 실시 예에 따른 업링크 동기를 설정하는 장치는 다수의 요소 반송파를 운영하는 사용자 단말에 있어서, 기지국으로부터 요소 반송파 집합 정보를 수신하고, 상기 기지국으로부터 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보를 수신하며, 동기화를 요청하는 동기화 요청 메시지를 상기 대표 요소 반송파을 통해 동시에 또는 이격하여 송신하는 송수신부, 상기 수신한 요소 반송파 집합 정보를 고려하여 상기 기지국 또는 상기 사용자 단말이 생성



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한 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정하는 요소 반송파 집합 확인부, 및 상기 수신한 업링크 동기화 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나의 요소 반송파에 적용하는 업링크 타이밍을 조정하는 업링크 타이밍 조정부를 포함한다.

【도면의 간단한 설명】

<16> 도 1은 다수의 요소 반송파가 구성되는 예를 보여주는 도면이다.

도 2는 동기화 과정에서의 TA(Timing Advance)와 관련된 예를 보여주는 도면이다.

도 3은 사용자 단말과 기지국 사이의 랜덤 액세스 과정을 보여주는 도면이다.

도 4는 본 명세서의 일 실시 예에 의한 업링크 동기를 획득하는 과정을 보여주는 도면이다.

도 5는 본 명세서의 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다.

도 6은 본 발명의 또 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다.

도 7은 본 명세서의 일 실시 예에 의한 기지국에서 단말의 요청에 의해 단말이 업링크 동기 획득을 할 수 있도록 하는 도면이다.



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도 8은 본 명세서의 일 실시 예에 의한 UE에서 업링크 타이밍 그룹을 이용하여 업링크 동기화를 획득하는 과정을 보여주는 도면이다.

도 9는 본 명세서의 일 실시 예에 의한 UE에서 업링크 타이밍 그룹을 이용하여 업링크 동기화를 획득하는 과정을 보여주는 도면이다.

도 10은 본 명세서의 일 실시 예에 의한 기지국의 구성을 보여주는 도면이다.

도 11은 본 명세서의 일 실시 예에 의한 UE의 구성을 보여주는 도면이다.

【발명을 실시하기 위한 구체적인 내용】

<17> 이하, 본 명세서에서는 일부 실시 예들을 예시적인 도면을 통해 상세하게 설명한다. 각 도면의 구성요소들에 참조부호를 부가함에 있어서, 동일한 구성요소들에 대해서는 비록 다른 도면상에 표시되더라도 가능한 한 동일한 부호를 가지도록 하고 있음에 유의해야 한다. 또한, 본 명세서의 실시 예를 설명함에 있어, 관련된 공지 구성 또는 기능에 대한 구체적인 설명이 본 명세서의 요지를 흐릴 수 있다고 판단되는 경우에는 그 상세한 설명은 생략한다.

<18> 또한 본 명세서는 무선 통신 네트워크를 대상으로 설명하며, 무선 통신 네트워크에서 이루어지는 작업은 해당 무선 통신 네트워크를 관할하는 시스템(예를 들어 기지국)에서 네트워크를 제어하고 데이터를 송신하는 과정에서 이루어지거나, 해당 무선 네트워크에 결합한 단말에서 작업이 이루어질 수 있다.

<19> 본 발명에서 무선통신 시스템은 음성, 패킷 데이터 등과 같은 다양한 통신



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서비스를 제공하기 위해 널리 배치된다. 무선통신 시스템은 단말(User Equipment, UE) 및 기지국(evolved Node-B, eNB)을 포함한다.

<20> 본 명세서에서의 단말은 무선 통신에서의 사용자 단말을 의미하는 포괄적 개념으로서, WCDMA 및 LTE(Long Term Evolution), HSPA 등에서의 UE(User Equipment)는 물론, GSM에서의 MS(Mobile Station), UT(User Terminal), SS(Subscriber Station), 무선기기(wireless device) 등을 모두 포함하는 개념으로 해석되어야 할 것이다.

<21> 기지국 또는 셀(cell)은 일반적으로 단말과 통신하는 고정된 지점(fixed station)을 말하며, 노드-B(Node-B), eNB, BTS(Base Transceiver System), 액세스 포인트(Access Point) 등 다른 용어로 불릴 수 있다.

<22> 본 명세서에서 기지국 또는 셀은 CDMA에서의 BSC(Base Station Controller), WCDMA의 Node B 등이 커버하는 일부 영역을 나타내는 포괄적인 의미로 해석되어야 하며, 메가셀, 매크로셀, 마이크로셀, 피코셀, 펨토셀 등 다양한 커버리지 영역을 모두 포괄하는 의미이다.

<23> 본 명세서에서 UE와 eNB는 본 명세서에서 기술되는 기술 또는 기술적 사상을 구현하는데 사용되는 두가지 송수신 주체로 포괄적인 의미로 사용되며 특정하게 지칭되는 용어 또는 단어에 의해 한정되지 않는다.

<24> 또한, 본 명세서에서 무선통신 시스템에 적용되는 다중 접속 기법에는 제한이 없다. CDMA(Code Division Multiple Access), TDMA(Time Division Multiple



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Access), FDMA(Frequency Division Multiple Access), OFDMA(Orthogonal Frequency Division Multiple Access), OFDM-FDMA, OFDM-TDMA, OFDM-CDMA와 같은 다양한 다중 접속 기법을 사용할 수 있다.

<25> 상향링크 전송 및 하향링크 전송은 서로 다른 시간을 사용하여 전송되는 TDD(Time Division Duplex) 방식이 사용될 수 있고, 또는 서로 다른 주파수를 사용하여 전송되는 FDD(Frequency Division Duplex) 방식이 사용될 수 있다.

<26> 본 명세서의 일실시 예는 GSM, WCDMA, HSPA를 거쳐 LTE 및 LTE-A(LTE-advanced)로 진화하는 비동기 무선통신과, CDMA, CDMA-2000 및 UMB로 진화하는 동기식 무선통신 등의 자원할당에 적용될 수 있다. 본 명세서에서 제시하는 실시 예는 특정한 무선통신 분야에 한정되거나 제한되어 해석되어서는 아니되며, 본 명세서의 기술적 사상이 적용될 수 있는 모든 기술분야를 포함하는 것으로 해석되어야 할 것이다.

<27> 도 1은 본 발명이 적용되는 다수의 요소 반송파들을 사용하는 시스템의 예를 보여주는 도면이다.

<28> 도 1을 참조하면, 본 발명이 적용되는 무선통신 시스템은, 최근 논의중인 차세대 통신 시스템으로써, LTE-A 시스템을 일 예로 든다. 상기 LTE-A 시스템은, 시스템 요구 사항 즉, LTE-A에서 요구하는 높은 데이터 전송률을 만족시키기 위한 대역폭(Bandwidth)를 확장하기 위한 방안으로써, 다수 개의 단위 반송파인 요소반송파 또는 컴포넌트 캐리어(Component Carrier, 이하 'CC'라 칭함)의 사용을 정의하고 있다. 여기서, 하나의 CC는 최대 20MHz의 대역폭을 가질 수 있으며, 해당 서비



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스에 따라 20MHz이내에서 자원 할당이 가능하지만, 이는 시스템을 구현하는 과정에 따른 일 실시예이며, 시스템의 구성에 따라, 20MHz 이상의 대역폭을 가지도록 설정할 수도 있다.

<29> 또한, 상기 하나의 요소 반송파들(Component Carriers)을 최대 5개까지 묶어 하나의 시스템 대역으로 사용하는 캐리어 집합체(carrier aggregation, 이하 "CA"라 함)의 사용을 정의할 수 있다. 따라서, 차세대 통신 시스템에서는 20MHz의 최대 대역폭을 가지는 요소 반송파 5개를 사용할 경우, 최대 100MHz까지 대역폭을 확장시켜 서비스 품질을 지원한다. 이때, 각 요소 반송파들에 의해 결정될 수 있는, 즉, 할당 가능한 주파수 대역은 실제 CA의 스케줄링에 따라 연속적(contiguous)일 수도 있고, 불연속적(non-contiguous)일 수도 있다.

<30> 즉, 본 명세서에서는 다수의 요소 반송파(component carrier)를 구별하기 위하여 CC로 표시하고 CC0, CC1과 같이 지시할 수 있다. 그러나, 이러한 요소 반송파에 포함되는 숫자가 요소 반송파의 순서 또는 해당 요소 반송파의 주파수 대역의 위치와 일치하는 것은 아니다.

<31> 도 1에서는 제 1 요소 반송파(CC1, 110), 제 2 요소 반송파(CC2, 120), 제 3 요소 반송파(CC3, 130), 제 4 요소 반송파(CC4, 140)로 구성되어 있으며, 각각의 요소 반송파는 스케줄러에 따라 업링크(Uplink, UL) 또는 다운링크(Downlink, DL)가 상이하게 할당될 수도 있고, 또는 동일한 업링크와 다운링크가 함께 할당되어 사용될 수도 있다.

<32> 한편, 무선 통신 환경에서는 송신기에서 전파가 전파되어 수신기에서 전달되

는 동안에 전파지연(propagation delay)을 겪게 된다. 따라서 송수신기 모두 정확히 송신기에서 전파가 전파되는 시간을 알고 있다 하더라도 수신기에 신호가 도착하는 시간은 송수신기간 거리, 주변 전파 환경 등에 의해 영향을 받게 되고 수신기가 이동하는 경우 시간에 따라 변하게 된다. 만일 수신기가 송신기가 전달하는 신호가 수신되는 시점을 정확히 알 수 없는 경우 신호 수신이 실패하거나 수신하더라도 왜곡된 신호를 수신하게 되어 통신이 불가능하게 된다.

<33> 따라서, 무선 통신 시스템에서는 다운링크/업링크를 막론하고, 정보 신호를 수신하기 위해 eNB와 UE간 동기(synchronization)가 반드시 선결되어야 한다. 즉, 동기획득 절차는 통신 시스템에서 매우 중요한 절차이며 이를 유지하는 것 또한 시스템 안정성 및 통신 품질에 큰 영향을 주게 된다.

<34> 한편, 동기의 종류는 프레임 동기, 정보심벌 동기, 샘플링 주기 동기 등으로 다양하며, 이 중에서 샘플링 주기 동기의 경우 물리적 신호를 구분하기 위해 가장 기본적으로 획득하여야 하는 동기라 할 수 있다.

<35> eNB에서 UE에게 전송하는 방향의 통신링크인 다운링크 전송에서 동기 획득은 UE에서 eNB의 신호를 기반으로 이루어진다. eNB는 UE에서 다운링크 동기 획득이 용이하도록 상호 약속된 특정 신호를 전송하며 이를 기반으로 UE에는 eNB에서 보내온 특정 신호가 전송된 시간을 정확히 분별할 수 있어야 한다. 다운링크의 경우 하나의 eNB이 다수의 UE에게 동시에 동일한 동기 신호를 전송하므로 UE각각이 독립적으로 동기신호를 통하여 동기를 획득할 수 있다.

<36> 그러나 업링크의 경우  다수의 UE로 부터 개별적으로 송신된 각각의 신호를



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eNB가 수신하게 되므로 어느 하나의 UE를 기준으로 동기를 획득할 수가 없다. 따라서 다운링크와 다른 동기획득 절차가 필요하다.

<37> 따라서, 각 UE와 eNB간 거리가 상이한 경우 서로 다른 전송지연 시간을 갖게 되고, 각각 획득한 다운링크 동기를 기준으로 업링크 정보를 송신하는 경우, 각 UE의 정보가 서로 다른 시간에 해당 eNB에서 수신되게 된다.

<38> 즉, 무선 통신 시스템에서 사용하는 전송방식이 서로 다른 시간에 각 UE의 업링크 정보가 수신되더라도 이를 분리하여 수신할 수 있는 CDMA와 같은 방식을 사용하는 경우에는 복잡도를 증가시키기는 하지만 큰 문제 없이 정보를 수신할 수 있으나, OFDMA 또는 FDMA를 기반으로 하는 무선 통신 시스템에서는 eNB에서 모든 UE의 업링크 송신정보를 동시에 수신하여 한꺼번에 복조하는 방식으로 운영되므로 정확한 시간에 수신될수록 수신 성능이 높아지며 eNB에서 각 UE 신호의 수신시간의 차이가 커질수록 수신성능은 급격히 열화된다.

<39> 따라서, 기존 LTE와 같은 OFDMA 또는 SC-FDMA을 업링크 전송방식으로 사용하고 있는 시스템에서는 다운링크에서의 전송지연시간과 업링크에서의 전송지연시간을 획득하기 위해 각 UE마다 랜덤 접속방식 등을 이용하여 Timing Alignment 값을 계산하고 이를 각 UE에게 알려주어 업링크 동기를 획득하도록 하고 있다.

<40> 도 2는 본 발명이 적용되는 동기화 과정에서의 TA(Timing Advance)와 관련된 예를 보여주는 도면이다.

<41> 일반적으로, eNB와 단말이 통신을 수행하기 위해서는 다운링크 라디오 프레



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임i(210)가 송신되는 시점과 일치하도록 업링크 라디오 프레임i(220)을 송신해야 한다. 그런데, 사용자 단말과 eNB사이에는 전파 지연 등으로 인해 시간차가 발생한다.

<42> 따라서 이러한 전파 지연을 고려하여 다운링크 프레임 i(210)보다 조금 일찍 단말로 하여금 업링크 라디오 프레임i(220)을 송신하여 eNB의 단말간의 동기를 맞추는 방안으로써 TA(Timing Advance)가 적용될 수 있다. 상기 TA를 계산하는 수식을 살펴보면 다음과 같다.

<43> [수학식 1]

【0044】 $$\mathrm{TA} = \left(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}\right) \cdot T_{\mathrm{s}} \quad \mathrm{seconds}$$

<45> 여기서, $N_{TA}$는 eNB으로부터 TA 명령 정보에 따라 제어되는 가변적인 값이며, $N_{TAoffset}$은 프레임 구조에 따라 고정되어 설정되는 값이다. 한편 $T_s$는 샘플링 주기를 의미한다. 도 2에서 알 수 있듯이, 업링크 동기화를 이루기 위하여 사용자 단말은 eNB에서 제공하는 TA 명령 정보를 수신하여 이를 기반으로 TA를 진행할 수 있다. 따라서, eNB와의 무선 통신을 위한 동기를 획득한다.

<46> 도 3은 본 발명이 적용되는 사용자 단말과 eNB 사이의 랜덤 액세스 과정을 보여주는 도면이다.

<47> 도 3을 참조하면, 사용자 단말(User Equipment, UE)(380)은 eNB(390)와 데이터를 송수신하기 위하여 업링크 동기를 필요로 한다. 업링크 동기를 위해 eNB(39

0)으로부터 동기에 필요한 정보를 수신하는 과정을 진행할 수 있다. 도 3은 동기에 필요한 정보를 수신하기 위한 랜덤 액세스 과정(Random Access Procedure)를 진행하는 과정을 보여준다. 랜덤 액세스 과정은 사용자 단말이 네트워크에 핸드오버 등을 통해 새로이 결합하는 경우에도 적용할 수 있고 네트워크에 결합한 후, 동기화 또는 상태 변경(RRC_IDLE에서 RRC_CONNECTED)과 같이 다양한 상황에서 진행할 수 있다.

<48> 사용자 단말(380)은 먼저 랜덤 액세스 프리엠블(Random access preamble)을 생성하기 위해 프리엠블 시그니처(preamble signature)를 무작위(random, 랜덤)로 선택한다. 그리고 선택한 프리엠블을 eNB(390)에 송신한다(S310). 프리엠블 시그니처 선택시 경쟁 기반(contention-based)으로 진행할 수 있다. 한편 무 경쟁 기반(contention-free)로 진행하는 방식도 사용할 수 있는데, eNB는 미리 예약한 랜덤 액세스 프리엠블을 단말에게 알려주며 해당 단말은 수신된 정보를 기반으로 선택한 프리엠블을 eNB(390)에게 송신한다(S310). 또한, 무 경쟁 기반 방식에서는 경쟁 기반 방식에서 필요한 CR 메시지와 같은 절차는 수행하지 않아도 된다.

<49> 여기서, 상기 사용자 단말(380)은 프리엠블 선택 또는 RACH 전송을 위해 임시 선택한 주파수 자원과 전송 시점을 고려하여 RA-RNTI(Random Access-Radio Network Temporary Identifier)을 인지할 수 있다.

<50> eNB(390)는 수신된 UE의 프리엠블에 대하여 랜덤 액세스 응답(Random access response, RAR)을 수행하는데, 이때, 물리 다운링크 데이터 채널(Physical downlink shared channel, PDSCH)를 통해 상기 랜덤 액세스 응답 메시지를 송신한



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다.

<51> 상기 RAR메시지를 통해 송신하는 정보는, 일 예로, eNB에 의해 수신된 UE 프리엠블의 식별정보, eNB의 식별자(ID), 임시 C-RANI(Cell Radio Network Temporary Identifier), 상기 UE 프리엠블을 수신한 타임 슬롯에 대한 정보, 그리고 TA 정보 등이 포함될 수 있다. 이에, 업링크 동기화를 위한 타이밍 정보가 상기 RAR메시지를 통해 수신되므로, 사용자 단말(380)은 eNB(390)와의 업링크 동기화를 수행할 수 있다. 사용자 단말(380)은 S320 단계에서 수신한 TA 정보를 이용하여 결정된 스케쥴 시점에서 데이터 전송(Scheduled transmission)을 수행한다(S330). 물리 업링크 데이터 채널(Physical uplink shared channel, PUSCH)를 통해 동기화시킨 데이터를 송신하며, HARQ(Hybrid Automatic Repeat reQuest)을 수행할 수도 있다.

<52> 상기 S330 단계에서 송신되는 메시지는 일 예로, RRC 연결 요청(RRC Connection Request), 트래킹 영역 변경(Tracking Area update), 스케줄링 요청(Scheduling request) 등을 포함할 수 있다. 또한, 상기 메시지 중 하나는, 임시 C-RNTI, C-RNTI (if the UE already has one), 또는 UE 식별자 정보 등을 포함할 수 있다.

<53> 한편 S310~330 과정에서 충돌(collision)이 발생할 수 있으므로, eNB(390)는 CR메시지(Contention resoulution message)를 송신하면(S340), UE(380)는 i) UE(380)이 수신한 메시지가 자신의 것인지 확인하고 ACK를 보내거나, ii) 수신한 메시지가 다른 UE의 것으로 확인하고 응답 데이터를 보내지 않는다. 물론 다운링크



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할당을 놓치거나 메시지를 디코딩 하지 못하는 경우에도 응답 데이터를 보내지 않게 된다. 또한, 상기 CR메시지(Contention resoulution message)는 C-RNTI 또는 UE 식별자 정보 등을 포함할 수 있다.

<54> 하나의 반송파를 사용하는 경우의 TA를 획득하는 과정과는 달리, 본 발명이 적용되는 다수의 요소 반송파를 운영하는 무선 시스템에서는 도 1과 같이 각 요소 반송파간 중심 주파수의 위치가 크게 이격되어 있거나, 각 요소 반송파를 지원하는 망 내 장치가 동일하지 않는 등의 경우, 각 요소 반송파간에 TA의 값은 서로 상이할 가능성이 높아진다.

<55> 따라서, 단일 반송파에서 사용하던 동기 획득 방안을 그대로 이용하는 경우, 다수의 요소 반송파의 모든 요소 반송파에 대한 업링크 동기를 획득하기 어렵게 된다. 그러므로 사용자 단말은 사용가능 요소 반송파 중에서 업링크 동기를 획득한 일부 요소 반송파에 한하여, 안정적인 업링크 통신을 수행하게 된다.

<56> 또한, 만일 사용자 단말이, 업링크 동기 기준이 서로 상이한 요소 반송파에 대하여 동일한 업링크 동기 기준을 통해 정보를 전송할 경우, 전송 오류가 발생할 확률이 매우 높고 이를 복구하기 위한 시간 및 자원낭비를 초래할 수 있다. 이러한 경우, 시스템에서 요구되는 응용프로그램에 대한 업링크 QoS(Quality of Service)를 만족시키기 어려울 수 있다.

<57> 또한, 만일 무선 통신시스템에서 다수의 요소 반송파를 운용하는 경우, 단일 UE에 대하여 각 요소 반송파의 특성 및 무선 망 내 지원방식에 따라 다운링크에서의 전송지연시간이 서로 상이할 수 있으며, 이로 인해 각 요소 반송파 또는 동일한



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TA값을 갖는 요소 반송파를 집합으로 구성하는 경우 각 요소 반송파 집합별 업링크 동기기준이 서로 상이하게 되어 이로 인한 업링크 성능열화가 발생할 수 있다.

<58> 따라서, 본 발명은 다수의 요소 반송파들을 사용하는 무선 통신 시스템에서 각 요소 반송파마다 또는 적어도 하나 이상의 요소 반송파로 구성된 요소 반송파 그룹간의 업링크 동기 기준이 상이한 경우, 사용자 단말에서 각 요소 반송파의 타입, 중심 주파수 위치 및 망 서비스 형태 등에 따라 해당 요소 반송파 또는 요소 반송파 그룹의 업링크 동기를 획득하는 방안을 제공하고자 한다.

<59> 이하 사용자 단말은 UE로, 기지국은 eNB로 기재하여 설명을 진행하고자 한다.

<60> 도 4는 본 명세서의 일 실시 예에 의한 업링크 동기를 획득하는 과정을 보여주는 도면이다.

<61> 도 4에서는 eNB가 UE에게 다수의 요소 반송파에 관련된 정보를 송신하면 UE가 요소 반송파들 중에서 타이밍과 관련된 그룹을 설정하고, 대표 요소 반송파를 통해 RAP(Random Access Procedure)를 진행하는 과정을 보여준다.

<62> 상기 도 4를 참조하면, UE(480)와 eNB(490)가 연결된 상태(RRC_CONNECTED)인 경우 S410 단계를 진행한다. 만약 무선 자원 제어 연결 상태가 IDLE이거나 재설정이 필요한 경우에는 S405 단계를 먼저 진행하고 S410 단계를 진행한다.

<63> S405 단계는 무선 자원 제어 연결을 진행하는 단계이다. 이는 eNB(490)와 UE(480)가 무선자원제어연결 상태가 IDLE 모드인 경우, 또는 무선자원제어연결을



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재설정해야 하는 경우 eNB(490)는 해당 UE의 요소 반송파 집합을 정의하여 전송할 수 없다. 따라서, 무선자원제어연결을 진행할 적어도 하나 이상의 요소 반송파를 선택하여 요소 반송파 집합 정보를 구성하여 무선자원제어연결을 진행한다(S405). 무선자원제어연결을 진행할 적어도 하나 이상의 요소 반송파를 선택하기 위해 다음 중 하나의 방법을 이용할 수 있다.

<64> i) UE(480)가 측정(measurement)한 정보를 기반으로 무선자원제어연결을 시도할 가장 적합한 요소 반송파 선택할 수 있다.

<65> ii) UE(480) 내부 메모리에 저장되어 있는 시스템에서 고정적으로 설정한 정보를 이용하여 무선자원제어연결을 시도할 수 있다.

<66> iii) eNB(490)에서 시스템 정보를 통해 UE(480)에게 전송한 정보를 이용하여 무선자원제어연결을 시도할 수 있다.

<67> iv) UE(480)내부 메모리에 저장되어 있는 유효한 요소 반송파들의 시스템 정보 이용하여 해당 요소 반송파들을 통해 무선자원제어연결을 시도할 수 있다.

<68> 일 예로 IDLE 모드인 UE는 무선자원제어연결을 위하여 상기의 선택조건을 기준으로 하나의 다운링크 요소 반송파를 선택하고, 상기 선택한 요소 반송파를 통하여 전송되는 방송채널 (broadcasting channel)을 통하여 시스템 정보를 수신한다. 상기 수신한 시스템 정보를 기반으로 상기 선택한 다운링크 요소 반송파와 상기 다운링크 요소 반송파와 연결설정되어 있는 업링크 요소 반송파를 주 서빙 셀 (primary serving cell: 이하 PCell)로 구성한다. 상기 구성된 PCell을 통하여 UE



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는 eNB에게 무선자원제어연결 요구 메시지를 전송한다. 이 때 UE는 상기 RACH 절차를 이용하여 상기 무선자원제어연결 요구 메시지를 eNB으로 전달할 수 있다.

<69> 상기 방법들 중 하나를 통해 무선자원제어연결 진행이 완료되어 eNB(490)와 UE의 무선자원제어연결 상태가 설정된 상태(RRC_CONNECTED 모드)가 되었다면 S410의 절차를 진행한다.

<70> eNB(490)는 해당 UE(480)의 하드웨어 성능, eNB(490)의 가용 주파수 자원 등을 고려하여 UE(480)에게 다수의 요소 반송파(CC)를 사용하도록 허용할 수 있으며 이를 집합으로 정의할 수 있다. eNB(490)는 UE(480)의 사용하도록 허용된 요소 반송파 집합 정보를 UE(480)에게 전송한다(S410).

<71> 앞서 살펴본 바와 같이, UE(480)와 eNB(490)는 S405 단계 또는 이전부터 RRC_CONNECTED를 유지하고 있는 상태, 즉 UE(480)의 무선자원제어연결이 설정된 업링크 요소 반송파의 업링크 동기가 유지되고 있는 경우이다. UE(480)는 eNB(490)으로부터 상기와 같은 기준으로 결정된 요소 반송파 집합 정보를 수신한다. 상기 요소 반송파 집합 정보의 송수신 방식은, 일 실시 예로 eNB(490)가 무선자원제어 재구성 메시지 내에 상기 요소 반송파 집합 정보를 포함하여 UE(480)에게 송신할 수도 있으며, 그 이외의 메시지가 사용될 수도 있다. 또한 상기 요소 반송파 집합 정보는 각 요소 반송파의 추가/제거와 같은 형태로 구성되어 전송될 수도 있다. 예를 들어, 최초 요소 반송파 집합 정보를 전송함에 있어서, DL CC1, DL CC2, DL CC4 로 구성된 요소 반송파 집합 정보는 다운링크 요소 반송파 추가 목록으로 구성될 수 있고 상기 목록에는 CC1, CC2, CC4가 포함될 수 있다. 마찬가지로 업링크 요소 반



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송파 집합 정보도 업링크 요소 반송파 추가 목록으로 구성될 수 있다. 또 다른 실시 예로서, 요소 반송파 집합 정보를 변경함에 있어서, 상기 구성된 다운링크 요소 반송파 집합이 CC1, CC3, CC4 로 변경되는 경우 다운링크 요소 반송파 제거 목록으로 CC2를 구성하고 다운링크 요소 반송파 추가 목록에 CC3를 구성하여 상기 다운링크 요소 반송파 집합 정보를 전송할 수 있다.

<72> UE(480)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들에 대한 시스템 정보(system information: 이하 SI)를 수신한다 (S420).

<73> 만약, 요소 반송파 집합 내에 요소 반송파들 중에서 해당 요소 반송파의 시스템 정보를 해당 요소 반송파로 전송할 수 없는 요소 반송파(예를 들어, 확장 요소 반송파 (extension component carrier: 이하 ECC)) 또는 방송채널을 통해 전송되는 시스템 정보를 수신할 수 없는 요소 반송파(예를 들어, 부 서빙 셀(Secondary serving cell: 이하 SCell)에 속하는 다운링크 요소 반송파)가 존재하는 경우, 시스템 정보를 수신할 수 있는 요소 반송파 또는 제어정보 형태로 변환된 시스템 정보를 수신할 수 있는 요소 반송파를 통해 수신할 수 있다. 상기 변환된 시스템 정보는 eNB에서 전송하는 무선자원제어 재구성 메시지 내에 상기 요소 반송파 집합 정보와 동시에 UE에게 전송될 수도 있으며, 상기 요소 반송파 집합 정보가 수신된 이후 무선자원제어 재구성 메시지를 통하여 UE에게 전송될 수도 있다. 이 방법 이외에 현 단계에서는 해당 요소 반송파에 대한 시스템 정보를 수신하지 않고 진행할 수 있다.



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<74> UE(480)는 수신된 시스템 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들을 원소로 하는 업링크 타이밍 그룹(Uplink timing group, UL timing group)을 설정한다(S432). 상기 업링크 타이밍 그룹을 구성하는 과정에서 고려할 사항은 다음과 같다.

<75> 먼저 다수의 요소 반송파들 중에서 서로 다른 그룹으로 할당할 것인지를 판단하는 방식으로는 다음과 같은 조건을 고려할 수 있다. 즉, 다음의 적어도 하나 이상의 조건을 만족하는 요소 반송파는 그룹 설정 시 다른 그룹으로 설정할 수 있다.

<76> a-i) 요소 반송파들의 중심 주파수 값의 차이가 임계치 이상 범위인 요소 반송파 들은 서로 다른 그룹으로 할당한다. 중심 주파수가 크게 차이날 경우, 무선 신호의 전파 과정에서 발생하는 지연이 달라지며 이에 따른 TA 값도 차이가 커질 가능성이 높아진다.

<77> a-ii) 서로 다른 빔포밍(beamforming)이 되는 요소 반송파들 간에도 서로 다른 그룹으로 할당한다. 빔포밍이 다르면 TA 값이 달라질 가능성이 높아진다.

<78> a-iii) 업링크 동기 갱신 요청이 있을 때마다 갱신하도록 설정된 요소 반송파들도 서로 다른 그룹으로 할당한다. 상기 설정은 eNB(490)에 의해 설정된 시스템 정보 내에 포함되어 전송될 수도 있으며 그 이외의 메시지 내에 포함되어 전송 될 수도 있다.

<79> a-iv) 매크로 셀(Macro cell)에서 서비스 하지 않는 요소 반송파이거나 펨토



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셀(femto cell), 피코셀(pico cell), 마이크로 셀(micro cell), 릴레이(relay), 리피터(repeater) 등에 의해 매크로 셀과 중첩된 공간에서 서비스 되는 요소 반송파들과 매크로 셀 에 의해 서비스 되는 요소 반송파 간에도 그 특성이 상이하므로 서로 다른 그룹으로 설정할 수 있다.

<80> a-v) eNB(490)으로부터 업링크 동기 갱신 요청이 있는 요소 반송파 역시 동기가 변화된 요소 반송파이므로 다른 그룹으로 할당할 수 있다.

<81> 상기 설명한 바와 같이, 업링크 타이밍 그룹으로 설정하는 조건은 앞서 살펴본 a-i)~ a-v)가 일 실시 예가 될 수 있으나, 이외에도 무선의 전파 특성과 소정 측정치 등을 고려하여 하나의 그룹으로 설정하거나, 또는 상이한 그룹으로 설정할 수 있다.

<82> 한편, 아래의 조건을 만족하는 경우는, 하나의 그룹으로 설정할 수 있다.

<83> b-i) 요소 반송파들의 중심 주파수 값의 차이가 임계치 이내 범위인 요소 반송파 간에는 전파 특성이 유사할 수 있으므로 하나의 그룹으로 할 수 있다.

<84> b-ii) 동일한 빔 포밍이 되는 요소 반송파들 간 하나의 그룹으로 할 수 있다.

<85> b-iii) 동일한 무선 망 내 장치에서 사용되는 요소 반송파들 간에 하나의 그룹으로 설정할 수 있다.

<86> b-iv) 또한, 상기 서로 상이한 그룹에 속하도록 하는 조건(a-i~a-v)을 만족하지 않는 요소 반송파들을 하나의 그룹으로 생성할 수 있다.



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<87> UE(480)에서 그룹을 생성하는 방식으로는 두 가지 방식, 즉 상이한 그룹에 속하는 요소 반송파를 구별하여 그룹을 생성하는 방식과 동일한 그룹에 속하도록 요소 반송파를 구별하여 그룹을 생성하는 방식으로 나뉘어 지며, 상기 두 방식을 혼용할 수 있고 어느 하나의 방식으로 진행할 수 있다 각각의 방식을 적용하는 과정에서 판단할 조건은 앞서 살펴본 바와 같다.

<88> 업링크 타이밍 그룹이 생성되면, UE(480)는 각 그룹 내 대표 요소 반송파(delegate CC)를 설정한다(S434). 이때, 대표 요소 반송파를 설정하는 기준은, 업링크 동기 획득을 위한 TA값을 획득이 가능한 요소 반송파 중에서 다음을 조건을 고려하여 설정할 수 있다.

<89> c-i) 가장 낮은 중심 주파수 값을 갖는 요소 반송파,

<90> c-ii) 가장 평균에 가까운 중심 주파수 값을 갖는 요소 반송파,

<91> c-iii) 가장 높은 중심 주파수 값을 갖는 요소 반송파,

<92> c-iv) 주파수 대역이 가장 넓은 요소 반송파,

<93> c-v) RLM 동작이 정의된 부서빙셀

<94> 중에서 하나를 대표 요소 반송파로 설정할 수 있다.

<95> 상기 대표 요소 반송파를 설정하는데 필요한 사항을 살펴보면 다음과 같다. CC는 DL CC 또는 DL CC와 UL CC가 모두 포함된 개념으로 정의될 수 있으며 셀(Cell)이라 정의할 수 있다. 다시 말하면 셀은 일정 지역에 단말기가 인지할 수 있



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는 무선신호가 도달할 수 있는 DL 주파수 자원(예를 들어 요소 반송파)만으로도 정의될 수 있으며, 상기 DL 주파수 자원과 상기 DL 주파수를 통하여 기지국으로부터 신호를 수신할 수 있는 단말기가 기지국으로 전송가능한 UL 주파수 자원의 쌍(pair)로 정의될 수 있다. 따라서 다수의 요소 반송파를 구성할 수 있는 단말기에 한하여 기지국은 현재 무선통신연결을 통해 데이터를 단말기와 주고받기 위해 다수의 서빙셀을 구성할 수 있다. 주서빙셀은 RRC 연결(establishment) 또는 재연결(re-establishment) 상태에서, 보안입력(security input)과 NAS 이동 정보(mobility information)을 제공하는 하나의 서빙셀을 의미한다. 단말의 성능(capabilities)에 따라, 적어도 하나의 셀이 주서빙셀과 함께 서빙셀의 집합을 형성하도록 구성될 수 있는데, 상기 적어도 하나의 셀을 부서빙셀이라 한다.

<96> 따라서, 하나의 단말에 대해 설정된 서빙셀의 집합은 하나의 주서빙셀만으로 구성되거나, 또는 하나의 주서빙셀과 적어도 하나의 부서빙셀로 구성될 수 있다.

<97> 주서빙셀의 주파수내 인접셀 및/또는 부서빙셀의 주파수내 인접셀, 각각은 동일한 반송파 주파수에 속한다. 그리고, 주서빙셀와 부서빙셀의 주파수간 인접셀은 상이한 반송파 주파수에 속한다.

<98> 주서빙셀에 대응하는 하향링크 요소 반송파를 하향링크 주요소 반송파(DL PCC)라 하고, 주서빙셀에 대응하는 상향링크 요소 반송파를 상향링크 주요소 반송파(UL PCC)라 한다. 또한, 하향링크에서, 부서빙셀(920)에 대응하는 요소 반송파를 하향링크 부요소 반송파(DL SCC)라 하고, 상향링크에서, 부서빙셀에 대응하는 요소 반송파를 상향링크 부요소 반송파(UL SCC)라 한다.



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<99> PCC는 단말이 여러 CC 중에 초기에 단말과 접속(Connection 혹은 RRC Connection)을 이루게 되는 CC이다. PCC는 다수의 CC에 관한 시그널링을 위한 연결(Connection 혹은 RRC Connection)을 담당하고, 단말과 관련된 연결정보인 단말문맥정보(UE Context)를 관리하는 특별한 CC이다. 또한, PCC는 단말과 접속을 이루게 되어 RRC 연결상태(RRC Connected Mode)일 경우에는 항상 활성화 상태로 존재한다.

<100> SCC는 PCC 이외에 단말에 할당된 CC로서, SCC는 단말이 PCC 이외에 추가적인 자원할당 등을 위하여 확장된 반송파(Extended Carrier)이며 활성화 혹은 비활성화 상태로 나뉠 수 있다. 주서빙셀과 부서빙셀은 다음과 같은 특징을 가진다.

<101> 첫째, 주서빙셀은 PUCCH의 전송을 위해 사용된다.

<102> 둘째, 주서빙셀은 항상 활성화되어 있는 반면, 부서빙셀(920)은 특정 조건에 따라 활성화/비활성화되는 반송파이다.

<103> 셋째, 주서빙셀이 무선링크실패(Radio Link Failure; 이하 RLF)를 경험할 때, RRC 재연결이 트리거링(triggering)되나, 부서빙셀(920)이 RLF를 경험할 때는 RRC 재연결이 트리거링되지 않는다.

<104> 넷째, 주서빙셀은 보안키(security key) 변경이나 RACH(Random Access CHannel) 절차와 동반하는 핸드오버 절차에 의해서 변경될 수 있다. 단, MSG4(contention resolution)의 경우, MSG4를 지시하는 PDCCH만 주서빙셀를 통하여 전송되어야 하고 MSG4 정보는 주서빙셀 또는 부서빙셀을 통하여 전송될 수 있다.

<105> 다섯째, NAS(non-access stratum) 정보는 주서빙셀를 통해서 수신한다.



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<106> 여섯째, 언제나 주서빙셀는 DL PCC와 UL PCC가 짝(pair)으로 구성된다.

<107> 일곱째, 각 단말마다 다른 CC를 주서빙셀로 설정할 수 있다.

<108> 여덟째, 부서빙셀의 재설정(reconfiguration), 추가(adding) 및 제거(removal)와 같은 절차는 RRC 계층에 의해 수행될 수 있다. 신규 부서빙셀의 추가에 있어서, 전용(dedicated) 부서빙셀의 시스템 정보를 전송하는데 RRC 시그널링이 사용될 수 있다.

<109> 주서빙셀과 부서빙셀의 특징에 관한 본 발명의 기술적 사상은 반드시 상기의 설명에 한정되는 것은 아니며, 이는 예시일 뿐이고 더 많은 예를 포함할 수 있다.

<110> RLM (Radio Link Monitoring)은 단말기가 cell-specific reference(CRS) 시그널을 기반으로 기지국간 설정된 서빙셀의 다운링크 품질을 탐지하기 위해 다운링크의 품질을 모니터링하는 것을 말한다.

<111> 단말기는 측정된 CRS과 제어채널들의 에너지의 비로 정의되는 미리 정해진 파라미터들을 이용하여 상기 다운링크 품질을 예측한다. 상기 RLM은 다음과 같은 조건으로 설정될 수 있다.

<112> 상기 RLM을 통하여 다운링크 품질을 예측하기 위해 PDCCH(physical dedicated control channel) / PCFICH (physical control format indicator channel)가 전송되는 RE (resource element-단일 OFDM 심볼 내의 단일 부반송파)의 수신 에너지와 상기 CRS의 평균 RE 에너지의 비를 dB 단위로 표현한 값을 기준으로 한다.



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<113> 상기 미리 정해진 파라미터 중 동기불일치(out-of-sync)를 선언하는 기준이 되는 파라미터인 $Q_{out}$ 값은 PDCCH / PCFICH을 전송하기 위해 설정된 파라미터와 함께 PCFICH의 오류를 고려한 가상의 PDCCH (DCI format 1A 기반) 전송의 BER (block error rate)가 10% 이상이라고 판단되는 값을 기준으로 설정된다. 상기 값은 CRS가 전송되는 안테나 포트의 개수에 의해 다른 값을 가질 수 있다. 예를 들어 단일 안테나 포트에 한하여 CRS가 전송되는 경우 $Q_{out}$ 값으로 설정할 상기 PDCCH와 CRS간 에너지의 비율은 4dB를 기준으로 하며 2개 이상의 안테나 포트에 대하여 CRS가 전송되는 경우 1dB를 기준으로 한다.

<114> 상기 미리 정해진 파라미터 중 동기회복 또는 동기유지(in-sync)를 선언하는 기준이 되는 파라미터인 $Q_{in}$ 값은 상기 $Q_{out}$ 의 경우에 비해 충분히 큰 신뢰성을 갖는 값을 기준으로 설정된다. 즉, PDCCH / PCFICH을 전송하기 위해 설정된 파라미터와 함께 PCFICH의 오류를 고려한 가상의 PDCCH (DCI format 1C 기반) 전송의 BER (block error rate)가 2% 이상이라고 판단되는 값을 기준으로 설정된다. 상기 값은 CRS가 전송되는 안테나 포트의 개수에 의해 다른 값을 가질 수 있다. 예를들어 단일 안테나 포트에 한하여 CRS가 전송되는 경우 $Q_{in}$ 값으로 설정할 상기 PDCCH와 CRS 간 에너지의 비율은 0dB를 기준으로 하며 2개 이상의 안테나 포트에 대하여 CRS가 전송되는 경우 -3dB를 기준으로 한다.

<115> 상기 예에서 $Q_{out}$ 값에 비해 $Q_{in}$ 값의 기준이 되는 에너지 비율의 값이 오히려



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낮은 이유는 상기에서 언급한 PDCCH / PCFICH을 전송하기 위해 설정된 파라미터와 가상의 PDCCH 전송의 BER을 기준으로 하기 때문이다. 상기 PDCCH / PCFICH을 전송하기 위해 설정된 파라미터들은 PDCCH의 DCI 포멧, 서브프레임 내의 제어정보가 전송되는 OFDM 심벌의 개수, PDCCH의 자기복제 비율을 나타내는 집성수준(aggregation level) 등이 포함된다. 상기 파라미터들은 다운링크 대역폭에 영향을 받는다. 또한 $Q_{out}$ 및 $Q_{in}$ 값은 해당 셀에 대한 단말기의 DRX(discountinous reception) 동작 여부에 의해 영향을 받는다.

<116> 업링크 타이밍 그룹이 생성되면, 단말기 또는 기지국은 각 그룹 내 대표 요소 반송파(delegate CC)를 설정한다. 상기 대표 요소 반송파 설정은 상기 대표 요소 반송파가 포함되어 있는 부서빙셀을 설정하는 형태일 수도 있다. 이때, 대표 요소 반송파 또는 부서빙셀을 설정하는 기준은, 업링크 동기 획득을 위한 TA값을 획득이 가능한 요소 반송파 중에서 상기 c-i)~c-v) 조건을 고려하여 설정할 수 있다. 즉, S434에서 살펴본 c-i)~c-v) 중에서 하나를 대표 요소 반송파로 설정할 수 있다.

<117> 한편, 각각의 업링크 타이밍 그룹별 대표 요소 반송파를 설정하는 방법은, 모든 그룹에 대하여 동일한 기준으로 설정할 수 있고, 또는 각 타이밍 그룹별로 구별되는 조건만 만족하는 다른 기준을 설정할 수 있다. 즉, 대표 요소 반송파의 선택은, 각 그룹의 네트워크 상태, 그룹을 구성하는 요소 반송파들의 특징 등을 고려



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하여 선택할 수 있다.

<118> S432, S434 단계를 완료하여 업링크 타이밍 그룹과 해당 그룹의 대표 요소 반송파를 설정한 후, UE(480)은 업링크 동기 획득을 위하여, 각 그룹 내 대표 요소 반송파들을 통해, 즉, 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 자원 중 하나를 선택하여 설정한 프리엠블을 전송한다(S440). 상기 프리엠블은 사용자 단말이 동기화를 요청하는 동기화 요청 메시지에 포함될 수 있다. 해당 프리엠블의 전송은 eNB(490)에 의해 설정된 시간/주파수 자원에서 UE(480)가 순차적으로 또는 동시에 또는 랜덤하게 프리엠블을 선택된 CC를 통해 전송하는 것을 포함할 수 있다.

<119> 한편, 업링크 동기 획득이 필요한 상황은 다음과 같다. 또는 다음의 상황이 아니어도, UE(480)에서 필요 여부를 판단하여 랜덤 액세스 프리엠블을 생성하여 eNB(490)로 송신할 수 있다.

<120> d-i) eNB(490)이 다운링크 동기에 대한 전체 재설정을 요구하는 경우,

<121> d-ii) 모든 업링크 데이터의 전송을 초기화하고 재시도하는 경우,

<122> d-iii) UE(480) TimeAlignment timer가 만료되었을 경우,

<123> UE(480)는 사용 가능한 전체 요소 반송파 그룹들에 대하여 업링크 동기 획득을 위한 프리엠블을 송신할 수 있다.

<124> 또한, UE(480)는 사용 가능한 일부 요소 반송파 그룹에 대하여 업링크 동기 획득을 필요로 할 수 있다. 이러한 조건은 아래와 같다.



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<125> e-i) 요소 반송파 그룹이 최초로 설정되어 해당 그룹 내에 TA값이 존재하지 않는 경우,

<126> e-ii) UE(480)의 그룹 내 요소 반송파들을 통한 업링크 전송 데이터에 대한 응답이 모두 없을 경우,

<127> e-iii) eNB(490)와 UE(480)간 RRC 연결을 재구성(re-configuration)한 경우,

<128> e-iv) UE(480)가 물리적으로 다른 eNB(490)으로 특정 요소 반송파 그룹이 핸드오버 하는 경우,

<129> e-v) eNB(490)이 다운링크 동기에 대한 특정 요소 반송파 그룹에 대하여 재설정을 요구하는 경우,

<130> e-vi) 요소 반송파 TA 타이머(CC TimeAlignment timer)가 만료되었을 경우 (상기 타이머는 각 요소 반송파 또는 그룹마다 설정 가능한 타이머임)에는 해당 요소 반송파가 포함된 요소 반송파의 그룹에 대해 업링크 동기 획득을 진행할 수 있다.

<131> 일 예로, 상기 S432, S434 단계에서 요소 반송파 CC1, CC2, CC3, CC4, CC5가 있고, CC1, CC2는 그룹1, CC3, CC4, CC5는 그룹 2로 설정되었으며, 그룹 1의 대표 요소 반송파가 CC1이며, 그룹 2의 대표 요소 반송파가 CC3인 경우, UE(480)에서 사용 가능한 전체 요소 반송파 그룹들에 대해 업링크 동기가 필요할 경우 CC1과 CC3을 통해 랜덤 액세스 프리엠블을 송신할 수 있다. 한편, 일부 요소 반송파 그룹에서 동기 획득이 필요한 상황에서 그룹 2에 대해 동기 획득이 필요할 경우, CC3을



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통해 랜덤 액세스 프리엠블을 송신할 수 있다.

<132> 또한, 만일 업링크를 통하여 데이터 송신 중인 상황에서 업링크 동기를 재설정하여야 하는 경우에는, UE(480)는 다음과 같은 동작(예를 들어 업링크 데이터 전송 초기화)을 우선적으로 수행한 후, 업링크 동기를 확보하기 위한 절차로 HARQ 버퍼들 초기화, PUCCH(Physical Uplink Control Channel)/SRS(Sounding Reference Signal) 해제, SPS(Semi-Persistent Scheduling) 할당/허용 초기화 등을 진행할 수 있다.

<133> eNB(490)는 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파 그룹(대표 요소 반송파)에 대하여 그룹 별 TA값을 계산한다. 그리고 eNB(490)는 UE(480)의 업링크할당(UL grant) 정보와 업링크 타이밍 그룹(대표 요소 반송파)의 TA값을 랜덤 액세스 응답(random access response) 메시지를 통해 UE(480)에게 전송한다(S450). 상기 TA 값은 사용자 단말이 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보의 일 실시예가 된다.

<134> 그 후, UE(480)는 CR(contention resolution) 절차(S460)를 통해 수신한 TA 값이 유효하다고 판단되면 해당 TA값을 그룹 내 다른 요소 반송파에 적용하여 업데이트 한다(S470).

<135> 앞서 살펴본 바와 같이, 전체 그룹에 대해 업링크 동기 획득 절차를 진행한 경우, CC1, CC3에 대한 TA 값을 그룹 1, 2에 포함된 요소 반송파들에 적용할 수 있다. 만약 그룹 2에 대해 CC3의 TA 값을 수신한 경우, 그룹 2에 포함된 요소 반송파들에 적용할 수 있다.



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<136> 도 5는 본 명세서의 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다. 여기서, 도 5는 eNB인 eNB(590)에서 업링크 타이밍 그룹을 설정하는 경우를 보여준다.

<137> 도 5를 참조하면, eNB(590)가 업링크 타이밍 정보를 송신하기에 앞서, eNB(590)는 UE의 모드(RRC_CONNECTED/ RRC_IDLE)를 확인한다. UE와 연결되어 있지 않는 경우, 무선 자원 제어 연결을 진행할 수 있으며(S505), 무선 자원 제어 연결을 위하여 PCell을 이용할 수 있으며, 이는 도 4의 S405과정과 동일하게 적용 가능하다.

<138> 또한, eNB(590)에서 그룹을 생성하는 방식은 도 4에 언급한 a-i)~a-v) 또는 b-i)~b-iv) 조건을 참조할 수 있다.

<139> 따라서, eNB(590)는 해당 UE(580)의 요소 반송파 집합 정보와 상기 설정한 업링크 타이밍 그룹 정보를 UE(580)에게 전송한다(S510). 여기서, 상기 업링크 타이밍 그룹 정보는, 상기 요소 반송파 집합 정보(CC set info.) 메시지에 포함되어 UE(580)에 전송될 수도 있으며, 그와 별개로 독립적으로 설정된 메시지를 이용하여 전송될 수도 있다. 별개로 설정된 메시지인 경우에 대해서는 도 6을 참조하여 설명하고자 한다. 한편, UE별로 제공되는 요소 반송파 집합 정보 전송 메시지(CC set infomation message)는 RRC (L3) 메시지일 수도 있으며 L1 시그널링일 수도 있으며 L2 시그널링 일 수도 있다.

<140> UE(580)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들



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의 시스템 정보(system information: 이하 SI)를 수신한다(S520). 이때, UE(580)는 eNB(590)에 의해 S508 단계에서 생성된 업링크 타이밍 그룹을 그대로 이용하거나, 혹은 현재의 네트워크 상황에 맞추어 도 4의 S432와 같이 업링크 타이밍 그룹을 일부 수정할 수 있다. 이는 UE(580)가 eNB(590)에 의해 생성된 그룹이 실제 UE(580)의 환경에 적합하지 않는 경우에, 상기 업링크 타이밍 그룹을 추가 수정할 수 있음을 포함한다.

<141> 즉, 업링크 타이밍 그룹 정보를 수신한 후, 혹은 업링크 타이밍 그룹 정보를 변경하거나 새로이 생성한 후, UE(580)는 각각의 업링크 타이밍 그룹에 대해 대표 요소 반송파를 선택한다(S534). 업링크 타이밍 그룹에 대한 대표 요소 반송파의 선택시 고려할 조건들은 도 4의 S434에서 살펴본 바와 같다

<142> S534에서 업링크 타이밍 그룹별로 대표 요소 반송파를 선택하는 과정이 완료한 후, 업링크 동기 획득이 필요한 상황이 발생하게 되면, 각 그룹 내 대표 요소 반송파들은 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 자원 중 하나를 선택하여 선택한 프리엠블을 전송한다(S540). 상기 프리엠블은 사용자 단말이 동기화를 요청하는 동기화 요청 메시지에 포함될 수 있다.

<143> 여기서, UE(580)는 업링크 타이밍 정보를 얻기 위한 랜덤 액세스 프리엠블을 송신하는 메시지(Random access preamble transmit message) 등을 보낼 수 있다. 또한, 해당 프리엠블을 전송하는 방법은 eNB(590)에 의해 설정된 시간/주파수 자원에서 UE(580)에 의해 순차적으로 또는 동시에 또는 랜덤하게 선택되어 전송될 수



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있다.

<144> 한편, UE(580)에 의해 업링크 동기 획득이 필요한 상황은 d-i)~d-iii) 조건을 참조할 수 있다. 또한, UE(580)는 사용 가능한 전체 요소 반송파 그룹들에 대하여 업링크 동기 획득을 위해 프리엠블을 송신할 수 있다. 한편, UE(580)는 사용 가능한 일부 요소 반송파 그룹에 대하여 업링크 동기 획득을 필요로 할 수 있다.

<145> eNB(590)는 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파 그룹(대표 요소 반송파) 마다 그룹 별 TA값을 계산하고, 해당 TA값을 업링크할당(UL grant) 정보와 함께 랜덤 액세스 응답(random access response) 정보에 포함시켜 UE(580)에게 전송한다(S550). 상기 TA 값은 사용자 단말이 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보의 일 실시예가 된다.

<146> 일 실시 예로 eNB(590)는 S508 단계에서 설정하였던 업링크 타이밍 그룹을 고려하여 TA 값을 계산하여 전송할 수 있다. 또한, 특정 요소 반송파를 통해 상기 랜덤 액세스 응답메시지를 송신할 수 있고, 해당 업링크 타이밍 그룹 내의 모든 요소 반송파들을 통해 랜덤 액세스 응답메시지를 송신할 수 있다.

<147> UE(580)는 CR(contention resolution) 절차(S560)를 통해 수신한 TA 값이 유효하다고 판단되면 해당 TA값을 그룹 내 다른 요소 반송파에 적용하여 업링크 타이밍 그룹별 TA를 업데이트 한다(S570).

<148> 도 6은 본 발명의 또 다른 실시 예에 의한 업링크 동기 획득 절차를 나타낸 도면이다. 여기서, 도 6은 eNB(690)에서 업링크 타이밍 그룹을 설정하고 그룹 정보



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를 별도의 메시지를 이용하여 송신하는 경우를 보여준다.

<149> eNB(690)는 UE(680)의 모드(RRC_CONNECTED/ RRC_IDLE)를 확인한다. UE(680)와 연결되어 있지 않는 경우, 무선 자원 제어 연결을 진행할 수 있으며(S605), 무선 자원 제어 연결을 위하여 PCell을 이용할 수 있으며, 이는 도 4의 S405, 도 5의 S505 과정과 동일하다.

<150> eNB(690)는 해당 UE(680)의 하드웨어 성능, eNB(690)의 가용 주파수 자원 등을 고려하여 UE(680)에게 다수의 요소 반송파(CC)를 사용하도록 허용할 수 있으며 이를 집합으로 정의할 수 있다. eNB(690)는 해당 UE(680)의 요소 반송파 집합 정보를 UE(680)에게 전송한다(S610). UE별로 제공되는 요소 반송파 집합 정보 전송 메시지(CC set infomation message)는 RRC (L3) 메시지 등에서 사용되는 메시지일 수도 있으며 L1 시그널링일 수도 있으며 L2 시그널링 일 수도 있다.

<151> 앞서 살펴본 바와 같이, UE(680)와 eNB(690)는 S605 단계 또는 이전부터 RRC_CONNECTED를 유지하고 있는 상태, 즉 UE(680)의 무선자원제어연결이 설정된 업링크 요소 반송파의 업링크 동기가 유지되고 있는 경우이다. UE(680)는 eNB(690)으로부터 상기와 같은 기준으로 결정된 요소 반송파 집합 정보를 수신한다. 요소 반송파 집합 정보의 수신 방식의 일 실시 예로 eNB(690)는 무선자원제어 재구성 메시지 내에 요소 반송파 집합 정보를 포함하여 송신할 수도 있으며 그 이외의 메시지가 될 수도 있다.

<152> UE(680)는 수신된 요소 반송파 집합 정보를 기반으로 집합 내 요소 반송파들의 시스템 정보(system information: 이하 SI)를 수신한다(S620).



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<153> eNB(690)는 UE(580)에 할당된 요소 반송파들에 대하여 업링크 타이밍 그룹을 생성한다(S624). 상기 eNB(690)에서 업링크 타이밍 그룹을 설정하는 과정은 앞서 a-i)~a-v) 또는 b-i)~b-iv)조건들을 고려하여 서로 다른 그룹으로 또는 동일한 그룹으로 설정할 수 있다.

<154> eNB(690)는 그룹을 생성하는 두 가지 방식, 즉, 상이한 그룹에 속하는 요소 반송파를 구별하여 그룹을 생성하는 방식과 동일한 그룹에 속하도록 요소 반송파를 구별하여 그룹을 생성하는 방식을 혼용할 수 있고 어느 하나의 방식으로 진행할 수 있다 각각의 방식을 적용하는 과정에서 판단할 조건은 앞서 살펴본 바와 같다.

<155> eNB(690)는 설정한 업링크 타이밍 그룹 정보를 UE(680)에게 전송한다(S626). 상기 업링크 타이밍 그룹 정보는, 요소 반송파 집합 정보(CC set info.) 메시지 등에 포함되지 않고 별개로 독립적으로 설정된 메시지를 이용하여 송신된다. 상기 업링크 타이밍 그룹 정보는 PDCCH 채널, RRC 시그널링, 브로드캐스트 채널과 같은 채널을 통해 전송되며, L2 (MAC 엘레먼트 컨트롤) 메시지를 통해 전송될 수 있다.

<156> 상기 요소 반송파 집합 정보 메시지를 메시지를 수신한 UE(680)는 수신한 업링크 타이밍 그룹을 그대로 이용하거나, 현재의 네트워크 상황에 맞추어 업링크 타이밍 그룹을 일부 수정할 수 있다. 이는 eNB(690)에서 생성한 그룹이 실제 UE(680)의 환경에 적합하지 않는 경우 UE(680)가 수정을 할 수 있는 경우를 포함한다. 업링크 타이밍 그룹 정보를 수신한 후, 혹은 업링크 타이밍 그룹 정보를 변경하거



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나 새로이 생성한 후, UE(680)는 각각의 업링크 타이밍 그룹에 대해 대표 요소 반송파를 선택한다(S634). 상기 업링크 타이밍 그룹에 대한 대표 요소 반송파의 선택 시 고려할 조건들은 도 4의 S434, 도 5의 S534에서 살펴본 바와 같다.

<157> S634에서 업링크 타이밍 그룹별로 대표 요소 반송파를 선택하는 과정이 완료한 후, 업링크 동기 획득이 필요한 상황이 발생하게 되면, 각 그룹 내 대표 요소 반송파들은 필요 시 각각 프리엠블(random access preamble)을 설정하고 각 요소 반송파의 SI에 정의된 랜덤 접속을 위해 할당된 자원들 중 하나를 선택하여 해당 프리엠블을 전송한다(S640). 해당 프리엠블을 전송하는 방법은 eNB(690)에 의해 설정된 시간/주파수 자원에서 UE(680)에 의해 순차적으로 또는 동시에 또는 랜덤하게 선택되어 전송될 수 있다. 상기 프리엠블은 사용자 단말이 동기화를 요청하는 동기화 요청 메시지에 포함될 수 있다.

<158> eNB(690)는 수신된 랜덤 액세스 프리엠블 신호를 기반으로 각 요소 반송파(대표 요소 반송파) 마다 TA값을 계산하고 해당 값을 업링크할당(UL grant) 정보와 함께 랜덤 액세스 응답(random access response) 정보에 포함시켜 UE(680)에게 전송한다(S650). 일 실시 예로 eNB(690)가 S624 단계에서 설정하였던 업링크 타이밍 그룹을 고려하여 TA 값을 계산하여 미리 전송할 수 있다. 한편, eNB(690)는 특정 요소 반송파를 통해 랜덤 액세스 응답메시지를 송신할 수 있고 해당 업링크 타이밍 그룹 내의 모든 요소 반송파들을 통해 랜덤 액세스 응답메시지를 송신할 수 있다. 상기 TA 값은 사용자 단말이 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보의 일 실시예가 된다.



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<159> UE(680)는 CR(contention resolution) 절차(S660)를 통해 수신한 TA 값이 유효하다고 판단되면, 해당 업링크 타이밍 그룹 별 TA값을 해당 그룹 내 다른 요소 반송파에 적용하여 업데이트를 수행한다(S670).

<160> 상기 도 6에서 설명한 바와 같이, UE(680)는 eNB(690)로부터 설정된 업링크 타이밍 그룹을 수신하고, 해당 그룹의 대표값을 통해 랜덤 액세스 절차를 수행한다. 그 후, 랜덤 액세스 절차에 따른 프리엠블에 대응하여 상기 타이밍 그룹의 TA값을 수신하여 동기 획득을 위한 업링크 타이밍 조절을 수행한다.

<161> 도 7은 본 명세서의 일 실시 예에 의한 eNB에서 단말의 요청에 의해 단말이 업링크 동기 획득을 할 수 있도록 지원하는 도면을 설명한 것이다.

<162> 도 7을 참조하면, eNB인 eNB는 UE의 RRC 모드를 확인한다(S702). eNB와 UE의 무선 자원 제어(RRC)의 연결 상태가 RRC_CONNECTED인 경우(S704), eNB는 다음 단계(S710)로 진행한다.

<163> 만약, RRC_CONNECTED가 아닌 경우에는, S705로 진행한다. S705에서 eNB는 UE로부터 RRC 연결 요청이 존재하는지를 확인할 수 있다. eNB는 UE로부터 RRC 연결 요청을 수신하고(S705), RRC 연결을 완료한다(S706). 이때, eNB는 UE로부터 RRC 연결 요청 메시지를 수신하고, RRC 연결 설정 메시지를 전송하며, 최종적으로 UE로부터 RRC 연결 설정 완료 메시지를 수신하여 RRC 연결을 완료한다. 앞서 S405, S505, S605에서 살펴본 바와 같이 무선 자원 제어 연결을 위하여 PCell을 이용할 수 있다.

<164> eNB는 RRC_CONNECTED UE에 대하여 사용 가능한 적어도 하나의 CC를 포함하는 CC 집합을 설정하고, 상기 설정된 CC 집합 정보를 UE로 송신한다(S710).

<165> 그리고 eNB는 상기 UE의 CC집합 정보를 기반으로 집합 내의 적어도 하나의 특정 요소 반송파에 대한 SI를 송신한다(S720). 여기서, 상기 CC 집합 정보는 RRC 메시지를 통해 전송가능하다. 또한, 상기 설정된 CC 집합의 SI는 브로드캐스트 채널을 통해 전송 가능하다.

<166> eNB는 업링크 타이밍 그룹 생성을 수행하는 주체가 eNB인지 확인한다(S722). 만약 eNB에서 업링크 타이밍 그룹을 생성하는 경우, 상기 UE의 CC집합 정보를 고려하여 업링크 타이밍 그룹을 생성하고, 생성된 업링크 타이밍 그룹에 대한 정보를 UE에 송신한다(S726). 물론 업링크 타이밍 그룹을 생성하여 이에 대한 정보는, S710의 CC 집합 정보를 설정하여 송신하는 시점과 같이 진행하거나 CC 집합 정보와 함께 업링크 타이밍 그룹의 정보를 송신할 수 있다.

<167> 한편, eNB는 UE로부터 랜덤 액세스 프리엠블을 수신한다(S740). 상기 프리엠블은 사용자 단말이 동기화를 요청하는 동기화 요청 메시지에 포함될 수 있다. S740은 업링크 타이밍 그룹 생성을 수행하는 주체가 UE인 경우도 포함한다. 즉, UE가 S710의 사용 가능한 CC 집합 정보와, S720의 해당 CC의 SI 정보를 참조하여 업링크 타이밍 그룹을 생성하고, 생성된 타이밍 그룹별로 대표 요소 반송파를 설정하여, 해당 대표 요소 반송파를 통해 랜덤 액세스 프리엠블을 송신하는 동작을 포함한다. 따라서, eNB는 UE로부터 송신된 프리엠블을 수신하게 된다. 여기서, eNB는 UE로부터 동기화 요청 메시지, 예를 들어, 프리엠블을 다수의 대표 요소 반송파를



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통하여 동시에 또는 시간상 이격하여 수신할 수 있다.

<168> 그 후, eNB는 수신된 프리엠블에 대하여 랜덤 액세스 응답 메시지를 송신하는데, 이 경우, 상기 UE에 할당된 업링크 할당 정보와 각 업링크 타이밍 그룹 별TA 정보를 함께 송신한다(S750). 상기 TA 값은 사용자 단말이 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보의 일 실시예가 된다. 또한 업링크 타이밍 그룹별 TA 정보를 다수의 대표 요소 반송파를 통하여 동시에 또는 이격하여 송신할 수 있다. 여기서, 상기 업링크 타이밍 그룹 별 TA 정보는, 그룹 인덱스에 대응하여 TA 값을 포함하는 테이블 형태로 전송될 수 있다. 또한, 정해진 기준 TA값에 대응하여 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 형태로 전송될 수 있다. 이때, 상기 그룹 별 오차는 정해진 단위 값에 대응하여 정수배의 크기로 표기될 수 있다. 또는 그룹 별 오차를 구체적으로 명시할 수도 있다. 또는 정해진 규칙에 따라 TA를 나타내는 지시자 형태로 전송되는 것을 포함할 수 있다.

<169> 그리고, eNB는 UE에 CR(Contention Resolution) 메시지를 송신한다(S760). 이는 UE 로 하여금 수신한 TA 값의 유효성을 확인하여 해당 그룹의 TA 값을 업데이트 할 수 있도록 동작함을 포함한다.

<170> 도 8은 본 명세서의 일 실시 예에 의한 UE에서 업링크 타이밍 그룹을 이용하여 업링크 동기화를 획득하는 과정을 보여주는 도면이다.

<171> 도 8을 참조하면, UE는 RRC 모드를 확인한다(S802). 만약, RRC_CONNECTED가 아닌 경우, 즉, IDLE 모드인 경우에는 UE는 RRC 연결 설정 과정을 수행한다.



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<172> 이에, UE는 RRC 연결을 설정할 특정 요소 반송파를 선택하고(S806), 선택한 특정 요소 반송파로 RRC 연결 요청(RRC Conneciton Request) 메시지를 전송하고, eNB로부터 RRC 연결 설정(RRC Conneciton setup) 메시지를 선택한 특정 요소 반송파를 통해 수신한 후, 최종적으로 eNB로RRC 연결 설정 완료(RRC Conneciton setup complete) 메시지를 전송하여 RRC 연결 설정을 완료한다(S808).

<173> RRC 모드를 확인한 결과, UE가 RRC_CONNECTED 인 경우(S804), 업링크가 지속적으로 유지되고 있는지 확인한다(S810).

<174> 업링크가 유지되고 있지 않다면, S812 단계로 진행한다. S812에서 UE는 eNB로부터 RRC 연결 재구성(RRC Conneciton setup Reconfiguration) 메시지를 수신하는지 확인한다(S812).

<175> 여기서, UE의 RRC 모드가 IDLE 모드인 경우, 또는 RRC 연결 재구성을 수행하는 경우, eNB는 해당 UE의 요소 반송파 집합을 정의하여 전송할 수 없다. 따라서, UE는 f-i) UE가 measurement한 정보를 기반으로 RRC Connection을 시도할 가장 적합한 요소 반송파 선택, f-ii) UE의 내부 메모리에 저장되어 있는 시스템에서 고정적으로 설정한 정보 이용, f-iii) eNB에서 시스템 정보를 통해 UE에게 전송한 정보 이용, f-iv) UE 내부 메모리에 저장되어 있는 유효한 요소 반송파들의 시스템 정보 이용 중 하나를 사용하여, RRC연결을 진행할 적어도 하나 이상의 요소 반송파를 선택하고, 요소 반송파 집합 정보를 구성할 수 있다. 한편, RRC 연결이 완료되어 UE의 모드가 RRC Connected 모드가 되었다면 S830으로 진행한다.

<176> 만일, UE가 핸드오버를 진행하고 있다면 수신한 RRC 연결 재구성 메시지를



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확인하여(S814), 모빌리티 제어 정보 (Mobility Control Information, MCI)을 확인한다(S816). 그리고, 확인한 MCI 정보를 기반으로 목표 eNB(T-eNB)로부터 해당 CC의 동기 획득을 위한 정보를 확인한다(S818). 즉, UE는 목표 eNB(T-eNB)로부터 업링크 동기화를 획득할 수 있다. 만일, UE가 핸드오버를 진행하고 있지 않다면 수신한 RRC 연결 재구성 메시지만을 확인하고(S814), S816 및 S818절차를 진행하지 않는다.

<177> 다시 설명하여, 업링크 동기화를 획득하는 과정에서, 만일 UE가 핸드오버하고 있지 않는 경우, UE는 소스 eNB(Source eNB, S-eNB)와 해당 요소 반송파의 업링크 동기를 획득하기 위한 절차를 진행하여 업링크 동기를 획득한다. 한편, 다른 실시 예로, UE가 핸드오버하고 있는 경우, UE는 해당 요소 반송파의 업링크 동기를 획득하기 위한 절차를 소스 eNB로부터 전송받은 목표 eNB(Target eNB, T-eNB)의 요소 반송파의 시스템 정보를 기반으로 업링크 동기를 획득하기 위한 절차를 진행하여 업링크 동기를 획득한다. 바람직하기로는 랜덤 접속 절차를 이용할 수도 있으며 그 이외의 절차가 적용될 수도 있다.

<178> 그 후, UE는 소스 eNB(S-eNB) 또는 목표 eNB(T-eNB)와의 동기를 맞추기 위하여 임의의 프리엠블을 선택하여 소스 eNB(S-eNB) 또는 목표 eNB(T-eNB)로 전송한다(S820). 상기 프리엠블은 사용자 단말이 동기화를 요청하는 동기화 요청 메시지에 포함될 수 있다. 상기 UE의 프리엠블 전송에 따라 소스 eNB(S-eNB) 또는 목표 eNB(T-eNB)로부터 랜덤 액세스 응답 메시지를 수신할 수 있다. 여기에는 상기 UE를 위한 업링크 할당 정보과 업링크 동기를 맞추기 위한 적어도 하나 이상의 CC를 포



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함하는 그룹 별 TA 정보가 포함되어 있다(S822).

<179> UE는 CR(Contention Resolution) 과정을 통해 상기 S822에서 수신한 TA가 유효한지 검증하고(S824), 상기 TA가 유효하다고 판단하는 경우, 수신한 TA값에 따라 적어도 하나 이상의 CC를 포함하는 업링크 타이밍 그룹을 업데이트한다(S826).

<180> 한편, RRC 재구성 메시지를 수신하지 않은 경우에는 S820 단계로 진행하여 해당 동작을 수행한다.

<181> 업링크가 유지되거나 UE가 업링크 동기화를 획득한 상황에서, UE는 eNB로부터 요소 반송파들의 집합 정보를 수신한다(S830). 또한, 수신한 CC 집합에 대한 SI 정보를 수신한다(S832).

<182> 그 후, UE는 업링크 타이밍 그룹 정보를 수신하였는지 확인한다(S840). 이때, 업링크 타이밍 그룹 정보가 eNB에서 생성되는 경우, UE는 상기 CC 집합 정보 수신 과정, 혹은 별도의 메시지를 통해 상기 업링크 타이밍 그룹 정보를 수신할 수 있다. 상기 업링크 타이밍 그룹 정보에는 각 그룹별 대표 CC정보도 포함될 수 있다. 만일 상기 업링크 타이밍 그룹 정보에 각 그룹별 대표 CC정보가 포함되어 있다면, S852절차를 진행하지 않으나 만일 상기 업링크 타이밍 그룹 정보에 각 그룹별 대표 CC정보가 포함되어 있지 않다면, UE는 수신한 업링크 타이밍 그룹 정보를 확인하여, 해당 업링크 타이밍 그룹에서 대표 CC를 설정한다(S852). 상기 대표 CC는 도 4의 c-i)~c-v) 조건을 고려하여 설정될 수 있다. 또한, 각 업링크 타이밍 그룹의 TA 조정을 위한 대표 CC는 모든 그룹에 동일한 기준을 적용하여 설정될 수도 있고, 각 업링크 타이밍 그룹의 특성을 고려하여 상이한 기준을 적용하여 설정될



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수도 있다.

<183> 한편, 업링크 타이밍 그룹 정보를 수신하지 않았거나, 수신한 업링크 타이밍 그룹 정보가 현재 UE가 위치한 무선 상황 또는 UE에 적합하지 않은 경우, UE는 수신한 CC 집합 정보를 고려하여 업링크 타이밍 그룹 정보를 설정한다(S850). 그리고, 설정한 업링크 타이밍 그룹 내에서 상기 타이밍 그룹을 대표하는 특정 CC를 설정한다(S852).

<184> UE는 대표 CC를 통해 프리엠블을 선택하여 송신한다(S854). 이는 대표 요소 반송파가 설정된 후, TA를 업데이트할 상황이 발생한 경우에도 적용될 수 있다.

<185> 그리고 UE는 eNB로부터 랜덤 액세스 응답 메시지를 수신한다. 이 때, UE의 업링크 할당 정보와 각 업링크 그룹 별 TA 정보를 수신한다(S856). 여기서, UE는 상기 업링크 타이밍 그룹 별 그룹 인덱스에 대응하는 테이블 형태의 TA 값을 확인할 수 있다. 또한, UE는 정해진 기준 TA값에 대응하여 각 타이밍 그룹 별 단위 오차를 포함하는 형태의 TA차이 값을 확인할 수 있다. 또한, 정해진 단위 값에 대응하여 정수배의 크기로 정해지는 업링크 타이밍 그룹 별 오차를 확인할 수도 있다. 또한 구체적으로 명시된 각 업링크 타이밍 그룹 별 오차를 확인할 수도 있다. 또한 정해진 규칙에 따라 지시자 형태로 정해진 TA 지시자를 확인할 수도 있다.

<186> 그 후, UE는 CR(Contention Resolution) 과정을 통해 수신한 TA가 유효한지 검증한다(S860).

<187> 확인한 TA가 유효함을 확인한 경우, UE는 업링크 타이밍 그룹별 TA값을 업데



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이트 한다(S870).

<188> 여기서, 본 명세서의 일 예에 따라UE는 업링크 타이밍 그룹 별 TA를 업데이트 한 결과를 대표 CC를 통해 eNB에 전송할 수도 있다. 즉, eNB와의 보다 정확한 동기 획득을 위하여 TA 값 확인 절차를 추가로 더 진행할 수도 있다.

<189> 도 9는 본 발명의 일 실시예에 따른 UE의 동작에 대한 도면이다. 여기서, 초기 업링크 타이밍 그룹의 설정이 eNB에서 수행되는 경우 UE의 동작을 도시한 것이다.

<190> 도 9를 참조하면, UE는 eNB으로부터 CC 세트 정보를 수신한다(872). 상기 CC 세트 정보는 PCC(Primary Component Carrier)를 통하여(via) 수신될 수 있다. PCC는 앞서 살펴본 PCell로, IDLE 모드인 UE는 무선자원제어연결을 위하여 상기의 선택조건을 기준으로 하나의 다운링크 요소 반송파를 선택하고, 상기 선택한 요소 반송파를 통하여 전송되는 방송채널 (broadcasting channel)을 통하여 시스템 정보를 수신할 수 있다. 상기 CC 세트 정보는, RRC메시지를 통해 전송될 수도 있다.

<191> UE는 상기 수신한 CC 세트 정보를 기반으로 CC 세트내 CC들에 대한 SI를 수신한다(874). 상기 SI는 브로드캐스팅 채널을 통하여 다수의 UE들에게 공통으로 전송될 수도 있으며 또는 RRC메시지를 통해 전용 채널 형태로 전송될 수도 있다. 상기 SI는 PCC를 통해 전송될 수 있다. 이에, UE는 상기 SI을 이용하여 CC 세트 내 업링크 CC들을 구성한다.

<192> 또한, 상기 874 단계에서, UE는 eNB로부터 사용할 각 CC의 RAP 또는 시간/주

파수 자원에 대한 정보를 수신할 수 있다. 상기 수신된 각 CC의 RAP 또는 시간/주파수 자원에 대한 정보를 이용하여 UE는 최초 업링크 타이밍 그룹을 설정할 수 있다. 상기 RAP 또는 시간/주파수 자원에 대한 정보는, PCC를 통해 상기 SI내에 포함되어 전송되거나, 또는 RRC 메시지 형태로 전송될 수 있다.

<193> UE는 수신된 SI내의 RACH정보와 CC 파라미터들을 기반으로 업링크 동기획득을 위하여 구성된 모든 업링크CC들을 통해 동시에 RAP를 전송할 수 있는지 확인한다(876).

<194> 여기서, 상기 UE는 eNB에 의해 설정된 '구성된 업링크 CC'들의 RACH 파라미터 중 상기 UE전용(specific) RACH 파라미터를 확인한다.

<195> 이 때, 상기 UE전용 RACH 파라미터 중, RAP정보가 설정되어 있는 경우, UE는 자신의 RAP정보를 확인하여 각 구성된 업링크 CC들로 전송할 RAP를 설정한다. 여기서, 상기 RAP 정보는 eNB가 UE구별을 위하여 UE마다 서로 상이하게 설정한 프리엠블 정보이다.

<196> 또는, 상기 UE전용 RACH 파라미터 중, 시간 / 주파수 자원 정보가 설정되어 있는 경우, UE는 자신의 시간 / 주파수 자원 정보를 확인하여 각 구성된 업링크 CC들로 전송할 RAP를 설정한다. 여기서, 상기 시간 / 주파수자원 정보는 eNB가 UE마다 서로 상이하게 설정한 정보이다.

<197> 상기 876단계의 확인 결과, 구성된 모든 업링크CC들을 통해 동시에 RAP를 전송 가능함을 확인한 UE는, 동시에 RAP를 전송한다(878).



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<198> 반면에, 상기 876단계의 확인 결과, UE가 모든 업링크CC들을 통해 동시에 RAP를 전송할 수 없음을 확인한 경우, UE는 890 단계로 진행한다.

<199> 상기 RAP 동시 전송과 관련하여, UE는 다수 개의 업링크 CC들 중 각각의 업링크 CC의 SI내 존재하는 RACH 파라미터들을 확인하고, 상기 RACH 파라미터에 정의되어 있는 다수의 시간/주파수 자원들을 확인하여, 동일한 시간에 RACH를 전송할 RAP전송 시간(rach_t)을 선택할 수 있다. 상기 RAP전송 시간(rach_t)은 상기 UE에 의해 모든 업링크 CC들을 통해 상기 RAP들이 동일하게 전송되는 시간이다.

<200> 그런데, UE가 상기 RAP전송 시간(rach_t) 설정할 수 없는 경우, 즉, UE가 동일한 시간에 구성된 모든 업링크 CC을 통해 RAP를 전송할 수 없는 경우, UE는 eNB에게 RAP 자원 정보 요청 메시지를 전송한다(890).

<201> 일 예로, 모든 업링크 CC들의 RACH 파라미터를 확인하여 RAP를 전송할 수 있는 시간이 t0, t1제한되어 있다고 가정한다. 이러한 경우, UE는 CC1, CC3, CC4를 통해 t0 시간에 RAP를 전송 가능함을 확인/ t1 시간에서는 전송 불가능함을 확인하며, CC2를 통해 t1 시간에 RAP를 전송 가능함을 확인하고, t0 시간에서는 전송 불가능함을 확인한 경우, UE는 eNB로 RAP 자원 정보 요청 메시지를 전송할 수 있다.

<202> 그 후, 상기 RAP 자원 정보 요청에 대한 응답으로, UE는 eNB로부터 RAP 자원 정보 응답 메시지를 수신한다(892). 여기서, 상기 RAP 자원 정보 요청 메시지를 수신한 eNB는 상기 UE가 모든 CCs를 통해 동시에 RAP를 전송할 수 없음을 확인 가능하다. 따라서, eNB는 상기 UE의 RAP 전송시 사용할 전송 시간 주파수 자원 및 프레

임블 종류를 RAP 자원 정보 응답 메시지에 포함하여 UE에게 전송한다.

<203> 이에, UE는 상기 RAP 자원 정보 응답 메시지내의 정보를 기반으로 구성된 모든 업링크 CC들을 통하여 RAP를 전송한다(894). 한편, 만일 eNB로부터 수신된 RAP 자원 정보 응답 메시지에 RAP 자원 정보가 존재하지 않는 경우, RAP를 전송해야 할 시점에서 구성된 모든 업링크 CC들을 통하여 동시에 RAP를 전송할 수 있는 최대한 빠른 시간을 선택한다. 이 때, 모든 CC에서 동일한 RAP를 선택하여 동시에 RAP를 전송할 수 있다.

<204> 그 후, eNB로부터 PCC를 통해 업링크 타이밍 그룹 정보를 수신한다(880). 즉, eNB는 UE로부터 전송된 RAP들을 확인하여 상기 UE가 업링크 타이밍 그룹의 설정을 요청하는 것을 확인하고, 상기 RAP를 통해 수신된 프리앰블들을 이용하여 TA 값을 계산한 후, 상기 계산된 TA 값을 기반으로 상기 UE의 업링크 타이밍 그룹을 생성한다. 상기 생성한 업링크 타이밍 그룹 정보를 상기 UE로 전송한다.

<205> 상기 업링크 타이밍 그룹 정보는 PCC를 통해 하향 링크 제어 채널(Physical Downlink Control Channel, 이하 'PDCCH'라 칭함), 매체 접근 제어(Media Access Control, 이하 'MAC'이라 칭함) 메시지의 제어 정보 형태, 또는 RRC 메시지를 통해 수신될 수 있다.

<206> UE는 eNB로부터 구성된 모든 업링크 CC들과 연결 설정되어 있는 다운링크 CC들 중 일부 또는 모든 다운링크 CC들에서 RAR를 동시에 수신할 수 있다(882). 상기 연결 설정은 무선통신시스템 내에서 고정적으로 설정될 수도 있으며, SI를 이용하여 eNB마다 설정될 수도 있으며, RRC 메시지를 통하여 UE 또는 UE그룹마다 설정될



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수도 있다.

<207> 상기 RAR메시지는, 일 예로, eNB에 의해 수신된 UE 프리엠블의 식별정보, eNB의 식별자(ID), 임시 C-RNTI(Cell Radio Network Temporary Identifier), 상기 UE 프리엠블을 수신한 타임 슬롯에 대한 정보, 업링크 그랜트 정보(UL grant), 그리고 업링크 동기화를 위한 타이밍 정보(TA) 등을 포함할 수 있다.

<208> 이에, UE는 상기 수신한 TA 정보를 이용하여 결정된 스케쥴 시점에서, 업링크 그랜트 정보에 포함되어 있는 시간 주파수 자원 정보를 이용하여 물리 업링크 데이터 채널(Physical uplink shared channel, PUSCH)를 통해 데이터를 송신하며, HARQ(Hybrid Automatic Repeat reQuest)을 수행할 수도 있다.

<209> UE는 RAR을 수신한 CC들에 대하여 TA 유효성을 동시에 검증할 수 있다(884). 이 때, 상기 UE전용 RACH 파라미터 중, RAP정보가 설정되어 있는 경우, UE는 TA 유효성 검증을 생략할 수 있다.

<210> 이미 언급한 바와 같이, UE는 eNB로부터 수신된 ACK 메시지에 포함된 C-RNTI, T_C-RNTI 또는 UE identity가 자신에 할당된 C-RNTI, T_C-RNTI 또는 UE identity와 동일한지를 확인하여, 상기 TA의 유효성을 동시에 검증할 수 있다. 여기서, UE는 C-RNTI, T_C-RNTI 또는 UE identity를 포함하는 L2/L3 메시지를 eNB로 전송하고, eNB로부터 L1/L2 메시지를 수신한다. 이는 ACK 메시지가 HARQ 동작에 기반한 것이기 때문이다.

<211> UE는 RAR 수신을 통하여 eNB가 상기 RAR이 수신된 다운링크 CC와 연결 설정



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되어 있는 업링크 CC들을 그룹 내 대표 CC로 설정하였다는 것을 인지하고 상기 업링크 CC들을 그룹 내 대표 CC로 설정한다(886).

<212> UE는 각 그룹 내 다른 CC들에 대하여 상기 872 단계에서 수신한 대표 CC의 TA값을 반영하여 업데이트 한다(888).

<213> 도 10은 본 명세서의 일 실시 예에 의한 송신장치의 구성을 보여주는 도면이다.

<214> 도 10을 참조하면 송신장치(900)는 UE 의 RRC 모드를 확인하는 연결 모드 확인부(905), UE가 사용 가능한 적어도 하나 이상의 CC를 포함하여 CC 집합을 결정하는 CC집합 결정부(920), 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부(930), 송수신부(950)을 포함한다.

<215> 보다 구체적으로, 상기 RRC 모드 확인부(905)는 UE와 eNB의 연결 상태를 확인하여, 연결이 되지 않은 상태, 즉, UE RRC_IDLE이거나, 또는 업링크 동기화가 이루어지지 않은 경우, UE의 연결 상태를 RRC_CONNECTED로 상태를 변경하거나 업링크 동기화가 이루어지도록 할 수 있다. 이 경우, 앞서 살펴본 바와 같이, UE와 PCC를 이용하여 무선 자원 제어 연결을 수행할 수 있다.

<216> 일 예로, 상기 RRC 모드 확인부(905)는 송수신부(950)을 통해 UE로부터 전송된 RRC 연결 요청(RRC Conneciton Request) 메시지를 수신하고, RRC 연결 설정 메시지를 UE로 전송하도록 동작한다. 또한, UE로부터 RRC 연결 설정 완료 메시지를 수신하여 RRC 연결 설정을 완료한 후, UE RRC_CONNECTED 모드를 확인할 수 있다.



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<217> 요소 반송파 집합 결정부(920)는 UE가 사용할 수 있는 적어도 하나 이상의 CC들을 확인하여 UE의 CC 집합을 설정한다. 이때, 상기 UE를 위한 CC 집합은 사용(구성)될 수 있는 CC들간의 업링크 동기 시간 차이, 각 CC의 타입 정보, 각 CC의 중심 주파수 위치, 각 CC의 서비스 지원 형태, 및 각 CC를 위한 네트워크 서비스 등을 고려하여 UE의 CC 집합을 설정할 수 있다.

<218> 업링크 타이밍 그룹 생성부(930)는 상기 요소 반송파 집합 결정부(920)에서 결정된 CC 집합을 반영하여 UE의 업링크 타이밍 그룹을 생성한다. 여기서, 타이밍 그룹은, 요소 반송파들간의 중심 주파수 값의 차이와 임계치를 비교하거나, 동일/상이한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 업링크 동기 갱신 요청에 따라 갱신된 요소 반송파들인지, 또는 매크로(Macro) 셀에서 서비스 하지 않는 요소 반송파이나 매크로보다 작은 셀(femto cell, pico cell, micro cell, relay, repeater) 등에 의해 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여 결정할 수 있다.

<219> 상기 송수신부(950)은 UE에게 CC 집합 정보와 업링크 타이밍 그룹 정보를 송신한다. 이 때, 송수신부(950)는 도 5와 같이 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 송신할 수 있고, 또는 도 6과 같이 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 구분하여 송신할 수 있다. 또한, 송수신부(950)는 CC 집합 정보를 송신한 후, 추가적으로 시스템 정보(SI)를 송신할 수도 있다. 따라서, UE로 하여금 상기 CC 집합 정보와, SI 정보를 기반으로 업링크 타이밍 그룹을 설정하도록 제공할 수도 있다.



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<220> 한편, 송수신부(950)는 UE로부터 동기화를 요청하는 동기화 요청 메시지, 예를 들어 랜덤 액세스 프리엠블(Random Access Preamble)을 포함하는 메시지를 수신할 수 있다. 즉, 상기 업링크 타이밍 그룹에 대응하여 UE에 의해 결정된 대표 요소 반송파를 통해 전송되는 랜덤 액세스 프리엠블을 확인하여 각 업링크 타이밍 그룹에 대한 TA 값을 전송하는 것을 포함한다. 상기 동기화 요청 메시지의 수신은 하나 이상의 대표 대표 요소 반송파를 통하여 동시에 또는 이격하여 수신할 수 있다.

<221> 또한, 송수신부(950)는 UE 로부터 전송되는 랜덤 액세스 프리엠블 메시지를 통해 업링크 타이밍 그룹 생성부(930)로 하여금 결정된 업링크 타이밍 그룹에 대하여 전체 또는 일부를 수정하도록 제공할 수 있다.

<222> 제어부(910)는 상기 수신한 랜덤 액세스 프리엠블에 대하여 동기화와 관련된 정보, 예를 들어, 업링크 할당, 동기화 관련된 TA정보 등을 포함한 메시지를 생성하여 UE에 송신하도록 송수신부(950)을 제어한다. 이때, 상기 TA 정보를 포함하는 메시지는 앞서 살펴본 랜덤 액세스 응답 메시지를 포함한다. 동기화와 관련된 정보는 앞서 업링크 전송 시간을 앞당기는데 필요한 정보인 TA 정보를 포함한다. 따라서, 상기 제어부(910)는 상기 송수신부(950)로 하여금 업링크 타이밍 그룹에 대하여 동기화 정보를 생성하여 송신하도록 제어할 수 있다.

<223> 여기서, 상기 제어부(910)은 각 업링크 타이밍 그룹 별 TA 정보를, 그룹 인덱스에 대응하여 TA 값을 포함하는 테이블 형태로 생성할 수 있고, 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 TA 값을 생성할 수 있고, 각 타이밍 그룹 별 오차는 정해진 단위 값에 대응하여 정수배의 크기를 가지도록 생성할 수 있고, 또는 타



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이밍 그룹 별 오차를 구체적으로 명시할 수도 있다. 또는 정해진 규칙에 따라 TA를 나타내는 지시자 형태로 전송하도록 송수신부(950)을 제어할 수 있다. 상기 TA 값은 사용자 단말이 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보의 일 실시예가 되며, 상기 업링크 타이밍 그룹에 대한 동기화 정보는 하나 이상의 대표 요소 반송파를 통하여 동시에 또는 이격하여 송신될 수 있다.

<224> 또한, 제어부(910)는 모든 구성 요소를 제어할 수 있으며, 일부 구성요소들은 독립적으로 동작할 수 있다. 도 10의 구성요소들은 하나 또는 둘 이상의 모듈에 포함되어 구성될 수 있고, 둘 이상의 모듈에서 하나의 기능을 구현하도록 구성될 수도 있다.

<225> 도 11은 본 명세서의 일 실시 예에 의한 수신장치의 구성을 보여주는 도면이다.

<226> 도 11을 참조하면, 수신장치(1000)는, 연결모드 확인부(1005), CC 집합 확인부(1007), 제어부(1010), 업링크 타이밍 조정부(1020), 업링크 타이밍 그룹 생성부(1030) 및 송수신부(1050)을 포함한다.

<227> 연결 모드 확인부(1005)는 eNB와의 연결 상태를 확인한다. 즉, UE RRC_IDLE이거나 eNB와 업링크 동기화가 이루어지지 않은 경우, UE로 하여금 RRC_CONNECTED로 상태를 변경하거나 업링크 동기화가 이루어지도록 할 수 있다. 이 경우, 앞서 살펴본 바와 같이, UE와 PCC를 이용하여 무선 자원 제어 연결을 수행할 수 있다.

<228> 일 예로, 상기 RRC 모드 확인부(905)는 송수신부(950)을 통해 eNB로 RRC 연



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결 요청(RRC Conneciton Request) 메시지를 전송하고, eNB로부터 RRC 연결 설정 메시지를 수신하여, RRC 연결 설정 완료 메시지를 통해 RRC 연결 설정을 완료하도록 한다.

<229> 송수신부(1050)는 eNB와 정보를 송수신하는 기능을 한다. 일 예로, 송수신부(1050)는 eNB로부터 CC 집합 정보와 동기화와 관련된 정보를 수신한다. 상기 CC 집합 정보를 수신한 후, eNB로부터 CC 집합내의 CC들에 대한 SI도 수신할 수 있다. SI 정보는 CC의 주파수 대역 정보, 실제 가용한 주파수 크기 정보등을 포함한다.

<230> 요소 반송파 집합 확인부(1007)는 CC 집합 정보로부터 UE가 사용할 수 있는 적어도 하나 이상의 CC들을 확인한다. 상기 CC 집합은 UE가 사용할 수 있는 CC들간의 업링크 동기 시간 차이, 각 CC의 타입 정보, 각 CC의 중심 주파수 위치, 각 CC의 서비스 지원 형태, 및 각 CC를 위한 네트워크 서비스 등을 고려하여 결정된 것이다.

<231> 업링크 타이밍 그룹 생성부(1030)는 상기 요소 반송파 집합 결정부(920)에서 결정된 CC 집합을 반영하여 UE의 업링크 타이밍 그룹을 생성한다. 여기서, 업링크 타이밍 그룹은, 도 10에 설명한 조건 사항들을 반영하여 UE에 의해 설정 가능하다. 또한, 업링크 타이밍 그룹 생성부(1030)는 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정할 수 있다.

<232> 일 예로, 업링크 타이밍 그룹 생성부(1030)가 송수신부(1050)를 통해 eNB로



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부터 CC 집합 정보와 함께 요소 반송파들에 대한 업링크 타이밍 그룹 정보를 수신한 경우에는, 수신한 업링크 타이밍 그룹에서 대표 요소 반송파를 선택한다. 물론 송수신부(1050)를 통해 CC집합 정보와 구분하여 별도의 시그널링르 통해 상기 업링크 타이밍 그룹 정보를 수신할 수도 있다.

<233> 따라서, 업링크 타이밍 그룹 생성부(1030)는 상기 송수신부(1050)에서 요소 반송파들에 대한 업링크 타이밍 그룹 정보를 수신하지 않았거나, 또는 eNB에서 생성한 업링크 타이밍 그룹 정보가 자신의 네트워크 상황에 적합하지 않은 경우에는, 새로이 업링크 타이밍 그룹을 생성할 수 있다.

<234> 또한, 제어부(1010)는 상기 송수신부(1050)를 통해 동기화를 요청하는 동기화 요청 메시지를 상기 대표 요소 반송파를 통해 eNB로 송신하고, 상기 대표 요소 반송파를 통해 동기화와 관련된 정보를 eNB로 수신하도록 제어한다. 일 예로, 송수신부(1050)로 하여금 UE에 의해 선택된 랜덤 액세스 프리엠블(Random Access Preamble)을 포함하는 메시지를 전송하고, eNB로부터 전송되는 랜덤 액세스 응답 메시지을 수신하도록 제어할 수 있다. 또한, eNB와의 RRC 재구성 및 동기 획득을 위한 메시지를 송수신하도록 제어할 수 있다. 상기 동기화 요청 메시지의 송신은 하나 이상의 대표 대표 요소 반송파를 통하여 동시에 또는 이격하여 송신할 수 있다.

<235> 또한, 제어부(1010)는 상기 랜덤 액세스 응답 메시지를 통해 업링크 타이밍 그룹 생성부(930)로 하여금 결정된 업링크 타이밍 그룹에 대하여 전체 또는 일부를 수정하도록 제어할 수 있다.



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<236> 특히, 상기 제어부(1010)는 상기 랜덤 액세스 응답 메시지에 포함되어 있는 상기 설정된 업링크 타이밍 그룹에 대응하여 각 업링크 타이밍 그룹에 대한 TA 값을 확인하도록 제어할 수 있다. 또한, 상기 UE의 업링크 전송을 위한 할당된 주파수 자원 정보를 확인하도록 제어할 수 있다.

<237> 업링크 타이밍 조정부(1020)는 제어부(1010)에 의해 확인된 TA 값을 확인하여 상기 대표 요소 반송파가 포함된 해당 업링크 타이밍 그룹의 모든 요소 반송파에 대하여 TA 값을 적용한다. 즉, eNB와의 동기화를 위하여 해당 업링크 타이밍 그룹에 TA값을 적용한다. 여기서, 각 업링크 타이밍 그룹 별 TA 정보는, 그룹 인덱스에 대응하여 TA 값을 포함하는 테이블 형태로 존재할 수 있고, 각 타이밍 그룹 별 정해진 단위 오차를 포함하는 TA 값으로 존재할 수도 있고, 각 타이밍 그룹 별 오차가 정해진 단위 값에 대응하여 정수배의 크기를 가지도록 존재할 수도 있고, 또는 구체적으로 명시된 타이밍 그룹 별 오차로 존재할 수도 있고, 정해진 규칙에 따라 TA를 나타내는 지시자 형태로 존재할 수도 있다. 따라서, 업링크 타이밍 조정부(1020)는 각 업링크 타이밍 그룹에 확인된 TA를 적용하여 동기를 획득한다. 상기 TA 값은 사용자 단말이 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보의 일 실시예가 되며, 상기 업링크 타이밍 그룹에 대한 동기화 정보는 하나 이상의 대표 요소 반송파를 통하여 동시에 또는 이격하여 수신될 수 있다.

<238> 또한, 예를 들어, TA 정보가 동기화 정보에 포함된 경우, 업링크 타이밍 그룹의 모든 요소 반송파에 대하여 동일하게 TA 정보를 설정할 수도 있다.

<239> 상기 언급한, 제어부(1010)는 모든 구성 요소를 제어할 수 있으며, 일부 구



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성요소들은 독립적으로 동작할 수 있다. 도 11의 구성요소들은 하나 또는 둘 이상의 모듈에 포함되어 구성될 수 있고, 둘 이상의 모듈에서 하나의 기능을 구현하도록 구성될 수도 있다.

<240> 따라서, 본 발명의 일 실시 예를 이용하면, 다수의 요소 반송파를 사용 시 각 요소 반송파 또는 요소 반송파 그룹간의 서로 다른 업링크 동기를 획득하는 것이 가능하므로 UE에서 다수의 요소 반송파를 동시에 사용하여 업링크로 정보를 전송하는 경우 동기 획득 오류로 인한 데이터 전송 오류 및 기지국에서의 정보 수신 지연을 줄이는 효과가 있다.

<241> 또한, 본 발명은 다수의 요소 반송파들의 각 요소 반송파마다 업링크 동기 기준이 서로 상이한 경우, 이동통신단말기(user equipment: 이하 UE)에서 각 요소 반송파의 타입, 중심 주파수 위치 및 서비스 형태에 따라 업링크 동기를 획득할 수 있는 장점을 가진다.

<242> 이상의 설명은 본 발명의 기술 사상을 예시적으로 설명한 것에 불과한 것으로서, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자라면 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 다양한 수정 및 변형이 가능할 것이다. 따라서, 본 발명에 개시된 실시 예들은 본 발명의 기술 사상을 한정하기 위한 것이 아니라 설명하기 위한 것이고, 이러한 실시 예에 의하여 본 발명의 기술 사상의 범위가 한정되는 것은 아니다. 본 발명의 보호 범위는 아래의 청구범위에 의하여 해석되어야 하며, 그와 동등한 범위 내에 있는 모든 기술 사상은 본 발명의 권리범위



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에 포함되는 것으로 해석되어야 할 것이다.

【특허청구범위】

【청구항 1】

다수의 요소 반송파를 운영하는 기지국에 있어서

사용자 단말이 사용할 요소 반송파 집합을 설정하는 단계;

상기 사용자 단말에게 상기 요소 반송파 집합 정보를 송신하는 단계;

상기 사용자 단말로부터 동기화를 요청하는 동기화 요청 메시지를 동시에 또는 이격하여 하나 이상의 대표 요소 반송파를 통하여 수신하는 단계; 및

상기 동기화 요청 메시지에 따라 상기 사용자 단말에 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보를 송신하는 단계를 포함하며,

상기 대표 요소 반송파는 상기 기지국 또는 상기 사용자 단말이 생성한 업링크 타이밍 그룹의 대표 요소 반송파인 것을 특징으로 하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 2】

제 1항에 있어서,

상기 업링크 타이밍 그룹에 대한 정보는 상기 요소 반송파 집합 정보와 함께 송신하거나 또는 상기 요소 반송파 집합 정보를 송신한 이후에 송신하는 것을 특징으로 하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 3】

제 1항에 있어서,

상기 업링크 동기화 정보를 송신하는 단계는

상기 업링크 타이밍 그룹에 대한 동기화 정보를 동시에 또는 이격하여 송신하는 단계를 포함하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는,

상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 4】

제 1항에 있어서,

상기 동기화 요청 메시지는 랜덤 액세스 프리엠블 신호를 포함하며,

상기 업링크 동기화 정보를 송신하는 단계는

상기 수신한 랜덤 액세스 프리엠블 신호를 기반으로 상기 대표 요소 반송파에 대한 그룹별 TA 값을 계산하는 단계; 및

상기 계산된 TA 값을 업링크 할당 정보와 함께 랜덤 액세스 응답 정보에 포함시켜 상기 사용자 단말에 송신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 5】

제 1항에 있어서,

상기 요소 반송파 집합을 설정하는 단계 이전에

상기 사용자 단말과 주 서빙 셀을 이용하여 무선 자원 제어 연결을 수행하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법.

【청구항 6】

사용자 단말이 기지국으로부터 요소 반송파 집합 정보를 수신하는 단계;

상기 기지국 또는 상기 사용자 단말이 생성한 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정하는 단계;

동기화를 요청하는 동기화 요청 메시지를 상기 하나 이상의 대표 요소 반송파를 통하여 동시에 또는 이격하여 송신하는 단계;

상기 기지국으로부터 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보를 수신하는 단계; 및

상기 수신한 업링크 동기화 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나 이상의 요소 반송파에 적용하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 7】

제 6항에 있어서, 상기 사용자 단말은 상기 요소 반송파 집합 정보를 수신하는 단계 이후에

상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 업링크 타이밍 그룹을 생성하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 8】

제 6항에 있어서,

상기 업링크 타이밍 그룹에 대한 정보는 상기 요소 반송파 집합 정보와 함께 수신하거나, 또는 상기 요소 반송파 집합 정보를 수신한 이후에 수신하는 것을 특징으로 하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 9】

제 6항에 있어서,

상기 업링크 동기화 정보를 수신하는 단계는

상기 업링크 타이밍 그룹에 대한 동기화 정보를 수신하는 단계를 포함하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 10】

제 6항에 있어서,

상기 동기화 요청 메시지는 랜덤 액세스 프리엠블 신호를 포함하며,

상기 업링크 동기화 정보를 수신하는 단계는

상기 기지국이 상기 랜덤 액세스 프리엠블 신호를 기반으로 상기 대표 요소 반송파에 대하여 계산한 그룹별 TA 값이 업링크 할당 정보와 함께 랜덤 액세스 응답 정보에 포함된 것을 수신하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 11】

제 6항에 있어서,

상기 요소 반송파 집합 정보를 수신하는 단계 이전에

상기 기지국과 주 서빙 셀을 이용하여 무선 자원 제어 연결을 수행하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 12】

제 6항에 있어서,

상기 대표 요소 반송파를 설정하는 단계는

상기 요소 반송파 집합 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들에 대한 시스템 관련 정보를 수신하는 단계;

상기 수신한 시스템 관련 정보에서 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 동기화 요청 메시지를 상기 기지국으로 송신하는 단계;

상기 기지국으로부터 업링크 타이밍 그룹 정보를 수신하는 단계;

상기 수신한 업링크 타이밍 그룹과 관련된 다운링크 요소 반송파 중 전부 또는 일부의 요소 반송파를 통해 업링크 동기화 정보를 동시에 수신하는 단계; 및

상기 동기화와 관련된 정보가 수신된 요소 반송파와 관련된 업링크 요소 반송파를 상기 수신한 업링크 타이밍 그룹 내의 대표 요소 반송파로 설정하는 단계를 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 13】

제 12항에 있어서,

상기 시스템 관련 정보를 수신하는 단계 이후에

상기 요소 반송파 집합 정보 및 시스템 관련 정보에 기반하여 최초 업링크 타이밍 그룹을 생성하는 단계를 포함하며,

상기 동시에 동기화를 요청하는 동기화 요청 메시지를 상기 기지국으로 송신

하는 단계는

상기 수신한 시스템 관련 정보에서 상기 최초 업링크 타이밍 그룹 내의 모든 업링크 요소 반송파를 통해 동시에 상기 동기화 요청 메시지를 송신하는 단계인 것을 특징으로 하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 14】

제 12항에 있어서,

상기 업링크 동기화 정보를 수신하는 단계 이후에

상기 수신한 동기화와 관련된 정보에서 타이밍의 유효성을 검증하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 15】

제 12항에 있어서,

상기 동시에 동기화를 요청하는 메시지를 상기 기지국으로 송신하는 단계는

상기 수신한 시스템 관련 정보에서 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 동기화 요청 메시지를 송신할 수 있는지 확인하는 단계;

상기 확인 결과 동시에 동기화 요청 메시지를 송신할 수 없는 경우

동기화 요청 메시지를 송신하는데 필요한 자원 정보 요청 메시지를 기지국에 송신하는 단계; 및

상기 송신한 자원 정보 요청 메시지에 대한 응답 메시지를 수신하는 단계를 더 포함하는, 다수의 요소 반송파를 운영하는 사용자 단말에서 업링크 동기를 설정하는 방법.

【청구항 16】

다수의 요소 반송파를 운영하는 기지국에 있어서,

사용자 단말이 사용할 요소 반송파 집합을 설정하는 요소 반송파 집합 결정부;

상기 요소 반송파 집합 정보와 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보를 상기 사용자 단말에게 송신하거나, 상기 사용자 단말로부터 동기화를 요청하는 동기화 요청 메시지를 하나 이상의 대표 요소 반송파를 통하여 동시에 또는 이격하여 수신하는 송수신부; 및,

상기 사용자 단말의 동기화 요청 메시지에 따라 상기 사용자 단말의 상기 업링크 동기화 정보를 조정하는 제어부를 포함하며,

상기 대표 요소 반송파는 상기 기지국 또는 상기 사용자 단말이 생성한 업링크 타이밍 그룹의 대표 요소 반송파인 것을 특징으로 하는, 업링크 동기를 설정하

는 장치.

【청구항 17】

제 16항에 있어서,

상기 요소 반송파 집합에 포함되는 각 요소 반송파를 고려하여 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부를 더 포함하며,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 RRC 메시지를 통해 송신하거나 또는 상기 요소 반송파 집합 정보와 구분하여 RRC 메시지를 통해 송신하는 것을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 18】

제 16항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 송신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크

로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 19】

다수의 요소 반송파를 운영하는 사용자 단말에 있어서,

기지국으로부터 요소 반송파 집합 정보를 수신하고, 상기 기지국으로부터 업링크 전송 시간을 조절하는데 필요한 업링크 동기화 정보를 수신하며, 동기화를 요청하는 동기화 요청 메시지를 상기 대표 요소 반송파을 통해 동시에 또는 이격하여 송신하는 송수신부;

상기 수신한 요소 반송파 집합 정보를 고려하여 상기 기지국 또는 상기 사용자 단말이 생성한 업링크 타이밍 그룹에 대한 대표 요소 반송파를 설정하는 요소 반송파 집합 확인부;

상기 수신한 업링크 동기화 정보를 상기 대표 요소반송파가 포함된 업링크 타이밍 그룹의 적어도 하나의 요소 반송파에 적용하는 업링크 타이밍을 조정하는 업링크 타이밍 조정부를 포함하는, 업링크 동기를 설정하는 장치.

【청구항 20】

제 19항에 있어서,

상기 수신한 요소 반송파 집합 정보와 상기 업링크 동기화 정보를 이용하여 업링크 타이밍 그룹을 설정하는 업링크 타이밍 그룹 생성부를 더 포함하며,

상기 업링크 타이밍 그룹 생성부는, 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔 포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여 상기 업링크 타이밍 그룹을 생성함을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 21】

제 19항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹 정보를 상기 요소 반송파 집합 정보와 함께 RRC 메시지를 통해 수신하거나 또는 상기 요소 반송파 집합 정보와 구분하여 수신하는 것을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 22】

제 19항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 수신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 23】

제 19항에 있어서,

상기 송수신부는 상기 요소 반송파 집합 정보를 기반으로 요소 반송파 집합 내의 요소 반송파들에 대한 시스템 관련 정보를 수신하며, 상기 수신한 시스템 관련 정보에 의하여 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 송신하고, 상기 기지국으로부터 업링크 타이밍 그룹 정보를 수신하며, 상기 수신한 업링크 타이밍 그룹과 관련된 다운링크 요소 반송파 중 전부 또는 일부의 요소 반송파를 통해 동기화와 관련된 정보를 동시에 수신하며,

상기 요소 반송파 집합 확인부는 업링크 동기화 정보가 수신된 요소 반송파와 관련된 업링크 요소 반송파를 상기 수신한 업링크 타이밍 그룹 내의 대표 요소

반송파로 설정하는 것을 특징으로 하는, 업링크 동기를 설정하는 장치.

【청구항 24】

제 23항에 있어서,

상기 요소 반송파 집합 정보 및 시스템 관련 정보에 기반하여 최초 업링크 타이밍 그룹을 생성하는 업링크 타이밍 그룹 생성부를 더 포함하며,

상기 송수신부는

상기 수신한 시스템 관련 정보에서 상기 최초 업링크 타이밍 그룹 내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 메시지를 송신하는, 업링크 동기를 설정하는 장치.

【청구항 25】

제 23항에 있어서,

상기 송수신부는 상기 수신한 시스템 관련 정보에서 상기 요소 반송파 집합 내의 모든 업링크 요소 반송파를 통해 동시에 동기화를 요청하는 메시지를 송신할 수 있는지 확인하여, 상기 확인 결과 동시에 동기화를 요청하는 메시지를 송신할 수 없는 경우 동기화를 요청하는 메시지를 송신하는데 필요한 자원 정보 요청 메시지를 기지국에 송신하고, 상기 송신한 자원 정보 요청 메시지에 대한 응답 메시지를 수신하는, 업링크 동기를 설정하는 장치.

【청구항 26】

제 23항에 있어서,

상기 송수신부는 상기 업링크 타이밍 그룹에 대한 동기화 정보를 동시에 수신하며,

상기 업링크 타이밍 그룹에 대한 동기화 정보는, 상기 업링크 타이밍 그룹 생성부에 의해 상기 요소 반송파 집합내의 요소 반송파들간의 중심 주파수 값 차이와 미리 정해진 임계치를 비교하거나, 또는 동일한 빔포밍 형태를 가지는 요소 반송파들인지를 확인하거나, 또는 동기화 갱신 요청에 따라 갱신된 요소 반송파들인지를 확인하거나, 또는 매크로셀에서 서비스 하지 않는 요소 반송파이나 상기 매크로 셀보다 작은 커버리지 셀에 의해서 중첩된 공간에서 서비스 되는 요소 반송파인지 등을 확인하여, 상이한 전송 시간을 가지도록 생성됨을 특징으로 하는, 업링크 동기를 설정하는 장치.

제출 일자 : 2011-01-28

【요약서】

【요약】

본 명세서에서는 다수의 요소 반송파를 운영하는 무선 통신 시스템에서 업링크 동기를 설정하는 방법 및 장치를 제공한다. 본 명세서의 일 실시 예에 따른 , 다수의 요소 반송파를 운영하는 기지국에서 업링크 동기를 설정하는 방법은 사용자 단말과 연결을 수행한 후, 요소 반송파 집합 정보를 설정하고, 설정된 요소 반송파 집합에서 업링크 타이밍 그룹을 생성하여 업링크 타이밍 그룹 정보를 사용자 단말에 송신한다.

【대표도】

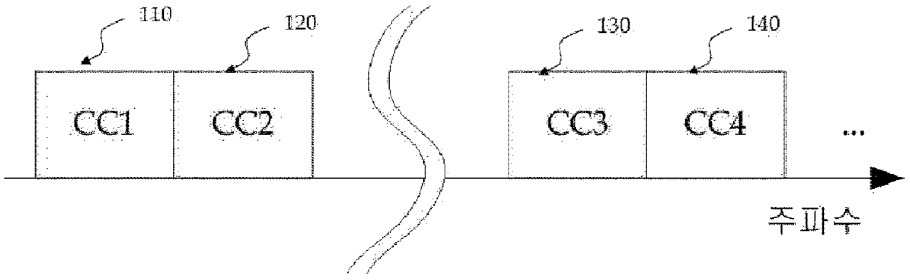
도 4



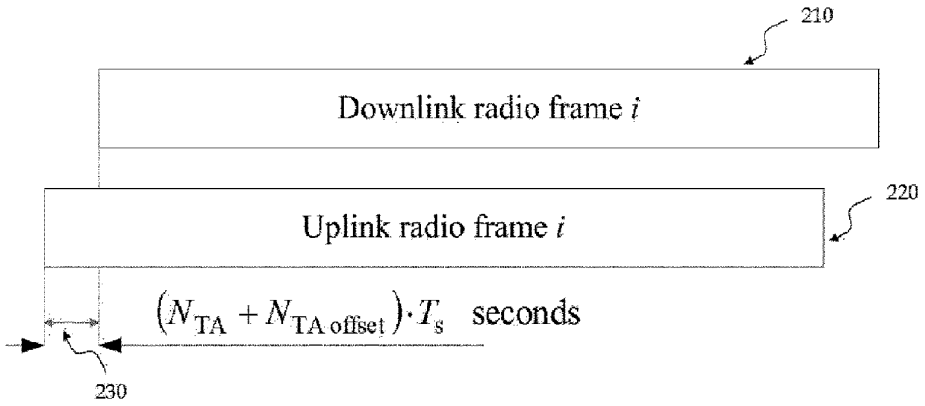
IPR2023-01269 Page 334

【도면】

【도 1】


110
120
130
140
CC1
CC2
CC3
CC4
...
주파수

【도 2】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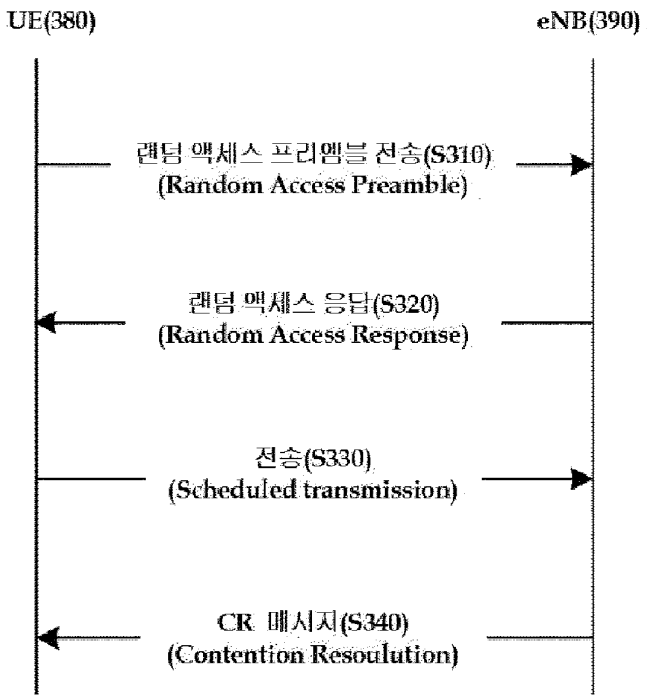
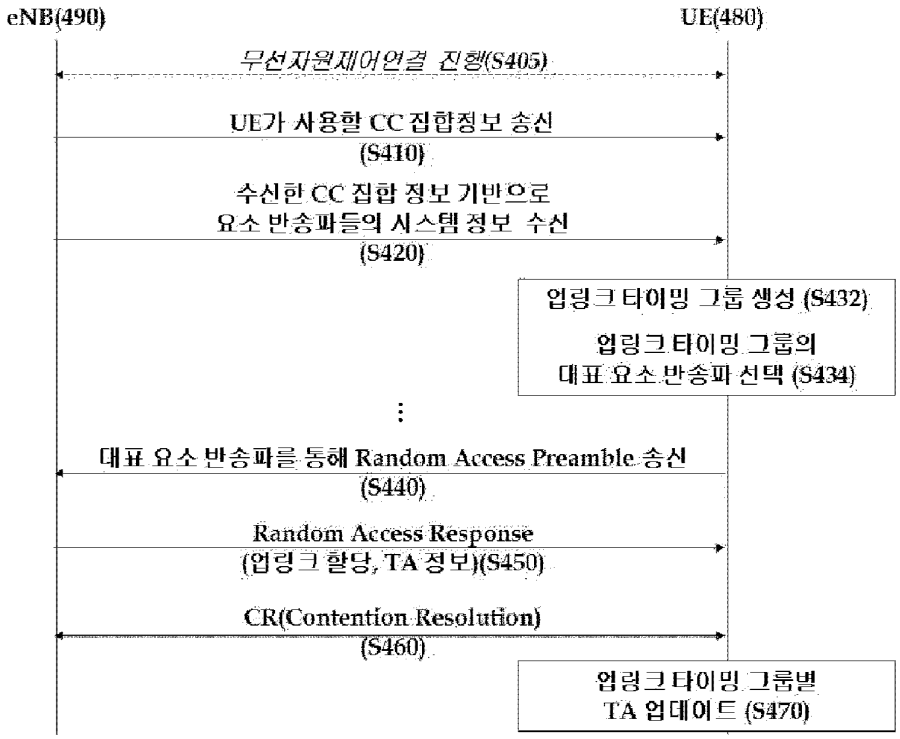
Downlink radio frame i
220
Uplink radio frame i
$(N_{TA} + N_{TA\,offset}) \cdot T_s$ seconds
230

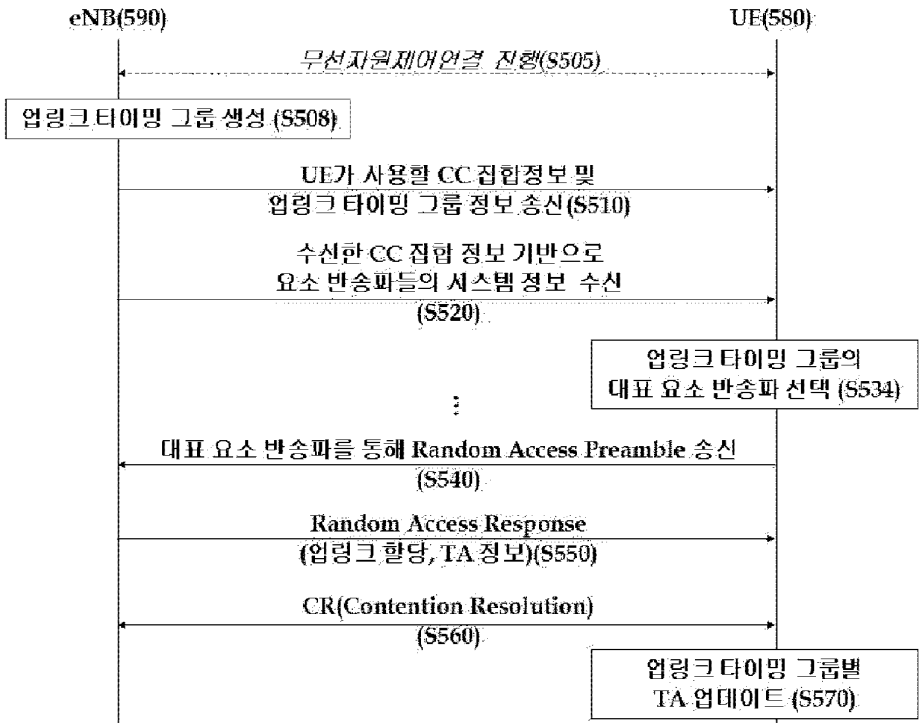
【도 3】


UE(380)
eNB(390)
랜덤 액세스 프리앰블 전송(S310)
(Random Access Preamble)
랜덤 액세스 응답(S320)
(Random Access Response)
전송(S330)
(Scheduled transmission)
CR 메시지(S340)
(Contention Resoulution)

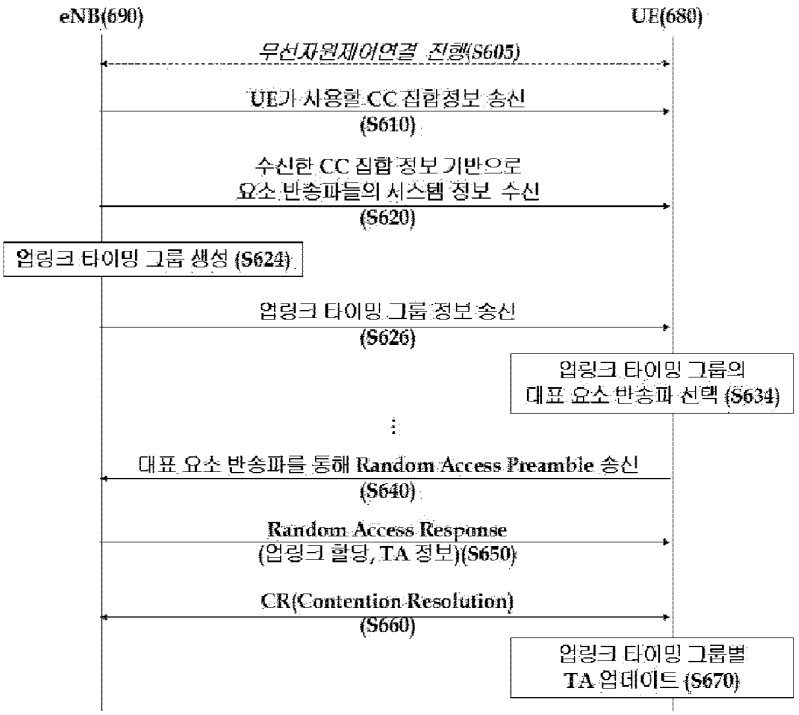
【도 4】


eNB(490)
UE(480)
무선자원제어연결 진행(S405)
UE가 사용할 CC 집합정보 송신
(S410)
수신한 CC 집합 정보 기반으로
요소 반송파들의 시스템 정보 수신
(S420)
업링크 타이밍 그룹 생성 (S432)
업링크 타이밍 그룹의
대표 요소 반송파 선택 (S434)
대표 요소 반송파를 통해 Random Access Preamble 송신
(S440)
Random Access Response
(업링크 할당, TA 정보)(S450)
CR(Contention Resolution)
(S460)
업링크 타이밍 그룹별
TA 업데이트 (S470)

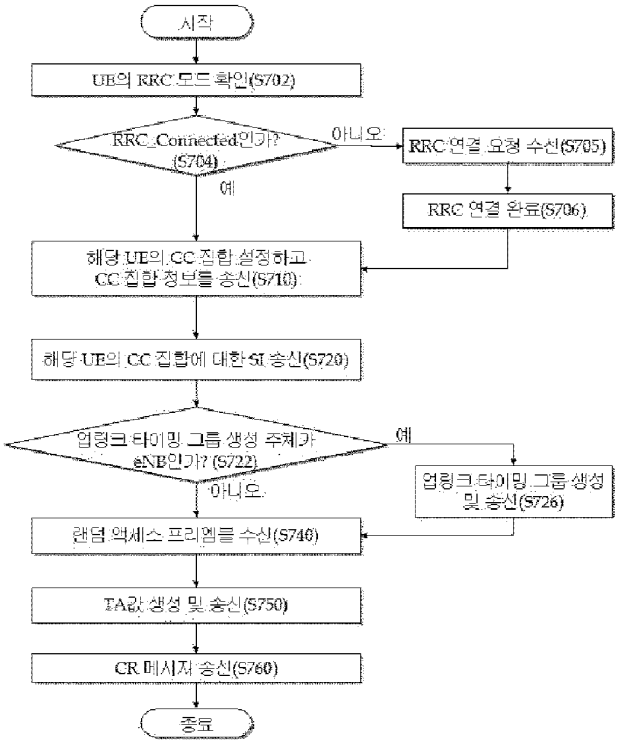
【도 5】


eNB(590)
UE(580)
무선자원제어연결 진행(S505)
업링크타이밍 그룹 생성 (S508)
UE가 사용할 CC 집합정보 및
업링크 타이밍 그룹 정보 송신(S510)
수신한 CC 집합 정보 기반으로
요소 반송파들의 시스템 정보 수신
(S520)
업링크 타이밍 그룹의
대표 요소 반송파 선택 (S534)
대표 요소 반송파를 통해 Random Access Preamble 송신
(S540)
Random Access Response
(업링크 할당, TA 정보)(S550)
CR(Contention Resolution)
(S560)
업링크 타이밍 그룹별
TA 업데이트 (S570)

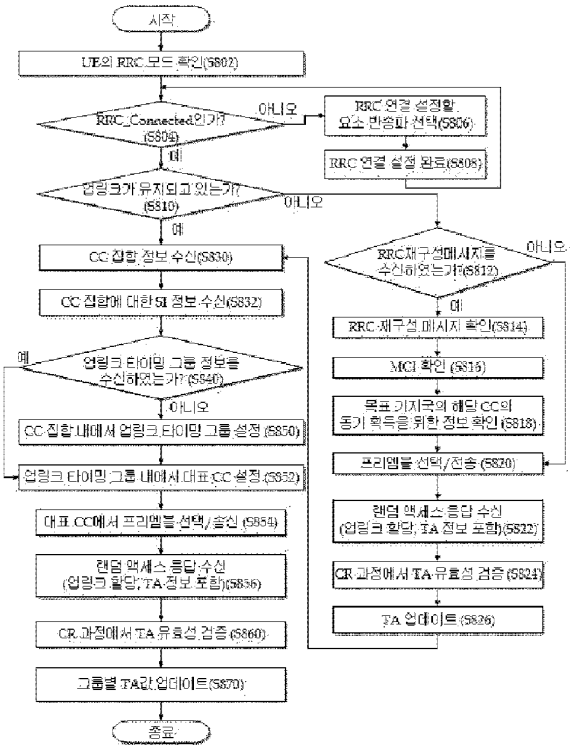
【도 6】


eNB(690)
UE(680)
무선자원제어연결 진행(S605)
UE가 사용할 CC 집합정보 송신
(S610)
수신한 CC 집합 정보 기반으로
요소 반송파들의 시스템 정보 수신
(S620)
업링크 타이밍 그룹 생성 (S624)
업링크 타이밍 그룹 정보 송신
(S626)
업링크 타이밍 그룹의
대표 요소 반송파 선택 (S634)
대표 요소 반송파를 통해 Random Access Preamble 송신
(S640)
Random Access Response
(업링크 할당, TA 정보)(S650)
CR(Contention Resolution)
(S660)
업링크 타이밍 그룹별
TA 업데이트 (S670)

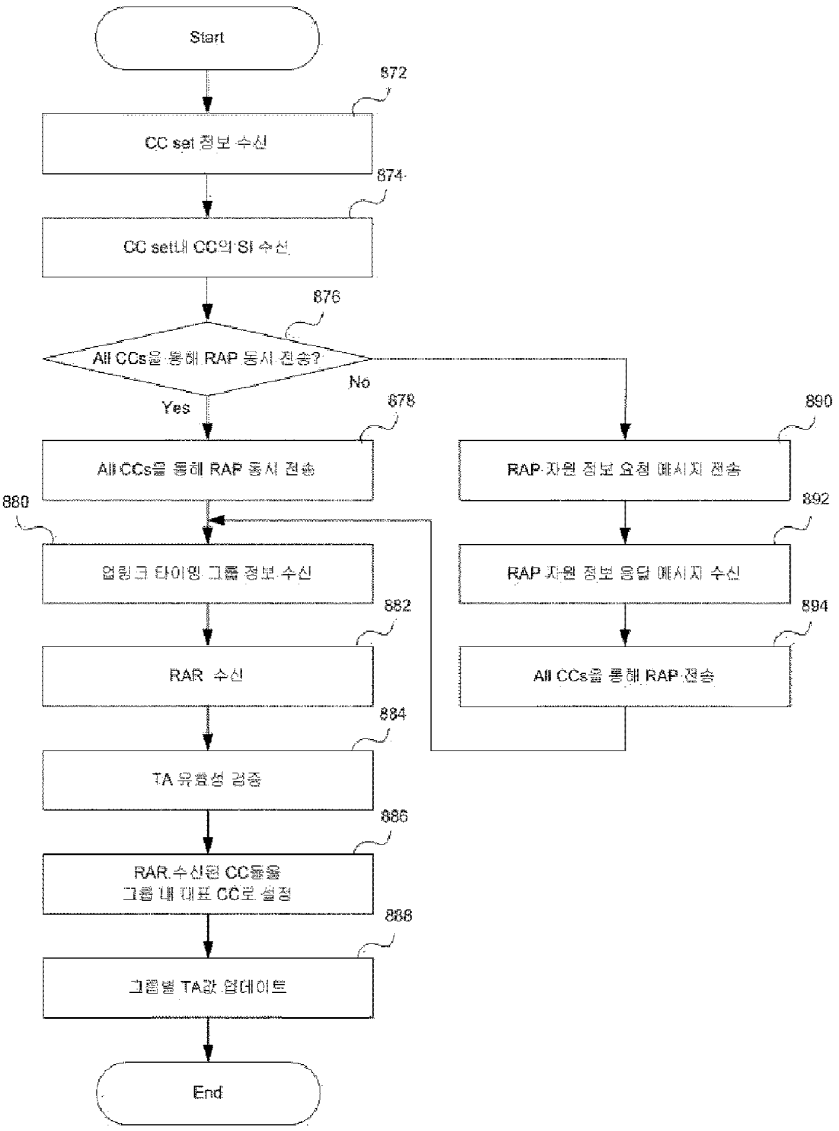
【도 7】


시작
UE의 RRC 모드 확인(S702)
RRC_Connected인가? (S704)
아니오
RRC 연결 요청 수신(S705)
RRC 연결 완료(S706)
예
해당 UE의 CC 집합 설정하고 CC 집합 정보를 송신(S710)
해당 UE의 CC 집합에 대한 SI 송신(S720)
업링크 타이밍 그룹 생성 주체가 eNB인가? (S722)
예
업링크 타이밍 그룹 생성 및 송신(S726)
아니오
랜덤 액세스 프리엠블 수신(S740)
TA값 생성 및 송신(S750)
CR 메시지 송신(S760)
종료

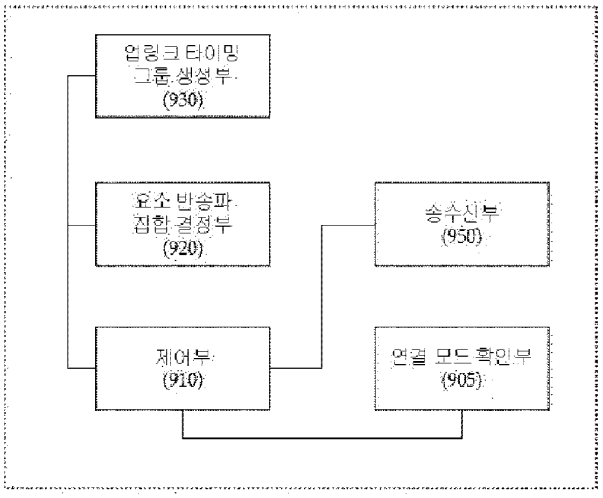
【도 8】


시작
UE의 RRC 모드 확인(S802)
RRC_Connected인가? (S804)
아니오
RRC 연결 설정할 요소 반송파 선택(S806)
RRC 연결 설정 완료(S808)
예
업링크가 유지되고 있는가? (S810)
아니오
예
CC 집합 정보 수신(S830)
CC 집합에 대한 SI 정보 수신(S832)
예
업링크 타이밍 그룹 정보를 수신하였는가? (S840)
아니오
CC 집합 내에서 업링크 타이밍 그룹 설정 (S850)
업링크 타이밍 그룹 내에서 대표 CC 설정 (S852)
대표 CC에서 프리앰블 선택/ 송신 (S854)
랜덤 액세스 응답 수신 (업링크 할당, TA 정보 포함)(S856)
CR 과정에서 TA 유효성 검증 (S860)
그룹별 TA값 업데이트(S870)
종료
RRC재구성메시지를 수신하였는가? (S812)
아니오
예
RRC 재구성 메시지 확인(S814)
MCI 확인 (S816)
목표 기지국의 해당 CC의 동기 획득을 위한 정보 확인 (S818)
프리앰블 선택/ 전송 (S820)
랜덤 액세스 응답 수신 (업링크 할당, TA 정보 포함)(S822)
CR 과정에서 TA 유효성 검증 (S824)
TA 업데이트 (S826)

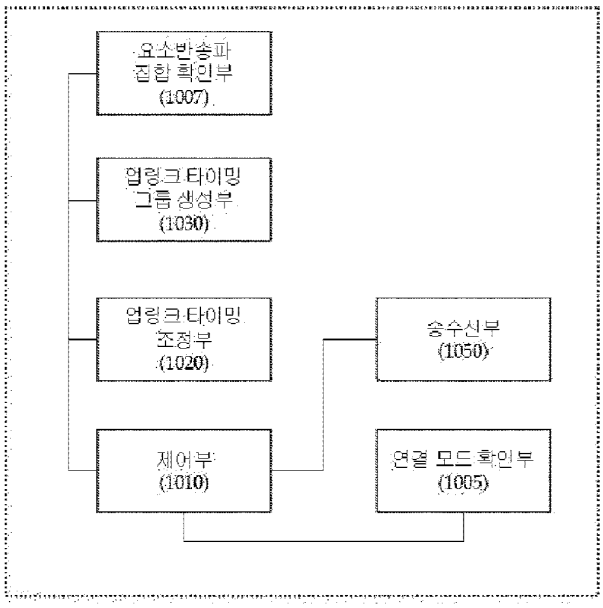
【도 9】


Start
872
CC set 정보 수신
874
CC set내 CC의 SI 수신
876
All CCs을 통해 RAP 동시 전송?
No
Yes
878
All CCs을 통해 RAP 동시 전송
880
업링크 타이밍 그룹 정보 수신
882
RAR 수신
884
TA 유효성 검증
886
RAR 수신된 CC들을
그룹 내 대표 CC로 설정
888
그룹별 TA값 업데이트
End
890
RAP 자원 정보 요청 메시지 전송
892
RAP 자원 정보 응답 메시지 수신
894
All CCs을 통해 RAP 전송

【도 10】


업링크 타이밍 그룹 생성부 (930)
요소 반송파 집합 결정부 (920)
송수신부 (950)
제어부 (910)
연결 모드 확인부 (905)

【도 11】


요소반송파 집합 확인부 (1007)
업링크 타이밍 그룹 생성부 (1030)
업링크 타이밍 조정부 (1020)
송수신부 (1050)
제어부 (1010)
연결 모드 확인부 (1005)

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www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 |

**CONFIRMATION NO. 5097**

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

**PUBLICATION NOTICE**

**Title:**APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

**Publication No.**US-2015-0271770-A1
**Publication Date:**09/24/2015

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

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

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Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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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 | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | P4998USC1 |

**U.S.PATENTS**

| 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 |
|---|---|---|---|---|---|---|
| | 1 | | | | | |

If you wish to add additional U.S. Patent citation information please click the Add button.

**U.S.PATENT APPLICATION PUBLICATIONS**

| 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.

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] i | 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] |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2009/113815 | WO | | 2009-09-17 | LG ELECTRONICS INC. | | ☐ |
| | 2 | 2013-516917 | JP | | 2013-05-13 | INTER DIGITAL PATENT HOLDINGS, INC. | | ☐ |

If you wish to add additional Foreign Patent Document citation information please click the Add button

**NON-PATENT LITERATURE DOCUMENTS**

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 14733068 |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | 2464 |
| | Examiner Name | TRUONG, LAN-HUONG |
| | Attorney Docket Number | P4998USC1 |

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|
| | 1 | Qualcomm Incorporated, "Supporting multiple timing advance groups", 3GPP TSG-RAN WG2 meeting#68bis, January 18-22, 2010, R2-100423, Valencia, Spain. | ☐ |
| | 2 | ITRI, "Time Alignment Timer for different TA", 3GPP TSG-RAN WG2 meeting#68bis, January 18-22, 2010, R2-100560, Valencia, Spain. | ☐ |
| | 3 | NTT DOCOMO, INC., "TA maintenance for CA", 3GPP TSG-RAN2#68bis, January 18-22, 2010, R2-100472, Valencia, Spain. | ☐ |
| | 4 | Huawei, "Different Timing Advance Impact on Carrier Aggregation", 3GPP TSG RAN WG2 meeting#67bis, October 12-16, 2009, R2-095815, Miyazaki, Japan . | ☐ |

If you wish to add additional non-patent literature document citation information please click the Add button

**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
|---|---|---|---|

*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 | 14733068 |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | 2464 |
| | Examiner Name | TRUONG, LAN-HUONG |
| | Attorney Docket Number | P4998USC1 |

**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 | /dongil moon/ | Date (YYYY-MM-DD) | 2016-07-22 |
|---|---|---|---|
| Name/Print | Dongil Moon | Registration Number | 74,793 |

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## Patent & Utility Model Number Search



### Selected Gazette



**JP,2013-516917,A**



*** NOTICES ***

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

## CLAIMS

[Claim(s)]

[Claim 1]

It is a wireless transceiver unit (WTRU) provided with a processor, and the aforementioned processor is at least one copy,

One or more uplink carriers with which the aforementioned WATU can operate are identified,

It is constituted so that one or more uplink component carrier sets (UL CC set) may be determined, WTRU being able to operate by the timing advance (TA) with one or more respectively same aforementioned uplink carriers that the aforementioned UL CC set is provided with one or more of the aforementioned uplink carriers, respectively, and are provided with each UL CC set.

[Claim 2]

The aforementioned processor, The WTRU according to claim 1 further constituting so that which of one or more aforementioned uplink carriers may determine one or more aforementioned UL CC sets based on predetermined identification of whether to correspond to one or more aforementioned UL CC sets.

[Claim 3]

The aforementioned processor is further constituted so that at least one index may be received, and said at least one index, The WTRU according to claim 1 corresponding to at least one of one or more aforementioned uplink carriers provided with said at least one of one or more aforementioned UL CC sets and one or more aforementioned UL CC sets.

[Claim 4]

The aforementioned processor,

At least one UL CC set is chosen,

At least one of one or more aforementioned uplink carriers which can perform random access channel (RACH) communication about at least one UL CC chosen [ aforementioned ] is identified,

RACH communication is started on [ of one or more uplink carriers identified / aforementioned / about at least one UL CC chosen / aforementioned ] at least one carrier,

The WTRU according to claim 1 further constituting so that it may respond to the aforementioned RACH communication and TA value may be received.

[Claim 5]

The WTRU according to claim 4, wherein the aforementioned processor is further constituted so that the aforementioned TA value may be applied to each of one or more aforementioned uplink carriers provided with at least one UL CC set chosen [ aforementioned ].

[Claim 6]

The WTRU according to claim 5, wherein the aforementioned TA value is applied using a timing advance command received by a random access response message which responded to the aforementioned RACH communication and was received.

[Claim 7]

The WTRU according to claim 5 further constituting so that at least one UL CC set chosen [ aforementioned ] may have a related time alignment timer (TAT), and the aforementioned processor may start the above TAT or the above TAT may be resumed.

[Claim 8]

The aforementioned processor,

A signal containing TA value is received via a down-link carrier,

At least one of one or more aforementioned uplink carriers which become the aforementioned

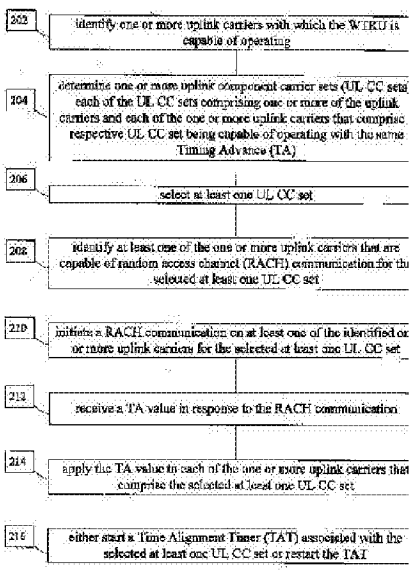


FIG. 2

Representative drawing

**Representative drawing** | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

down-link carrier and a pair is identified,
At least one of one or more aforementioned UL CC sets corresponding to said at least one of one or more aforementioned uplink carriers which become the aforementioned down-link carrier and a pair is identified,
The WTRU according to claim 1 further constituting so that the aforementioned TA value may be applied to each of one or more aforementioned uplink carriers provided with at least one by which it was identified [ aforementioned ] of one or more aforementioned UL CC sets.
[Claim 9]
The WTRU according to claim 1, wherein the aforementioned signal contains a timing advance command media-access-control (MAC) control element.
[Claim 10]
One or more aforementioned UL CC sets are equivalent to each frequency band, and are the aforementioned processors,
A signal containing TA value is received via a down-link carrier,
A frequency band corresponding to the aforementioned down-link carrier is identified,
At least one of one or more aforementioned UL CC sets corresponding to the aforementioned frequency band of the aforementioned down-link carrier in each of the frequency band is identified,
The WTRU according to claim 1 further constituting so that the aforementioned TA value may be applied to each of one or more aforementioned uplink carriers provided with at least one by which it was identified [ aforementioned ] of one or more aforementioned UL CC sets.
[Claim 11]
At least one UL CC set chosen [ aforementioned ], Individual physical uplink control channel (PUCCH) composition including at least one uplink carrier which it has the aforementioned processor, The WTRU according to claim 7 further constituting so that it may stop transmitting on a resource corresponding to the aforementioned PUCCH, after the above TAT is completed.
[Claim 12]
At least one UL CC set chosen [ aforementioned ], Individual physical uplink control channel (PUCCH) composition including at least one uplink carrier which it has the aforementioned processor, The WTRU according to claim 7 further constituting so that at least one copy of the aforementioned PUCCH composition may be deleted after the above TAT is completed.
[Claim 13]
The WTRU according to claim 7, wherein the aforementioned processor is further constituted so that one or more RACH resources may be deleted from composition of at least one selected UL CC set, after the above TAT is completed.
[Claim 14]
It is a method for establishing a timing advance,
A step which identifies one or more uplink carriers which operate by a wireless communication screen oversize,
It is a step which determines one or more uplink component carrier sets (UL CC set), The aforementioned UL CC set is provided with one or more of the aforementioned uplink carriers, respectively, A method, wherein one or more aforementioned uplink carriers provided with each UL CC set are provided with a step which can operate by the same timing advance (TA), respectively.
[Claim 15]
A step which chooses at least one UL CC set,
A step which identifies at least one of one or more aforementioned uplink carriers which can perform random access channel (RACH) communication about at least one UL CC set chosen [ aforementioned ],
A step which starts RACH communication about at least one UL CC set chosen [ aforementioned ] on [ of one or more uplink carriers identified / aforementioned ] at least one carrier,
A method of further having a step which responds to the aforementioned RACH communication and receives TA value according to claim 14.
[Claim 16]
A step which applies the aforementioned TA value to each of one or more aforementioned uplink carriers provided with at least one UL CC set chosen [ aforementioned ],
A step related with at least one UL CC set with which it is a step which performs at least one of a start of a time alignment timer (TAT), or resumption, and the above TAT was chosen [ aforementioned ]
A method of preparing for a pan according to claim 15.
[Claim 17]
A step which receives a signal containing TA value via a down-link carrier,
A step which identifies at least one of one or more aforementioned uplink carriers which become the aforementioned down-link carrier and a pair,
A step which identifies at least one of one or more aforementioned UL CC sets corresponding to said at least one of one or more aforementioned uplink carriers which become the aforementioned down-link carrier and a pair,
A step which applies the aforementioned TA value to each of one or more aforementioned uplink carriers provided with at least one by which it was identified [ aforementioned ] of one or more aforementioned UL CC sets
A method of preparing for a pan according to claim 15.
[Claim 18]
It is evolved type Node B (eNode B) provided with a processor, and the aforementioned processor is at least one copy,
Aforementioned eNode B identifies one or more uplink carriers which can operate by it,
Are constituted so that one or more indexes may be determined, and each index of one or more aforementioned indexes, It corresponds to one or more uplink component carrier sets (UL

CC set), respectively, One or more aforementioned uplink carriers which a UL CC set is provided with one or more of the aforementioned uplink carriers, respectively, and are provided with each UL CC set can operate by the same timing advance (TA), respectively, and the aforementioned processor is further,
eNode B constituting so that one or more aforementioned indexes may be transmitted.
[Claim 19]
The aforementioned processor,
RACH communication is received on [ of one or more aforementioned uplink carriers provided with at least one of one or more aforementioned UL CC sets ] at least one carrier,
Are further constituted so that it may respond to the aforementioned RACH communication and TA value may be transmitted, and the aforementioned TA value, application to each of one or more aforementioned uplink carriers provided with said at least one of one or more aforementioned UL CC sets is possible -- eNode B according to claim 18 characterized by a certain thing.
[Claim 20]
The aforementioned processor,
eNode B according to claim 18, wherein it is further constituted so that a signal may be transmitted, and the aforementioned signal shows at least one of one or more aforementioned UL CC sets with which the aforementioned indicator can apply the aforementioned TA value including TA value and an indicator.



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[Translation done.]

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最終頁に続く

(54)【発明の名称】複数のアップリンクキャリアとのタイムアライメントの維持

(57)【要約】
複数のアップリンクキャリアとのタイムアライメントの維持について企図される。単一のタイミングアドバンス（ＴＡ）で動作するアップリンクキャリアのグループ（ＵＬ　ＣＣセット）が決定されてよく、ＴＡ値が、特定のＵＬ　ＣＣセットに適用されてよい。ワイヤレス送受信ユニット（ＷＴＲＵ）が複数のＴＡを使用できることによって、各ＵＬ　ＣＣセットごとに数ビットのグループインデックスを定義することができる。ランダムアクセス応答メッセージで受信されたＴＡコマンドは、ＵＬ　ＣＣセットの各ＵＬキャリアにＴＡ値を適用するために使用されてよい。ＷＴＲＵは、どのＤＬキャリアからコマンドが送信されたかに基づいて、ＴＡ値がどのＵＬ　ＣＣセットに適用されるか決定してよい。ＷＴＲＵは、コマンドで明示的に提供されているグループインデックスに基づいて、ＴＡ値がどのＵＬ　ＣＣ　セットに適用されるか決定することができる。ＷＴＲＵは、タイムアライメントタイマ（ＴＡＴ）が終了すると、マルチＣＣ構成を解放してよい。

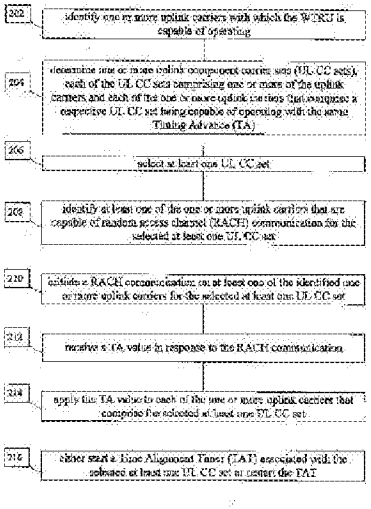



FIG. 2

【特許請求の範囲】
【請求項１】
プロセッサを備えるワイヤレス送受信ユニット（ＷＴＲＵ）であって、前記プロセッサは、少なくとも一部は、
前記ＷＡＴＵが動作可能な１つまたは複数のアップリンクキャリアを識別し、
１つまたは複数のアップリンクコンポーネントキャリアセット（ＵＬ　ＣＣセット）を決定するように構成され、前記ＵＬ　ＣＣセットはそれぞれ、前記アップリンクキャリアのうちの１つまたは複数を備え、各々のＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアはそれぞれ、同じタイミングアドバンス（ＴＡ）で動作可能であることを特徴とするＷＴＲＵ。
【請求項２】
前記プロセッサは、前記１つまたは複数のアップリンクキャリアのうちのどれが前記１つまたは複数のＵＬ　ＣＣセットに対応するかの所定の識別に基づいて前記１つまたは複数のＵＬ　ＣＣセットを決定するようにさらに構成されることを特徴とする請求項１に記載のＷＴＲＵ。
【請求項３】
前記プロセッサは、少なくとも１つのインデックスを受信するようにさらに構成され、前記少なくとも１つのインデックスは、前記１つまたは複数のＵＬ　ＣＣセット、および前記１つまたは複数のＵＬ　ＣＣセットのうちの前記少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つに対応することを特徴とする請求項１に記載のＷＴＲＵ。
【請求項４】
前記プロセッサは、
少なくとも１つのＵＬ　ＣＣセットを選択し、
前記選択された少なくとも１つのＵＬ　ＣＣについてランダムアクセスチャネル（ＲＡＣＨ）通信ができる前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別し、
前記選択された少なくとも１つのＵＬ　ＣＣについて前記識別された１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を開始し、
前記ＲＡＣＨ通信に応答してＴＡ値を受信するようにさらに構成されることを特徴とする請求項１に記載のＷＴＲＵ。
【請求項５】
前記プロセッサは、前記選択された少なくとも１つのＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するようにさらに構成されることを特徴とする請求項４に記載のＷＴＲＵ。
【請求項６】
前記ＴＡ値は、前記ＲＡＣＨ通信に応答して受信されたランダムアクセス応答メッセージで受信されたタイミングアドバンスコマンドを使用して適用されることを特徴とする請求項５に記載のＷＴＲＵ。
【請求項７】
前記選択された少なくとも１つのＵＬ　ＣＣセットは、関連するタイムアライメントタイマ（ＴＡＴ）を有しており、前記プロセッサは、前記ＴＡＴを開始し、または前記ＴＡＴを再開するようにさらに構成されることを特徴とする請求項５に記載のＷＴＲＵ。
【請求項８】
前記プロセッサは、
ダウンリンクキャリアを介して、ＴＡ値を含む信号を受信し、
前記ダウンリンクキャリアと対になる前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別し、
前記ダウンリンクキャリアと対になる前記１つまたは複数のアップリンクキャリアのうちの前記少なくとも１つに対応する前記１つまたは複数のＵＬ　ＣＣセットのうちの少な

くとも１つを識別し、
前記１つまたは複数のＵＬ　ＣＣセットのうちの前記識別された少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するようにさらに構成されることを特徴とする請求項１に記載のＷＴＲＵ。
【請求項９】
前記信号は、タイミングアドバンスコマンドメディアアクセス制御（ＭＡＣ）制御要素を含むことを特徴とする請求項１に記載のＷＴＲＵ。
【請求項１０】
前記１つまたは複数のＵＬ　ＣＣセットは、それぞれの周波数帯に対応し、前記プロセッサは、
ダウンリンクキャリアを介して、ＴＡ値を含む信号を受信し、
前記ダウンリンクキャリアに対応する周波数帯を識別し、
その各々の周波数帯が前記ダウンリンクキャリアの前記周波数帯に対応する前記１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別し、
前記１つまたは複数の　ＵＬ　ＣＣセットのうちの前記識別された少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するようにさらに構成されることを特徴とする請求項１に記載のＷＴＲＵ。
【請求項１１】
前記選択された少なくとも１つのＵＬ　ＣＣセットは、個別の物理アップリンク制御チャネル（ＰＵＣＣＨ）構成を有する少なくとも１つのアップリンクキャリアを含み、前記プロセッサは、前記ＴＡＴが終了すると、前記ＰＵＣＣＨに対応するリソース上で送信するのをやめるようにさらに構成されることを特徴とする請求項７に記載のＷＴＲＵ。
【請求項１２】
前記選択された少なくとも１つのＵＬ　ＣＣセットは、個別の物理アップリンク制御チャネル（ＰＵＣＣＨ）構成を有する少なくとも１つのアップリンクキャリアを含み、前記プロセッサは、前記ＴＡＴが終了すると、前記ＰＵＣＣＨ構成の少なくとも一部を削除するようにさらに構成されることを特徴とする請求項７に記載のＷＴＲＵ。
【請求項１３】
前記プロセッサは、前記ＴＡＴが終了すると、選択された少なくとも１つのＵＬ　ＣＣセットの構成から１つまたは複数のＲＡＣＨリソースを削除するようにさらに構成されることを特徴とする請求項７に記載のＷＴＲＵ。
【請求項１４】
タイミングアドバンスを確立するための方法であって、
ワイヤレス通信網上で動作する１つまたは複数のアップリンクキャリアを識別するステップと、
１つまたは複数のアップリンクコンポーネントキャリアセット（ＵＬ　ＣＣセット）を決定するステップであって、前記ＵＬ　ＣＣセットはそれぞれ、前記アップリンクキャリアのうちの１つまたは複数を備え、各々のＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアはそれぞれ、同じタイミングアドバンス（ＴＡ）で動作可能である、ステップとを備えることを特徴とする方法。
【請求項１５】
少なくとも１つのＵＬ　ＣＣセットを選択するステップと、
前記選択された少なくとも１つのＵＬ　ＣＣセットについて、ランダムアクセスチャネル（ＲＡＣＨ）通信ができる前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別するステップと、
前記選択された少なくとも１つのＵＬ　ＣＣセットについて、前記識別された１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を開始するステップと、
前記ＲＡＣＨ通信に応答してＴＡ値を受信するステップとをさらに備えることを特徴とする請求項１４に記載の方法。

【請求項１６】
前記選択された少なくとも１つのＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するステップと、
タイムアライメントタイマ（ＴＡＴ）の開始または再開のうちの少なくとも１つを実行するステップであって、前記ＴＡＴは、前記選択された少なくとも１つのＵＬ　ＣＣセットに関連付けられる、ステップと
をさらに備えることを特徴とする請求項１５に記載の方法。
【請求項１７】
ダウンリンクキャリアを介して、ＴＡ値を含む信号を受信するステップと、
前記ダウンリンクキャリアと対になる前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別するステップと、
前記ダウンリンクキャリアと対になる前記１つまたは複数のアップリンクキャリアのうちの前記少なくとも１つに対応する前記１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別するステップと、
前記１つまたは複数の　ＵＬ　ＣＣセットのうちの前記識別された少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するステップと
をさらに備えることを特徴とする請求項１５に記載の方法。
【請求項１８】
プロセッサを備える進化型Ｎｏｄｅ　Ｂ（ｅＮｏｄｅ　Ｂ）であって、前記プロセッサは、少なくとも一部は、
前記ｅＮｏｄｅ　Ｂがそれで動作可能な１つまたは複数のアップリンクキャリアを識別し、
１つまたは複数のインデックスを決定するように構成され、前記１つまたは複数のインデックスの各インデックスは、１つまたは複数のアップリンクコンポーネントキャリアセット（ＵＬ　ＣＣセット）にそれぞれ対応し、ＵＬ　ＣＣセットはそれぞれ、前記アップリンクキャリアのうちの１つまたは複数を備え、各々のＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアはそれぞれ、同じタイミングアドバンス（ＴＡ）で動作可能であり、前記プロセッサはさらに、
前記１つまたは複数のインデックスを送信するように構成されたことを特徴とするｅＮｏｄｅ　Ｂ。
【請求項１９】
前記プロセッサは、
前記１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を受信し、
前記ＲＡＣＨ通信に応答してＴＡ値を送信するようにさらに構成され、前記ＴＡ値は、前記１つまたは複数のＵＬ　ＣＣセットのうちの前記少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのそれぞれに適用可能あることを特徴とする請求項１８に記載のｅＮｏｄｅ　Ｂ。
【請求項２０】
前記プロセッサは、
信号を送信するようにさらに構成され、前記信号はＴＡ値とインジケータとを含み、前記インジケータは、前記ＴＡ値が適用可能である前記１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを示すことを特徴とする請求項１８に記載のｅＮｏｄｅ　Ｂ。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、複数のアップリンクキャリアとのタイムアライメントの維持に関する。
【背景技術】

【０００２】
関連出願の相互参照
本出願は、２０１０年１月８日に出願された米国特許仮出願第６１／２９３２７１号明細書、「METHOD OF MAINTAINING TIME ALIGNMENT WITH MULTIPLE UPLINK CARRIERS」、２０１０年４月２日に出願された米国特許仮出願第６１／３２０４４９号明細書、「METHOD AND APPARATUS FOR MAINTAINING TIME ALIGNMENT WITH MULTIPLE UPLINK CARRIERS」、および２０１０年４月１３日に出願された米国特許仮出願第６１／３２３６８０号明細書、「METHOD AND APPARATUS FOR MAINTAINING TIME ALIGNMENT WITH MULTIPLE UPLINK CARRIERS」の優先権を主張するものであり、３つのすべての出願の内容は、参照により各々の全体が本明細書に事実上組み込まれている。
【０００３】
ＬＴＥ（Ｌｏｎｇ　Ｔｅｒｍ　Ｅｖｏｌｕｔｉｏｎ）ワイヤレスシステムなど、ワイヤレス通信システムでは、ネットワークは、それぞれ単一のアップリンク（ＵＬ）キャリアおよび単一のダウンリンク（ＤＬ）キャリア上のアップリンク（ＵＬ）リソースおよびダウンリンク（ＤＬ）リソースでワイヤレス送受信ユニット（ＷＴＲＵ）を構成することができる。これらのリソースを使用するために、ＷＴＲＵは、これらのキャリア上でネットワークと同期していることが期待され得る。
【０００４】
リソースは、単一のＵＬ／ＤＬキャリアを介してＷＴＲＵとネットワークの間の同期およびアライメントの状況を決定するのに消費される必要があり得る。複数のアップリンクキャリアをＷＴＲＵが使用可能なＷＴＲＵでは、ＷＴＲＵとネットワークの間の同期およびアライメントを決定するには、より多くのリソースが必要となることがある。
【発明の概要】
【０００５】
この概要は、詳細な説明において下記にさらに述べられる選択された概念を簡略化された形で述べるために提供されている。この概要は、特許請求された主題の主な特徴または本質的な特徴を識別することを意図しておらず、また特許請求された主題の範囲を限定するために使用することも意図していない。さらに、特許請求された主題は、本開示のいずれかの部分に述べられたいずれかまたはすべての欠点を解決する制限事項に限定されない。
【０００６】
複数のキャリアとのタイムアライメントを維持するためのやり方が、本明細書に開示される。単一のタイミングアドバンス（Ｔｉｍｉｎｇ　Ａｄｖａｎｃｅ）（ＴＡ）で動作するアップリンクキャリアのグループ（ＵＬ　ＣＣセット）が決定される。ＴＡ値が、特定のＵＬ　ＣＣセットに適用されることもある。ワイヤレス送受信ユニット（ＷＴＲＵ）が複数のＴＡを使用できることによって、各ＵＬ　ＣＣセットごとに数ビットのグループインデックスを定義することができる。ランダムアクセス応答メッセージで受信されたＴＡコマンドが、ＵＬ　ＣＣセットの各ＵＬキャリアにＴＡ値を適用するために使用されてよい。ＷＴＲＵは、どのＤＬキャリア上にコマンドが受信されたかに基づいて、ＴＡ値がどのＵＬ　ＣＣセットに適用されるか決定することができる。ＷＴＲＵは、コマンドで明示的に提供されているグループインデックスに基づいて、ＴＡ値がどのＵＬ　ＣＣセットに適用されるか決定することができる。ＷＴＲＵは、タイムアライメントタイマ（ＴＡＴ）が終了すると、マルチＣＣ構成を解放してよい。
【０００７】
実施形態は、ワイヤレス送受信ユニット（ＷＴＲＵ）が、少なくとも部分的には、ＷＴＲＵがそれで動作可能であり得る１つまたは複数のアップリンクキャリア、またはワイヤレスネットワーク上で動作している１つまたは複数のアップリンクキャリアを識別するように構成され得ることを企図している。ＷＴＲＵは、１つまたは複数のアップリンクコンポーネントキャリアセット（ＵＬ　ＣＣセット）を決定するように構成することもできる。ＵＬ　ＣＣセットはそれぞれ、アップリンクキャリアのうちの１つまたは複数を備えて

よく、各々のＵＬ　ＣＣセットを備えてよい１つまたは複数のアップリンクキャリアはそれぞれ、同じタイミングアドバンス（ＴＡ）で動作可能であってよい。ＷＴＲＵは、１つまたは複数のアップリンクキャリアのどれが１つまたは複数のＵＬ　ＣＣセットに対応し得るかの所定の識別情報に基づいて、ＵＬ　ＣＣセットの１つまたは複数のグループを決定するように構成されてよい。たとえば、所定の識別情報は、個別のシグナリングを使用して受信してもよいし、それぞれのＵＬ　ＣＣセットの１つまたは複数の特性に基づいて推論してもよい。ＷＴＲＵは、少なくとも１つのＵＬ　ＣＣセットを選択し、選択された少なくとも１つのＵＬ　ＣＣ　セットについて、ランダムアクセスチャネル（ＲＡＣＨ）通信が可能であってよい１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別するように構成することもできる。ＷＴＲＵは、選択された少なくとも１つのＵＬ　ＣＣ　セットについて、識別された１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を開始し、ＲＡＣＨ通信に応答してＴＡ値を受信するように構成されてよい。ＷＴＲＵは、選択された少なくとも１つのＵＬ　ＣＣセットを備える１つまたは複数のアップリンクキャリアのそれぞれにＴＡ値を適用するようにさらに構成されてよい。

【０００８】

実施形態は、選択された少なくとも１つのＵＬ　ＣＣセットが関連するタイムアライメントタイマ（ＴＡＴ）を有してもよいし、ＷＴＲＵがＴＡＴを開始し、またはＴＡＴを再開するようにさらに構成されてよいことを企図している。ＷＴＲＵは、ダウンリンクキャリアを介して、ＴＡ値を含んでよい信号を受信するように構成することもできる。ＷＴＲＵは、ダウンリンクキャリアと対になり得る１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別し、ダウンリンクキャリアと対になり得る１つまたは複数のアップリンクキャリアのうちの少なくとも１つに対応し得る１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別してよい。ＷＴＲＵは、１つまたは複数のＵＬ　ＣＣセットのうちの識別された少なくとも１つのＵＬ　ＣＣセットを備える１つまたは複数のアップリンクキャリアのそれぞれにＴＡ値を適用することができる。

【０００９】

実施形態は、１つまたは複数のＵＬ　ＣＣセットが、その各々のサービングセルの周波数帯に対応することができ、ＷＴＲＵは、ダウンリンクキャリアを介して、ＴＡ値を含んでよい信号を受信するように構成されてよいことを企図している。ＷＴＲＵは、ダウンリンクキャリアに対応する周波数帯を識別し、その各々の周波数帯がダウンリンクキャリアの周波数帯に対応し得る１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別するように構成されてよい。ＷＴＲＵは、１つまたは複数のＵＬ　ＣＣセットのうちの識別された少なくとも１つのＵＬ　ＣＣセットを備え得る１つまたは複数のアップリンクキャリアのそれぞれにＴＡ値を適用することができる。

【００１０】

実施形態は、選択された少なくとも１つのＵＬ　ＣＣセットが、個別の物理制御チャネル（ＰＵＣＣＨ）構成を有する少なくとも１つのアップリンクキャリアを含んでよいことを企図している。ＷＴＲＵは、ＴＡＴが終了すると、ＰＵＣＣＨに対応するリソース上で送信することをやめるように構成されてよい。あるいは、またはさらに、ＷＴＲＵは、ＴＡＴが終了すると、ＰＵＣＣＨ構成の少なくとも一部を削除するように構成されてよい。同様に、あるいはまたはさらに、ＷＴＲＵは、ＴＡＴが終了すると、選択された少なくとも１つのＵＬ　ＣＣセットの構成から１つまたは複数のＲＡＣＨリソースを削除するように構成されてよい。

【００１１】

実施形態は、進化型Ｎｏｄｅ　Ｂ（ｅｖｏｌｖｅｄ　Ｎｏｄｅ　Ｂ）（ｅＮｏｄｅ　Ｂ）などのワイヤレスネットワークリソースは、少なくとも一部を、ｅＮｏｄｅ　Ｂがそれで動作可能な１つまたは複数のアップリンクキャリアを識別するように構成され得ることを企図している。ｅＮｏｄｅ　Ｂは、１つまたは複数のインデックスを決定することができる。１つまたは複数の各インデックスはそれぞれ、１つまたは複数のアップリンクコン

ポーネントキャリアセット（ＵＬ　ＣＣセット）に対応してよい。また、ＵＬ　ＣＣセットはそれぞれ、アップリンクキャリアのうちの１つまたは複数を備えてよく、各々のＵＬ　ＣＣセットを備える１つまたは複数のアップリンクキャリアはそれぞれ、同じタイミングアドバンス（ＴＡ）で動作可能であってよい。ｅＮｏｄｅ　Ｂは、１つまたは複数のインデックスを送信するように構成されてよい。

【００１２】

実施形態は、ｅＮｏｄｅ　Ｂが、１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つのＵＬ　ＣＣセットを備える１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を受信するように構成され得ることを企図している。ｅＮｏｄｅ　Ｂは、ＲＡＣＨ通信に応答してＴＡ値を送信することができる。ＴＡ値は、１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを備える１つまたは複数のアップリンクキャリアのそれぞれに適用可能であってよい。ｅＮｏｄｅ　Ｂは、信号を送信するように構成されてよく、ただし信号は、ＴＡ値とインジケータとを含んでよい。インジケータは、ＴＡ値が適用可能であってよい１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを示すことができる。ＵＬ　ＣＣセットの１つまたは複数のアップリンクキャリアのうちの少なくとも１つのアップリンクキャリア上でＲＡＣＨ通信を受信するように構成されてよく、ＲＡＣＨ通信に応答して、ＴＡ値を送信することができる。ＴＡ値は、ＵＬ　ＣＣセットを備える１つまたは複数のアップリンクキャリアのそれぞれに適用可能であってよい。あるいは、またはさらに、ｅＮｏｄｅ　Ｂは、信号を送信するように構成されてよく、ただし信号は、ＴＡ値とインジケータを含んでよい。インジケータは、ＴＡ値が適用可能であってよいＵＬ　ＣＣセットを示すことができる。

【図面の簡単な説明】

【００１３】

より詳細な理解は、添付の図面と併せて、例示するために示されている下記の説明から得ることができる。

【００１４】

【図１Ａ】１つまたは複数の開示された実施形態が実施されてよい例示的な通信システムのシステム図である。

【図１Ｂ】図１Ａに示された通信システム内で使用してよい例示的なワイヤレス送受信ユニット（ＷＴＲＵ）のシステム図である。

【図１Ｃ】図１Ａに示された通信システム内で使用してよい例示的な無線アクセスネットワークおよびコアネットワークのシステム図である。

【図２】実施形態による例示的な方法のフローチャートである。

【図３】実施形態による例示的な方法のフローチャートである。

【図４】実施形態による例示的な方法のフローチャートである。

【図５】実施形態による例示的な方法のフローチャートである。

【図６】実施形態による例示的な方法のフローチャートである。

【発明を実施するための形態】

【００１５】

図１Ａは、１つまたは複数の開示された実施形態が実施され得る例示的な通信システム１００の図である。通信システム１００は、音声、データ、ビデオ、メッセージング、ブロードキャストなど、コンテンツを複数のワイヤレスユーザに提供する多元接続システムであってよい。通信システム１００は、複数のワイヤレスユーザが、ワイヤレス帯域幅を含めてシステムリソースを共有することよってこうしたコンテンツにアクセスすることを可能にすることができる。たとえば、通信システム１００は、ＣＤＭＡ（ｃｏｄｅ　ｄｉｖｉｓｉｏｎ　ｍｕｌｔｉｐｌｅ　ａｃｃｅｓｓ）、ＴＤＭＡ（ｔｉｍｅ　ｄｉｖｉｓｉｏｎ　ｍｕｌｔｉｐｌｅ　ａｃｃｅｓｓ）、ＦＤＭＡ（ｆｒｅｑｕｅｎｃｙ　ｄｉｖｉｓｉｏｎ　ｍｕｌｔｉｐｌｅ　ａｃｃｅｓｓ）、ＯＦＤＭＡ（ｏｒｔｈｏｇｏｎａｌ　ＦＤＭＡ）、ＳＣ－ＦＤＭＡ（ｓｉｎｇｌｅ－ｃａｒｒｉｅｒ　ＦＤＭＡ）など、１つまたは複数のチャネルアクセス法を使用してよい。

【００１６】
図１Ａに示されたように、通信システム１００は、ワイヤレス送受信ユニット（ＷＴＲＵ）１０２ａ、１０２ｂ、１０２ｃ、１０２ｄ、無線アクセスネットワーク（ＲＡＮ）１０４、コアネットワーク１０６、公衆交換電話網（ＰＳＴＮ）１０８、インターネット１１０、および他のネットワーク１１２を含んでよいが、開示された実施形態は、任意の数のＷＴＲＵ、基地局、ネットワークおよび／またはネットワーク要素を企図することが理解されよう。ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、１０２ｄはそれぞれ、ワイヤレス環境内で動作および／または通信するように構成された任意のタイプのデバイスであってよい。例を挙げると、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、１０２ｄは、ワイヤレス信号を送信および／または受信するように構成されてよく、ユーザ機器（ＵＥ）、移動局、固定または移動加入者ユニット、ページャ、携帯電話、携帯情報端末（ＰＤＡ）、スマートフォン、ラップトップ、ネットブック、パーソナルコンピュータ、ワイヤレスセンサ、家電などを含んでよい。
【００１７】
通信システム１００は、基地局１１４ａおよび基地局１１４ｂを含むこともできる。基地局１１４ａ、１１４ｂはそれぞれ、コアネットワーク１０６、インターネット１１０および／またはネットワーク１１２など、１つまたは複数の通信ネットワークへのアクセスを容易にするために、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、１０２ｄのうちの少なくとも１つのＷＴＲＵと無線でインターフェースするように構成された任意のタイプのデバイスであってよい。例を挙げると、基地局１１４ａ、１１４ｂは、送受信基地局（ＢＴＳ）、Ｎｏｄｅ　Ｂ、ｅＮｏｄｅ　Ｂ、ホームＮｏｄｅ　Ｂ、ホームｅＮｏｄｅ　Ｂ、サイトコントローラ、アクセスポイント（ＡＰ）、ワイヤレスルータなどであってよい。基地局１１４ａ、１１４ｂはそれぞれ、単一の要素として示されているが、基地局１１４ａ、１１４ｂは、相互に接続された任意の数の基地局および／またはネットワーク要素を含んでよいことが理解されよう。
【００１８】
基地局１１４ａは、ＲＡＮ　１０４の一部であってよく、このＲＡＮ　１０４は、基地局コントローラ（ＢＳＣ）、無線ネットワークコントローラ（ＲＮＣ）、中継ノードなど、他の基地局および／またはネットワーク要素（図示せず）を含むこともできる。基地局１１４ａおよび／または基地局１１４ｂは、セル（図示せず）と呼ばれることがある特定の地理的領域内でワイヤレス信号を送信および／または受信するように構成されてよい。セルは、セルセクタにさらに分割されてよい。たとえば、基地局１１４ａに関連するセルは、３つのセクタに分割されてよい。したがって、一実施形態では、基地局１１４ａは、３つのトランシーバ、たとえばセルの各セクタにつき１つを含んでよい。別の実施形態では、基地局１１４ａは、ＭＩＭＯ（ｍｕｌｔｉｐｌｅ－ｉｎｐｕｔ　ｍｕｌｔｉｐｌｅ　ｏｕｔｐｕｔ）技術を使用することができ、したがって、セルの各セクタにつき複数のトランシーバを使用してもよい。
【００１９】
基地局１１４ａ、１１４ｂは、任意の適切なワイヤレス通信リンク（たとえば無線周波数（ＲＦ）、マイクロ波、赤外線（ＩＲ）、紫外線（ＵＶ）、可視光線など）であってよいエアインターフェース１１６を介してＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、１０２ｄ　のうちの１つまたは複数と通信することができる。エアインターフェース１１６は、任意の適切な無線アクセス技術（ＲＡＴ）を使用して確立することができる。
【００２０】
より具体的には、上述されたように、通信システム１００は、多元接続システムであってよく、ＣＤＭＡ、ＴＤＭＡ、ＦＤＭＡ、ＯＦＤＭＡ、ＳＣ－ＦＤＭＡなど、１つまたは複数のチャネルアクセス方式を使用してよい。たとえば、ＲＡＮ　１０４内の基地局１１４ａ、およびＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃは、広帯域ＣＤＭＡ（ＷＣＤＭＡ）を使用してエアインターフェース１１６を確立できるＵＴＲＡ（ＵＭＴＳ（Ｕｎｉｖｅｒｓａｌ　Ｍｏｂｉｌｅ　Ｔｅｌｅｃｏｍｍｕｎｉｃａｔｉｏｎｓ　Ｓｙｓｔｅｍ）Ｔｅ

ｒｒｅｓｔｒｉａｌ　Ｒａｄｉｏ　Ａｃｃｅｓｓ）など、無線技術を実装することができる。ＷＣＤＭＡは、ＨＳＰＡ（Ｈｉｇｈ－Ｓｐｅｅｄ　Ｐａｃｋｅｔ　Ａｃｃｅｓｓ）および／または進化型ＨＳＰＡ（ＨＳＰＡ＋）などの通信プロトコルを含んでよい。ＨＳＰＡは、ＨＳＤＰＡ（Ｈｉｇｈ－Ｓｐｅｅｄ　Ｄｏｗｎｌｉｎｋ　Ｐａｃｋｅｔ　Ａｃｃｅｓｓ）および／またはＨＳＵＰＡ（Ｈｉｇｈ－Ｓｐｅｅｄ　Ｕｐｌｉｎｋ　Ｐａｃｋｅｔ　Ａｃｃｅｓｓ）を含んでよい。

【００２１】

別の実施形態では、基地局１１４ａ、およびＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃは、ＬＴＥ（Ｌｏｎｇ　Ｔｅｒｍ　Ｅｖｏｌｕｔｉｏｎ）および／またはＬＴＥ－Ａ（ＬＴＥ－Ａｄｖａｎｃｅｄ）を使用してエアインターフェース１１６を確立できるＥ－ＵＴＲＡ（Ｅｖｏｌｖｅｄ　ＵＭＴＳ　Ｔｅｒｒｅｓｔｒｉａｌ　Ｒａｄｉｏ　Ａｃｃｅｓｓ）などの無線技術を実装してよい。

【００２２】

他の実施形態では、基地局１１４ａおよびＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃは、ＩＥＥＥ　８０２．１６（たとえばＷｉＭＡＸ（Ｗｏｒｌｄｗｉｄｅ　Ｉｎｔｅｒｏｐｅｒａｂｉｌｉｔｙ　ｆｏｒ　Ｍｉｃｒｏｗａｖｅ　Ａｃｃｅｓｓ））、ＣＤＭＡ２０００、ＣＤＭＡ２０００　１Ｘ、ＣＤＭＡ２０００　ＥＶ－ＤＯ、ＩＳ－２０００（Ｉｎｔｅｒｉｍ　Ｓｔａｎｄａｒｄ　２０００）、ＩＳ－９５（Ｉｎｔｅｒｉｍ　Ｓｔａｎｄａｒｄ　９５）、ＩＳ－８５６（Ｉｎｔｅｒｉｍ　Ｓｔａｎｄａｒｄ　８５６）、ＧＳＭ（登録商標）（Ｇｌｏｂａｌ　Ｓｙｓｔｅｍ　ｆｏｒ　Ｍｏｂｉｌｅ　ｃｏｍｍｕｎｉｃａｔｉｏｎｓ）、ＥＤＧＥ（Ｅｎｈａｎｃｅｄ　Ｄａｔａ　ｒａｔｅｓ　ｆｏｒ　ＧＳＭ　Ｅｖｏｌｕｔｉｏｎ）、ＧＥＲＡＮ（ＧＳＭ　ＥＤＧＥ）など、無線技術を実装することができる。

【００２３】

図１Ａの基地局１１４ｂは、たとえばワイヤレスルータ、ホームＮｏｄｅ　Ｂ、ホームｅＮｏｄｅ　Ｂまたはアクセスポイントであってよく、事業所、自宅、車両、キャンパスなど、局所的な領域のワイヤレス接続を容易にするのに適した任意の適切なＲＡＴを使用することができる。一実施形態では、基地局１１４ｂおよびＷＴＲＵ　１０２ｃ、１０２ｄは、ＷＬＡＮ（ｗｉｒｅｌｅｓｓ　ｌｏｃａｌ　ａｒｅａ　ｎｅｔｗｏｒｋ）を確立するために、ＩＥＥＥ　８０２．１１などの無線技術を実装することができる。別の実施形態では、基地局１１４ｂおよびＷＴＲＵ　１０２ｃ、１０２ｄは、ＷＰＡＮ（ｗｉｒｅｌｅｓｓ　ｐｅｒｓｏｎａｌ　ａｒｅａ　ｎｅｔｗｏｒｋ）を確立するために、ＩＥＥＥ　８０２．１５などの無線技術を実装してよい。別の実施形態では、基地局１１４ｂおよびＷＴＲＵ　１０２ｃ、１０２ｄは、ピコセルまたはフェムトセルを確立するために、セルラベースＲＡＴ（たとえばＷＣＤＭＡ、ＣＤＭＡ２０００、ＧＳＭ、ＬＴＥ、ＬＴＥ－Ａなど）を使用してよい。図１Ａに示されたように、基地局１１４ｂは、インターネット１１０への直接接続を有してよい。したがって、基地局１１４ｂは、コアネットワーク１０６を介してインターネット１１０にアクセスする必要はないことがある。

【００２４】

ＲＡＮ　１０４は、コアネットワーク１０６と通信していることがあり、このコアネットワーク１０６は、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、１０２ｄのうちの１つまたは複数に、音声、データ、アプリケーションおよび／またはボイスオーバーＩＰ（ＶｏＩＰ）サービス１０６を提供するように構成されてよい。たとえば、コアネットワーク１０６は、呼制御、請求サービス、モバイル位置ベースのサービス、プリペイド式の発呼、インターネット接続性、ビデオ配信などを提供し、かつ／またはユーザ認証などの高レベルのセキュリティ機能を実施することができる。図１Ａに示されていないが、ＲＡＮ　１０４および／またはコアネットワーク１０６は、ＲＡＮ　１０４と同じＲＡＴ、または異なるＲＡＴを使用する他のＲＡＮと直接的に通信していることも、間接的に通信していることもある。たとえば、Ｅ－ＵＴＲＡ無線技術を使用していてよいＲＡＮ　１０４に接続されることに加えて、コアネットワーク１０６は、ＧＳＭ無線技術を使用する別のＲＡＮ

（図示せず）と通信していることもある。

【００２５】

コアネットワーク１０６は、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、１０２ｄがＰＳＴＮ　１０８、インターネット１１０および／または他のネットワーク１１２にアクセスするためのゲートウェイとして働くこともできる。ＰＳＴＮ　１０８は、ＰＯＴＳ（ｐｌａｉｎ　ｏｌｄ　ｔｅｌｅｐｈｏｎｅ　ｓｅｒｖｉｃｅ）を提供する回路交換電話網を含んでよい。インターネット１１０は、ＴＣＰ／ＩＰインターネットプロトコルスイートのＴＣＰ（ｔｒａｎｓｍｉｓｓｉｏｎ　ｃｏｎｔｒｏｌ　ｐｒｏｔｏｃｏｌ）、ＵＤＰ（ｕｓｅｒ　ｄａｔａｇｒａｍ　ｐｒｏｔｏｃｏｌ）およびＩＰ（ｉｎｔｅｒｎｅｔ　ｐｒｏｔｏｃｏｌ）など、共通の通信プロトコルを使用する相互接続されたコンピュータネットワークおよびデバイスのグローバルシステムを含んでよい。ネットワーク１１２は、他のサービスプロバイダによって所有および／または操作された有線または無線の通信網を含んでよい。たとえば、ネットワーク１１２は、１つまたは複数のＲＡＮに接続された別のコアネットワークを含んでよく、この１つまたは複数のＲＡＮは、ＲＡＮ　１０４と同じＲＡＴを用いてもよいし、異なるＲＡＴを用いてもよい。

【００２６】

通信システム１００内のＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、１０２ｄの一部またはすべては、マルチモード能力を含んでよく、たとえばＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、１０２ｄは、それぞれ異なるワイヤレスリンクを介してそれぞれ異なるワイヤレスネットワークと通信するための複数のトランシーバを含んでよい。たとえば、図１Ａに示されたＷＴＲＵ　１０２ｃは、セルラベースの無線技術を使用できる基地局１１４ａと、またＩＥＥＥ　８０２無線技術を使用できる基地局１１４ｂと通信するように構成されてよい。

【００２７】

図１Ｂは、例示的なＷＴＲＵ　１０２のシステム図である。図１Ｂに示されたように、ＷＴＲＵ　１０２は、プロセッサ１１８と、トランシーバ１２０と、送受信要素１２２と、スピーカ／マイクロホン１２４と、キーパッド１２６と、ディスプレイ／タッチパッド１２８と、取外し不可能なメモリ１３０と、取外し可能なメモリ１３２と、電源１３４と、ＧＰＳ（ｇｌｏｂａｌ　ｐｏｓｉｔｉｏｎｉｎｇ　ｓｙｓｔｅｍ）チップセット１３６と、他の周辺装置１３８とを含んでよい。ＷＴＲＵ　１０２は、一実施形態に依然として従いながら、上記要素の任意の下位組合せを含んでよいことが理解されよう。

【００２８】

プロセッサ１１８は、汎用プロセッサ、特別目的のプロセッサ、従来のプロセッサ、ＤＳＰ（ｄｉｇｉｔａｌ　ｓｉｇｎａｌ　ｐｒｏｃｅｓｓｏｒ）、複数のマイクロプロセッサ、ＤＳＰコアに関連する１つまたは複数のマイクロプロセッサ、コントローラと、マイクロコントローラ、ＡＳＩＣ（Ａｐｐｌｉｃａｔｉｏｎ　Ｓｐｅｃｉｆｉｃ　Ｉｎｔｅｇｒａｔｅｄ　Ｃｉｒｃｕｉｔ）、ＦＰＧＡ（Ｆｉｅｌｄ　Ｐｒｏｇｒａｍｍａｂｌｅ　Ｇａｔｅ　Ａｒｒａｙ）回路、他の任意のタイプのＩＣ（ｉｎｔｅｇｒａｔｅｄ　ｃｉｒｃｕｉｔ）、状態機械などであってよい。プロセッサ１１８は、信号符号化、データ処理、電源制御、入出力処理、および／またはＷＴＲＵ　１０２がワイヤレス環境内で動作することを可能にする他の機能性を実施することができる。プロセッサ１１８は、トランシーバ１２０に結合されてよく、このトランシーバ１２０は、送受信要素１２２に結合されてよい。図１Ｂは、プロセッサ１１８およびトランシーバ１２０を別個の構成要素として示しているが、プロセッサ１１８およびトランシーバ１２０は、電子パッケージまたはチップ内に統合されてよいことが理解されよう。

【００２９】

送受信要素１２２は、エアインターフェース１１６を介して基地局（たとえば基地局１１４ａ）に信号を送信し、またはそこから信号を受信するように構成されてよい。たとえば、一実施形態では、送受信要素１２２は、ＲＦ信号を送信および／または受信するように構成されたアンテナであってよい。別の実施形態では、送受信要素１２２は、たとえば

ＩＲ、ＵＶまたは可視光信号を送信および／または受信するように構成されたエミッタ／検出器であってよい。別の実施形態では、送受信要素１２２は、ＲＦ信号と光信号の両方を送受信するように構成されてよい。送受信要素１２２は、任意の組合せの無線信号を送信および／または受信するように構成されてよいことが理解されよう。

【００３０】

さらに、送受信要素１２２は、図１Ｂでは単一の要素として示されているが、ＷＴＲＵ　１０２は、任意の数の送受信要素１２２を含んでよい。より具体的には、ＷＴＲＵ　１０２は、ＭＩＭＯ技術を使用してよい。したがって、一実施形態では、ＷＴＲＵ　１０２は、エアインターフェース１１６を介してワイヤレス信号を送受信するために２つ以上の送受信要素１２２（たとえば複数のアンテナ）を含んでよい。

【００３１】

トランシーバ１２０は、送受信要素１２２によって送信される信号を変調し、また送受信要素１２２によって受信される信号を復調するように構成されてよい。上述されたように、ＷＴＲＵ　１０２は、マルチモード能力を有してよい。したがって、トランシーバ１２０は、たとえばＵＴＲＡとＩＥＥＥ　８０２．１１など、複数のＲＡＴを介してＷＴＲＵ　１０２が通信することを可能にする複数のトランシーバを含んでよい。

【００３２】

ＷＴＲＵ　１０２のプロセッサ１１８は、スピーカ／マイクロホン１２４、キーパッド１２６　および／またはディスプレイ／タッチパッド１２８（たとえば液晶ディスプレイ（ＬＣＤ）表示装置や有機発光ダイオード（ＯＬＥＤ）表示装置）に結合されてよく、そこからユーザ入力データを受信することができる。プロセッサ１１８は、スピーカ／マイクロホン１２４、キーパッド１２６および／またはディスプレイ／タッチパッド１２８にユーザデータを出力することもできる。さらに、プロセッサ１１８は、非リムーバブルメモリ１０６および／またはリムーバブルメモリ１３２など、任意の適切なタイプのメモリからの情報にアクセスし、そこにデータを格納することができる。取外し不可能なメモリ１０６は、ランダムアクセスメモリ（ＲＡＭ）、読取り専用メモリ（ＲＯＭ）、ハードディスクまたは他の任意のタイプのメモリ記憶デバイスを含んでよい。取外し可能なメモリ１３２は、ＳＩＭ（ｓｕｂｓｃｒｉｂｅｒ　ｉｄｅｎｔｉｔｙ　ｍｏｄｕｌｅ）カード、メモリスティック、ＳＤ（ｓｅｃｕｒｅ　ｄｉｇｉｔａｌ）メモリカードなどを含んでよい。他の実施形態では、プロセッサ１１８は、サーバやホームコンピュータ（図示せず）など、ＷＴＲＵ　１０２に物理的に置かれないメモリからの情報にアクセスし、そこにデータを格納することができる。

【００３３】

プロセッサ１１８は、電源１３４から電力を受信することができ、ＷＴＲＵ　１０２内の他のコンポーネントに電力を分配し、電力を制御するように構成されてよい。電源１３４は、ＷＴＲＵ　１０２に電力を供給するのに適した任意のデバイスであってよい。たとえば、電源１３４は、１つまたは複数の乾電池（たとえばニッケルカドミウム（ＮｉＣｄ）、ニッケル亜鉛（ＮｉＺｎ）、ニッケル水素（ＮｉＭＨ）、リチウムイオン（Ｌｉ－ｉｏｎ）など）、太陽電池、燃料電池などを含んでよい。

【００３４】

プロセッサ１１８は、ＧＰＳチップセット１３６に結合することもでき、このＧＰＳチップセット１３６は、ＷＴＲＵ　１０２の現在の位置に関する位置情報（たとえば経緯度）を提供するように構成されてよい。ＧＰＳチップセット１３６からの情報に加えて、またはその代わりに、ＷＴＲＵ　１０２は、エアインターフェース１１６を介して基地局（たとえば基地局１１４ａ、１１４ｂ）から位置情報を受信し、かつ／または２つ以上の近くの基地局から受信されている信号のタイミングに基づいてＷＴＲＵ　１０２の位置を決定することができる。一実施形態に依然として従いながら、ＷＴＲＵ　１０２が任意の適切な位置決定方法によって位置情報を取得できることが理解されよう。

【００３５】

プロセッサ１１８は、他の周辺装置１３８にさらに結合されてよく、この他の周辺装置

１３８は、追加の特徴、機能および／または有線もしくは無線の接続性を提供する１つまたは複数のソフトウェアおよび／またはハードウェアモジュールを含んでよい。たとえば、周辺装置１３８は、加速度計、ｅ－コンパス、衛星トランシーバ、デジタルカメラ（写真またはビデオ用）、ＵＳＢ（ｕｎｉｖｅｒｓａｌ　ｓｅｒｉａｌ　ｂｕｓ）ポート、振動デバイス、テレビトランシーバ、ハンズフリーヘッドセット、Ｂｌｕｅｔｏｏｔｈ（登録商標）モジュール、ＦＭ（ｆｒｅｑｕｅｎｃｙ　ｍｏｄｕｌａｔｅｄ）無線ユニット、デジタル音楽プレイヤー、メディアプレイヤー、ビデオゲームプレイヤーモジュール、インターネットブラウザなどを含んでよい。

【００３６】

図１Ｃは、一実施形態による、ＲＡＮ　１０４およびコアネットワーク１０６のシステム図である。上述されたように、ＲＡＮ　１０４は、エアインターフェース１１６を介してＷＴＲＵ　１０２ａ、１０２ｂおよび／または１０２ｃと通信するためにＥ－ＵＴＲＡ無線技術を使用してよい。ＲＡＮ　１０４は、コアネットワーク１０６と通信していることもある。

【００３７】

ＲＡＮ　１０４は、ｅＮｏｄｅ　Ｂ　１４０ａ、１４０ｂ、１４０ｃを含んでよいが、ＲＡＮ　１０４は、一実施形態に依然として従いながら、任意の数のｅＮｏｄｅ　Ｂを含んでよいことを理解されたい。ｅＮｏｄｅ　Ｂ　１４０ａ、１４０ｂ、１４０ｃはそれぞれ、エアインターフェース１１６を介してＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃと通信するための１つまたは複数のトランシーバを含んでよい。一実施形態では、ｅＮｏｄｅ　Ｂ　１４０ａ、１４０ｂ、１４０ｃは、ＭＩＭＯ技術を実装してよい。したがって、ｅＮｏｄｅ　Ｂ　１４０ａは、たとえば、複数のアンテナを使用して、ＷＴＲＵ　１０２ａにワイヤレス信号を送信し、ＷＴＲＵ　１０２ａからワイヤレス信号を受信することができる。

【００３８】

ｅＮｏｄｅ　Ｂ　１４０ａ、１４０ｂ、１４０ｃはそれぞれ、特定のセル（図示せず）に関連付けることができ、無線リソース管理決定、ハンドオーバ決定、アップリンクおよび／またはダウンリンクのユーザスケジューリングなどに対処するように構成されてよい。図１Ｃに示されたように、ｅＮｏｄｅ　Ｂ　１４０ａ、１４０ｂ、１４０ｃは、Ｘ２インターフェースを介して互いに通信してよい。図１Ｃに示されたコアネットワーク１０６は、モビリティ管理ゲートウェイ（ＭＭＥ）１４２、サービングゲートウェイ１４４およびパケットデータ網（ＰＤＮ）ゲートウェイ１４６を含んでよい。上記要素はそれぞれ、コアネットワーク１０６の一部として示されているが、これらの要素のいずれの要素もが、コアネットワーク事業者以外のエンティティによって所有および／または操作されてよいことが理解されよう。

【００３９】

ＭＭＥ　１４２は、Ｓ１インターフェースを介してＲＡＮ　１０４内のｅＮｏｄｅ　Ｂ　１４２ａ、１４２ｂ、１４２ｃのそれぞれに接続することができ、制御ノードとして働くことができる。たとえば、ＭＭＥ　１４２は、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃ、ＷＴＲＵ　１０２ａのユーザの認証、ベアラのアクティブ化／非アクティブ化、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃの初期接続の間に特定のサービングゲートウェイを選択することの責任を担うことができる。ＭＭＥ　１４２は、ＲＡＮ　１０４と、ＧＳＭやＷＣＤＭＡなど、他の無線技術を使用する他のＲＡＮ（図示せず）との間で切り換える制御プレーン機能を提供することもできる。

【００４０】

サービングゲートウェイ１４４は、Ｓ１インターフェースを介して、ＲＡＮ　１０４内のｅＮｏｄｅ　Ｂ　１４０ａ、１４０ｂ、１４０ｃのそれぞれに接続されてよい。サービングゲートウェイ１４４は一般に、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃに／から、ユーザデータパケットをルーティングし転送してよい。サービングゲートウェイ１４４は、ｅＮｏｄｅ　Ｂ間ハンドオーバの間のユーザプレーンのアンカリング、ＷＴＲＵ　１０

２ａ、１０２ｂ、１０２ｃにダウンリンクデータが使用可能な場合のページングのトリガ、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃのコンテキストの管理および格納など、他の機能を実施することもできる。

【００４１】

サービングゲートウェイ１４４は、ＰＤＮゲートウェイ１４６にも接続されてよく、このＰＤＮゲートウェイ１４６は、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃとＩＰ対応デバイスとの間の通信を円滑に進めるために、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃがインターネット１１０などのパケット交換網にアクセスできるようにしてよい。

【００４２】

コアネットワーク１０６は、他のネットワークとの通信を円滑に進めることができる。たとえば、コアネットワーク１０６は、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃと従来の地上通信デバイスとの間の通信を円滑に進めるために、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃがＰＳＴＮ　１０８などの回路交換網にアクセスできるようにしてよい。たとえば、コアネットワーク１０６は、コアネットワーク１０６とＰＳＴＮ　１０８の間のインターフェースとして働くＩＰゲートウェイ（たとえばＩＰマルチメディアサブシステム（ＩＭＳ）サーバ）含んでもよし、それと通信してもよい。さらに、コアネットワーク１０６は、ＷＴＲＵ　１０２ａ、１０２ｂ、１０２ｃがネットワーク１１２にアクセスできるようにすることができ、このネットワーク１１２は、他のサービスプロバイダによって所有および／または操作される他の有線網または無線網を含んでよい。

【００４３】

下記に言及されるとき、用語１次コンポーネントキャリア（ＰＣＣ）は、一般性を失わずに、複数のコンポーネントキャリアで動作するように構成されたＷＴＲＵの１つのキャリアを含み、たとえばセキュリティパラメータおよびＮＡＳ情報の導出など一部の機能は、そのコンポーネントキャリアだけに適用可能であってよい。ＷＴＲＵは、少なくともダウンリンク用の１つのＰＣＣ（ＤＬ　ＰＣＣ）、およびアップリンク用の１つのＰＣＣ（ＵＬ　ＰＣＣ）で構成されてよい。したがって、ＷＴＲＵのＰＣＣでないキャリアは、下記では２次キャリア（ＳＣＣ）と呼ばれることがある。

【００４４】

ＤＬ　ＰＣＣは、たとえば、システムに最初にアクセスするとき、初期セキュリティパラメータを導出するためにＷＴＲＵによって使用されるＣＣに対応する。ＵＬ　ＰＣＣは、たとえば、そのＰＵＣＣＨリソースが所与のＷＴＲＵのためのすべてのハイブリッド自動反復要求（ＨＡＲＱ）肯定応答／否定応答（Ａ／Ｎ）およびチャネル状態情報（ＣＳＩ）フィードバックを運ぶように構成されるＣＣに対応することがある。

【００４５】

本明細書に言及されるとき、用語「コンポーネントキャリア（ＣＣ）」は、一般性を失わずに、ＷＴＲＵが動作する周波数を含む。たとえば、ＷＴＲＵは、ダウンリンクＣＣ（以下「ＤＬ　ＣＣ」）上で送信を受信することができ、ＤＬ　ＣＣは、それだけに限らないが、物理制御フォーマットインジケータチャネル（ＰＣＦＩＣＨ）、物理ＨＡＲＱインジケータチャネル（ＰＨＩＣＨ）、物理ダウンリンク制御チャネル（ＰＤＣＣＨ）、物理マルチキャストデータチャネル（ＰＭＣＨ）および物理ダウンリンク共有チャネル（ＰＤＳＣＨ）を含めて、いくつかのＤＬ物理チャネルからなってよい。ＰＣＦＩＣＨ上で、ＷＴＲＵは、ＤＬ　ＣＣの制御領域のサイズを示す制御データを受信する。ＰＨＩＣＨ上で、ＷＴＲＵは、前のアップリンク送信に対するＨＡＲＱ　ＡＣＫ／ＮＡＣＫフィードバックを示す制御データを受信する。ＰＤＣＣＨ上で、ＷＴＲＵは、主としてダウンリンクリソースおよびアップリンクリソースをスケジューリングするために使用されるダウンリンク制御情報（ＤＣＩ）メッセージを受信する。ＰＤＳＣＨ上で、ＷＴＲＵは、ユーザデータおよび／または制御データを受信する。たとえば、ＷＴＲＵは、アップリンクＣＣ（以下「ＵＬ　ＣＣ」）上で送信することができ、ＵＬ　ＣＣは、それだけに限らないが、物理アップリンク制御チャネル（ＰＵＣＣＨ）および物理アップリンク共有チャネル（ＰＵＳＣＨ）を含めて、いくつかのＵＬ物理チャネルからなってよい。ＰＵＳＣＨ上で、ＷＴ

ＲＵは、ユーザデータおよび／または制御データを送信する。ＰＵＣＣＨ上で、また一部の場合ではＰＵＳＣＨ上で、ＷＴＲＵは、アップリンク制御情報（ＣＱＩ／ＰＭＩ／ＲＩまたはＳＲなど）および／またはハイブリッド自動反復要求（ＨＡＲＱ）肯定応答／否定応答（ＡＣＫ／ＮＡＣＫ）フィードバックを送信する。ＵＬ　ＣＣ上で、ＷＴＲＵに、サウンディングリファレンス信号（Ｓｏｕｎｄｉｎｇ　ａｎｄ　Ｒｅｆｅｒｅｎｃｅ　Ｓｉｇｎａｌ）（ＳＲＳ）送信のための専用のリソースを割り当てることもできる。

【００４６】

典型的にはセルは最小限、ＵＬ　ＣＣ内に存在し、このＤＬ　ＣＣは、一部の実施形態では、ＤＬ　ＣＣ上でブロードキャストされ、またはネットワークからの個別の構成シグナリングを恐らく使用した、ＷＴＲＵによって受信されたシステム情報（ＳＩ）に基づいてＵＬ　ＣＣにリンクされる。たとえば、ＤＬ　ＣＣ上でブロードキャストされる場合、ＷＴＲＵは、リンクされたＵＬ　ＣＣのアップリンク周波数および帯域幅を、システム情報ブロックタイプ２（ＳＩＢ２）情報要素の一部として受信する。

【００４７】

本明細書に言及されるとき、用語１次セル（ＰＣｅｌｌ）は一般性を失わずに、ＷＴＲＵが初期接続確立手順を実施しまたは接続再確立手順を開始する１次周波数の動作するセル、またはハンドオーバ手順において１次セルとして示されたセルを含む。ＷＴＲＵは、ＰＣｅｌｌを使用して、セキュリティ機能についてのパラメータ、およびＮＡＳモビリティ情報など上位層システム情報についてのパラメータを導出するためにＰＣｅｌｌを使用する。ＰＣｅｌｌ　ＤＬ上だけでサポートされ得る他の機能は、ブロードキャストチャネル（ＢＣＣＨ）上のシステム情報（ＳＩ）取得および変更監視手順、およびページングを含む。ＰＣｅｌｌのＵＬ　ＣＣは、所与のＷＴＲＵのためのすべてのＨＡＲＱ　ＡＣＫ／ＮＡＣＫフィードバックを運ぶよう構成された物理アップリンク制御チャネル（ＰＵＣＣＨ）リソースが構成されるＣＣに対応してよい。

【００４８】

本明細書に言及されるとき、用語「２次セル（ＳＣｅｌｌ）」は一般性を失わずに、２次周波数で動作するセルを含み、このセルは、ＲＲＣ接続が確立されると構成することができ、また追加の無線リソースを提供するために使用することができる。関与するＳＣｅｌｌ内の動作に関連するシステム情報は典型的には、ＷＴＲＵの構成にＳＣｅｌｌが追加されるときの個別のシグナリングを使用して提供される。パラメータは、システム情報（ＳＩ）シグナリングを使用して、関与するＳＣｅｌｌのダウンリンク上でブロードキャストされた値とは異なる値を有し得るが、この情報は本明細書では、この情報を得るためにＷＴＲＵによって使用される方法とは独立に、関与するＳＣｅｌｌのＳＩと呼ばれる。

【００４９】

本明細書に言及されるとき、用語「ＰＣｅｌｌ　ＤＬ」および「ＰＣｅｌｌ　ＵＬ」は、一般性を失わずに、それぞれＰＣｅｌｌのＤＬ　ＣＣおよびＵＬ　ＣＣに対応する。同様に、用語「ＳＣｅｌｌ　ＤＬ」および「ＳＣｅｌｌ　ＵＬ」は、それぞれＳＣｅｌｌのＤＬ　ＣＣおよびＵＬ　ＣＣ（構成される場合）に対応する。ＰＣｅｌｌでは、ＣＣは、ＰＣＣと呼ばれることもあり、ＳＣｅｌｌでは、ＣＣは、ＳＣＣと呼ばれることがある。

【００５０】

本明細書に言及されるとき、用語「サービングセル」は、一般性を失わずに、１次セル（たとえばＰＣｅｌｌ）または２次セル（たとえばＳＣｅｌｌ）を含む。より具体的には、ＳＣｅｌｌで構成されておらず、または複数のコンポーネントキャリア上の動作（たとえばキャリアアグリゲーション）をサポートしないＷＴＲＵでは、ＰＣｅｌｌからなる１つのサービングセルがあり、また一部の実施形態では多分、ＰＣｅｌｌからなる１つのサービングセルだけがあり、少なくとも１つのＳＣｅｌｌで構成されるＷＴＲＵでは、用語「サービングセル」は、ＰＣｅｌｌおよびすべての構成されたＳＣｅｌｌからなる１つまたは複数のセルのセットを含む。

【００５１】

ＷＴＲＵが少なくとも１つのＳＣｅｌｌで構成される場合、少なくとも１つのＰＣｅｌ

１　ＤＬ（たとえば１つのＤＬ－ＳＣＨを含む）、および少なくとも１つのＰＣｅｌｌ　ＵＬ（たとえば１つのＵＬ－ＳＣＨを含む）があり、また構成された各ＳＣｅｌｌにつき、少なくとも１つのＳＣｅｌｌ　ＤＬがあり、一部の実施形態では、少なくとも１つのＳＣｅｌｌ　ＵＬ（構成される場合）がある。一部の実施形態では、１つのＰＣｅｌｌ　ＤＬ（たとえば１つのＤＬ－ＳＣＨを含む）、および１つのＰＣｅｌｌ　ＵＬ（たとえば１つのＵＬ－ＳＣＨを含む）があり、また構成された各ＳＣｅｌｌにつき、１つのＳＣｅｌｌ　ＤＬがあり、一部の実施形態では、１つのＳＣｅｌｌ　ＵＬ（構成される場合）がある。

【００５２】

キャリアアグリゲーション（ＣＡ）を有するＲ１０では、たとえば、ＷＴＲＵは、その構成に少なくとも１つのＳＣｅｌｌ　ＤＬを有し、ＷＴＲＵは、ＰＵＣＣＨ上のＡ／Ｎへの１つまたは複数の明示的なリソース割当て構成することもできる。一部の実施形態では、限定のためでなく、例を挙げると、たとえば個別のシグナリングを使用して、ＵＬ　ＰＣＣ用にＰＵＣＣＨ　Ａ／Ｎリソースが明示的に割り当てられ得ること、ＵＬ／ＤＬ　ＰＣＣリンクが、ＤＬ　ＰＣＣ上のＳＩに基づき得ること、ＳＣｅｌｌが明示的に（非）アクティブ化され得ること、およびＷＴＲＵがＳＣＣ内でＲＡ（たとえばＲＡ－ＳＲ）を実施してよいことを含む作業仮説が行われる。

【００５３】

ＵＬ同期は、ランダムアクセスチャネル（ＲＡＣＨ）手順を使用して最初に達成することができ、ＷＴＲＵは、ネットワークとのＵＬタイムアライメントが行われると見なされる。ＷＴＲＵは、構成可能なタイマ、たとえばネットワークとのタイミングアライメントを維持するために使用できるタイムアライメントタイマ（ＴＡＴ）を有する。リリース８／リリース９（Ｒ８／Ｒ９）ＷＴＲＵは、ＷＴＲＵが有効なタイミングアドバンスを有さない場合、たとえばＴＡタイマが終了すると、チャネル品質情報／プリコーディングマトリックスインジケータ／ランクインジケータ（ＣＱＩ／ＰＭＩ／ＲＩ）用の構成された物理アップリンク制御チャネル（ＰＵＣＣＨ）リソース、またサウンディングリファレンス信号（ＳＲＳ）をも解放する。動的に割り当てられるＨＡＲＱ　ＡＣＫ／ＮＡＣＫ（Ａ／Ｎ）の送信用のＰＵＣＣＨリソースでは、ＴＡＴが実行されていないとき、ＷＴＲＵは、ＰＵＣＣＨ上でＡ／Ｎを送信することは許されない。ＰＵＣＣＨ上のＨＡＲＱフィードバックでは、ＰＵＣＣＨ上の送信のリソースは、物理ダウンリンク制御チャネル（ＰＤＣＣＨ）上で受信されたダウンリンク（ＤＬ）割当てのためのＤＣＩの第１の制御チャネル要素（ＣＣＥ）に基づいて動的に決定される。

【００５４】

ＷＴＲＵは、接続モードにおいて複数のキャリアで動作するように構成されてよい。ＷＴＲＵ構成は、構成されたアップリンクリソースを有する２つ以上のサービングセルを含んでよく、その対応するアップリンクキャリアは、それぞれ異なるタイミングアドバンスを必要とするアップリンクキャリアをＷＴＲＵがサポートする場合には、類似のタイミングアライメント要件に基づいて恐らくグループ化されてよい。こうしたシナリオでは、ＷＴＲＵは、これらのキャリア（のグループ）のそれぞれに有効なタイミングアライメントを確立する必要があり得る。１つの問題は、ＷＴＲＵおよびネットワークが、どのアップリンクキャリアが同じタイミングアドバンス（ＴＡ）を共有すべきかについてどのように合意するかであり得る。限定のためではなく、例を挙げると、ＴＡは、割り当てられたタイムスロット内でＷＴＲＵが送信することを許され得る時間の調整を制御する変数であってよい。別の問題は、これらのアップリンクキャリア、またはそのグループに関連するＴＡ値をネットワークがどのようにＷＴＲＵに通信するかであり得る。しかし、別の問題は、各アップリンクキャリアまたはそのグループのタイミングアドバンスタイマの終了のせいで同期の損失が発生するとき、ＷＴＲＵがどんな措置を講じる必要があるか決定することであり得る。別の問題は、マルチキャリア操作用に構成されたＷＴＲＵがどのように下記に対処するかであり得る。（１）リソースが構成されるＵＬ　ＣＣ、たとえば　ＰＣｅｌｌ　ＵＬについてＴＡＴが終了する場合のＰＵＣＣＨ　Ａ／Ｎリソース、たとえば、Ｐ

Ｃｅｌｌ　ＵＬ、および（２）リンクされたＳＣｅｌｌ　ＵＬについてＴＡＴが終了する場合のＳＣｅｌｌ　ＤＬ。

【００５５】

実施形態は、ＷＴＲＵが、ＲＡＲメッセージ受信の後、ＷＴＲＵ競合解決メディアアクセス制御（ＭＡＣ）制御要素（ＣＥ）を含めて、第１のスケジューリングされたＰＤＳＣＨ送信、たとえば、Ｃ－ＲＮＴＩでスクランブルされたＰＤＣＣＨの使用により、またはＤＬ－ＳＣＨ上での別のやり方によりスケジューリングされるＰＤＳＣＨ割当てに対するＡ／Ｎを送信できることを企図している。ＲＡＲメッセージは、ＴＡコマンドを含んでよく、ＲＡ手順の間、ＴＡＴを再開することができる。ＴＡＴ終了がたとえばＲ１０　ＰＵＣＣＨ　Ａ／Ｎリソースを無効にする場合、ＳＣｅｌｌ　ＤＬで受信されたＰＤＳＣＨへのＡ／Ｎ送信に規則が必要となることがあり、そうでない場合は、互換性を保証するためにＲ８原理に従って物理アップリンク制御チャネルＰＵＣＣＨ動的リソース上でＡ／Ｎを送信できるように、Ｒ１０　ＰＵＣＣＨ　Ａ／Ｎリソースを暗黙的に解放するための異なる機構が必要となり得る。

【００５６】

実施形態は、本明細書に開示された方法および技法が、ＷＴＲＵが接続モードで複数のキャリアと動作することを容易にでき、また複数のアップリンクキャリアとのタイムアライメントを維持することもできることを企図している。

【００５７】

実施形態は、ＵＬタイムアライメントのためにＷＴＲＵによって使用されるタイミングアドバンス（ＴＡ）値が、ネットワークによって、ＷＴＲＵのＲＡＣＨ要求メッセージへのランダムアクセスチャネル（ＲＡＣＨ）応答で提供されてもよいし、またはタイミングアドバンスコマンドＭＡＣ制御要素を使用することによって提供されてもよいことを企図している。ＷＴＲＵは、ＵＬタイムアライメントのためにＴＡ値を使用することができる。ＷＴＲＵは、１つのＵＬキャリアがＷＴＲＵに割り当てられ得るので、ＵＬキャリアに関連するＴＡＴを開始／再開してよい。一部の場合では、ＷＴＲＵは、所与のときにそれで動作していることがあるＵＬキャリアのグループについて単一のＴＡで動作するようにＷＴＲＵを実装することによって制約を受けることがある。これは、たとえば、ＵＬキャリアが同じ周波数帯内にあり、共通のＲＦモジュールを使用して送信される場合に当てはまり得る。同じＴＡで動作するキャリアのグループは、本明細書では「ＵＬ　ＣＣセット」と呼ばれることがある。

【００５８】

実施形態は、最小限のシグナリングを必要とし得るＵＬ　ＣＣセットが、同じ周波数帯の一部である１つまたは複数のＵＬキャリアが同じＵＬ　ＣＣセットの一部であると決定することを含んでよいことを企図している。同じ周波数帯の一部でないＵＬキャリアは、同じＵＬ　ＣＣセットの一部でないことがある。実施形態は、ＷＴＲＵおよびネットワークが、どのＵＬキャリアが同じＵＬ　ＣＣセットに属するか前もって知り得ることをも企図している。

【００５９】

実施形態は、ＵＬ　ＣＣセットの定義がＷＴＲＵ能力に依存し得ることを企図している。したがって、ＷＴＲＵは、そのＥ－ＵＴＲＡ能力の一環として、それぞれ異なるＴＡでどのＵＬキャリアが送信され得るかを含めて、情報をネットワークに送信することができる。複数のＴＡで動作できる可能性を、ＷＴＲＵがサポートしている周波数帯に結び付けることができるので、能力を単一の情報要素（「ｍｕｌｔｉｐｌｅＴＡｓｕｐｐｏｒｔ」）として定義することを用いて、ネットワークにこの情報を転送することができる。例示的な符号化は、下記の通りであってよい：

コードポイント０：ＷＴＲＵは複数のＴＡをサポートすることができない；

コードポイント１：ＵＬキャリアが同じ帯域にない場合、ＷＴＲＵはそれぞれ異なるＴＡで動作することができる；および

コードポイント２：ＷＴＲＵは、いずれかのＵＬキャリア対についてそれぞれ異なるＴＡ

で完全に動作することができる。また、例を挙げると、企図された別の符号化は、下記の通りであってよい：
コードポイント０：ＷＴＲＵは、複数のＴＡをサポートすることができない（たとえば、単一の無線フロントエンドが単一の周波数帯をサポートする）；
コードポイント１：ＵＬキャリアが同じ帯域内にない（たとえば２重の無線フロントエンドがそれぞれ、単一の周波数帯をサポートする）場合、ＷＴＲＵは、最大２つの異なるＴＡで動作することができる；および
コードポイント２：ＷＴＲＵは、任意の数のＵＬキャリアについてそれぞれ異なるＴＡで完全に動作することができる（たとえば、報告されたＷＴＲＵの能力およびＷＴＲＵのクラスによる、周波数帯の任意の組合せへの完全なサポート）。

【００６０】
符号化した情報を使用して、ネットワークは、同じタイミングアドバンスを使用するＵＬキャリアのセット（ＵＬ　ＣＣセット）を定義し、ＷＴＲＵに情報を提供することができる。ネットワークは、それぞれ異なる帯域のＵＬキャリアについて異なるＴＡでＷＴＲＵが動作可能である場合でも、同じＵＬ　ＣＣセット内の異なる帯域からのＵＬキャリアを含むことができる。

【００６１】
一部の実施形態は、各ＵＬ　ＣＣセットごとに数ビット（最大２つのＵＬ　ＣＣがある場合は、恐らく単一ビット）のグループインデックスを定義することによって同じタイミングアドバンスを使用するＵＬキャリアを識別することができる。ＷＴＲＵは、このＵＬキャリアが（たとえばＲＲＣメッセージで）ネットワークによって構成されている場合、ＵＬキャリアが属するＵＬ　ＣＣセットのグループインデックスを取得することができる。あるいは、グループインデックスは、対になったＤＬキャリアのシステム情報でブロードキャストしてもよい。別の代替案では、帯域内で複数のタイミングアドバンスで動作することがサポートされない場合、グループインデックスは、周波数帯に関連しないことがある。

【００６２】
ＷＴＲＵは、各ＵＬキャリアまたはＵＬ　ＣＣセットごとのタイミングアドバンスのための基準として使用できるＤＬキャリア（またはＤＬキャリアのセット）を取得することもできる。あるいは、タイミングアドバンスのための基準として使用できるＤＬキャリアは、暗黙的に、タイミングアドバンス値を含むメッセージがそこから送信されるＤＬキャリアであってよい。

【００６３】
実施形態は、それぞれ異なるＵＬ　ＣＣセットについて異なるＴＡ値をＷＴＲＵが適用できることを企図している。それぞれのＵＬ　ＣＣセットは、別個のタイムアライメントタイマ（ＴＡＴ）で動作してよい。この方法によれば、一実施形態では、初期のタイミングアライメントは、ＲＡＣＨ応答メッセージを使用してＴＡ値がネットワークによってＷＴＲＵに提供され得るランダムアクセスチャネル（ＲＡＣＨ）手順を使用して達成することができる。セットのすべてのキャリア（またはサブセット）がＲＡＣＨ用に構成されるＵＬ　ＣＣセットの場合、ＷＴＲＵは、ＲＡＣＨのために使用され、ランダムアクセス手順をトリガできるキャリアのうちの１つを選択することができる。次いで、ランダムアクセス応答メッセージで受信されたタイミングアドバンスコマンドは、ＵＬ　ＣＣセットの一部またはそれぞれのＵＬキャリアにＴＡ値を適用するために使用することができ、ＷＴＲＵは、ＵＬ　ＣＣセットに関連するＴＡＴを開始／再開してよい。

【００６４】
一部の実施形態では、ＵＬ　ＣＣセット内の１つのキャリアだけがＲＡＣＨ用に構成されてよい。こうした実施形態では、ＷＴＲＵは、このキャリア上でランダムアクセス手順をトリガし、対応するランダムアクセス応答メッセージで取得されたＴＡ値をＵＬ　ＣＣセットの各ＵＬキャリアに適用し、ＵＬ　ＣＣセットに関連するＴＡＴを開始／再開してよい。

【００６５】
他の実施形態では、タイミングアライメントは、既存のＭＡＣ　ＣＥまたは他のいずれかの形のシグナリングによってネットワークから受信されたＴＡ値に基づいてＷＴＲＵによって維持することができる。ＷＴＲＵは、どのＤＬキャリアからコマンド（たとえばタイミングアドバンスコマンドＭＡＣ制御要素）が送信されたに基づいてＴＡ値をどのＵＬ　ＣＣセットに適用してよいか決定することができる。たとえば、ＴＡ値が適用されるＵＬ　ＣＣセットは、このＤＬキャリアと対になるＵＬキャリアが属するＵＬ　ＣＣセットとして決定することができる。ＵＬ　ＣＣセットが周波数帯に対応する場合、ＴＡ値は、コマンドが送信されるＤＬキャリアと同じ帯域のＵＬ　ＣＣセットに適用することができる。あるいは、ＤＬキャリアとＵＬ　ＣＣセットの間の対応は、明示的に知らせることができる。

【００６６】
実施形態は、サービングセルについて周波数帯を定義することができ、たとえばＤＬキャリア、一部の実施形態ではサービングセルを形成するＵＬキャリアについて一緒に定義できることを企図している。またタイミングアドバンスは、同じ周波数帯に対応するサービングセルの一部またはすべてのＵＬキャリアに適用することができる。実施形態は、タイムアライメントコマンド（ＴＡＣ）に適用可能な帯域を識別するための少なくとも２つの技法を企図している。適用可能な帯域は、それ自体が同じ周波数帯の一部であり得る特定のダウンリンクキャリア内のＴＡＣの受信に結び付けてもよいし、結び付けなくてもよい。実施形態は、ＴＡＣが受信され、ＴＡＣが受信されるキャリアの周波数帯の一部またはすべてのＵＬキャリアに適用され得ること（たとえば適用可能な帯域の暗黙的な識別）を企図している。あるいは、またはさらに、ＴＡＣは、どこかで受信され、ＴＡＣ自体の中に示され得る（たとえば適用可能な帯域の明示的な識別）周波数帯のすべてのＵＬキャリアに適用されてよい。

【００６７】
実施形態は、ＴＡを含み得るＭＡＣ　ＣＥを、サービングセルのＤＬ上で受信できることを企図している。ＷＴＲＵは、サービングセルの対応するＵＬ　ＣＣがどのＵＬ　ＣＣセットに属し得るか決定することができる。ＷＴＲＵは、決定されたＵＬ　ＣＣセットに属し得るすべてのサービングセルのＵＬ　ＣＣ（および／またはすべてのＵＬ　ＣＣ）に、受信されたＴＡを適用することができる。実施形態は、ＵＬ　ＣＣをＤＬ　ＣＣと対にすることは一意（たとえば１つのＤＬにつき１つのＵＬ）であってよいことを企図している。実施形態は、対がセットの一部であり得ることをも企図しており、ただし、セットの一部であることの基準は、セットのすべてのＵＬ　ＣＣが同じＴＡ要件を有することであり得る。

【００６８】
あるいは、ＷＴＲＵは、コマンドで明示的に提供されてよいグループインデックスに基づいて、ＴＡ値がどのＵＬ　ＣＣセットに適用されるか決定してもよい。たとえば、既存の「タイミングアドバンスコマンドＭＡＣ制御要素」の２つの予備ビットを使用してもよいし、グループインデックスを含む新しいタイプのＭＡＣ制御要素を定義してもよい。タイミングアドバンスコマンドＭＡＣ　ＣＥが受信される場合、ＷＴＲＵは、グループインデックスを使用してＵＬ　ＣＣセットを識別することができ、対応するＵＬ　ＣＣセットのＴＡＴを開始／再開することができる。

【００６９】
あるいは、ネットワークは、ＷＴＲＵにＴＡ値を提供するために、いずれかの他の形の個別のシグナリングを使用してよい。ネットワークは、このＴＡ値にどのＵＬ　ＣＣセットを関連付けることができるか示すために、このメッセージにＣＣ「グループインデックス」を組み込んでよい。

【００７０】
やはり、あるいはＷＴＲＵは、ＵＬ　ＣＣセットのＴＡＴが終了すると特定のＵＬ　ＣＣセットにＴＡ値を適用するために、上記に述べられた初期ＴＡ確立と同じ手順に従い、

ＵＬタイミングアライメントを再確立することができる。必要である場合は、ＴＡの取得を行うことができる。あるいは、ＷＴＲＵは、個別のシグナリングで提供されるグループインデックスに基づいて、対応するＵＬ　ＣＣセットのＴＡを再確立するためにどのＲＡＣＨリソースを使用するか決定することができる。次いで、ＷＴＲＵは、上述されたランダムアクセス手順を繰り返すことができる。

【００７１】

別の案では、ネットワークは、対応するＵＬ　ＣＣセット用に以前に使用されたＴＡ値を提供するために、既存のタイミングアドバンスコマンドＭＡＣ　ＣＥを使用してもよいし、他の任意の形の個別シグナリングを使用してもよい。ネットワークは、ＴＡＴの終了後に、十分な時間量（このために新しいタイマが定義され得る）の範囲内でこの機構を使用することができる。次いで、ＷＴＲＵは、このＴＡ値を使用して、このＵＬ　ＣＣについてのＲＡ手順を実施せずに、対応するＴＡＴを開始／再開することができる。

【００７２】

特定のＵＬ　ＣＣセットについて（または単一のＴＡＴがある場合、すべての構成されたＵＬ　ＣＣについて）ＴＡＴが終了すると、ＷＴＲＵは、ＵＬ　ＣＣセットのＵＬキャリア部分のＵＬ－ＳＣＨに対応するすべてのＨＡＲＱバッファをフラッシュしてよい。

【００７３】

対応するローカルのＮＡＣＫもまた、ＲＬＣサブレイヤに示すことができる。ＵＬ　ＣＣセットの一部であるＵＬキャリアの任意の物理アップリンク制御チャネル（ＰＵＣＣＨ）またはＳＲＳ構成を、ＴＡＴが終了すると解放することができる。ＰＣｅｌｌ　ＤＬなどの特定のＤＬキャリアを除いて、こうしたＰＵＣＣＨを介してフィードバックが送信されるどんなＤＬキャリアについても、ＷＴＲＵは、下記のうちの少なくとも１つを実施することができる。ＷＴＲＵは、このＤＬキャリアについてＰＤＳＣＨ処理（たとえばバッファリング／復号化）を停止し、ＤＬキャリアを非アクティブ化し、このＤＬキャリアのＰＤＳＣＨ構成を解放し、このＤＬキャリアについてＰＤＣＣＨ構成を解放し、このＤＬキャリアに適用可能なＰＲＡＣＨ構成を解放し、かつ／またはＤＬキャリアに関係する構成のどんな部分をも解放する。

【００７４】

ＵＬ　ＣＣセットのＵＬキャリア部分に適用可能などんなアップリンク許可も、終了時にクリアすることができる。さらに、ＵＬ　ＣＣセットの一部であってよいＵＬキャリアに対応するリソース上でフィードバックをそれについて提供できるどんなダウンリンク割当てをもクリアすることができる。

【００７５】

ＵＬ　ＣＣセットの一部であるＵＬキャリア上のＰＵＳＣＨ構成は、解放することができる。しかし、これは、ＰＣｅｌｌ　ＵＬなど、特定のＵＬキャリアには適用することができない。

【００７６】

ＵＬ　ＣＣセットの一部であるＵＬキャリア上のＰＵＳＣＨは、非アクティブ化することができる。しかし、これは、ＰＣｅｌｌ　ＵＬなど、特定のＵＬキャリアには適用することができない。これらのキャリア上のＰＵＳＣＨは、ＵＬ　ＣＣセットに適用可能なタイミングアドバンスコマンドがその後に受信されると、非アクティブ化されてよい。

【００７７】

個別のシグナリングを使用して受信できるＰＵＣＣＨ構成、たとえばＵＬ　ＣＣセットの一部であるＷＴＲＵの構成のＵＬ　ＣＣ（たとえばＰＣｅｌｌ　ＵＬ）の、複数のＤＬ　ＣＣに対応する制御情報のためのＨＡＲＱ　Ａ／Ｎおよび／またはＣＱＩ／ＰＭＩ／ＲＩへの明示的なリソース割当てのためのＲ１０構成が、無効にされてよい。たとえば、ＷＴＲＵは、個別のＰＵＣＣＨ構成（の少なくとも一部）を維持してよいが、恐らくＷＴＲＵがＵＬ　ＣＣに有効なタイミングアドバンスを有するまで、構成に対応するリソース上で送信しないことがある。これは、ＰＣｅｌｌ　ＵＬのＴＡＴが終了するからであり、ＷＴＲＵは、ＰＣｅｌｌ　ＵＬ上のＰＵＣＣＨ　Ａ／Ｎを無効にし／削除し、Ｒ８／９　Ａ

／Ｎ動作に戻ってよい。ＷＴＲＵは、ＵＬ　ＣＣ（たとえばＰＣＣ）で送信されたＨＡＲＱフィードバック用のＡ／Ｎリソースを動的に選択することに戻ることができ、かつ／または、ＷＴＲＵは、ＣＱＩ／ＰＭＩ／ＲＩのＰＵＣＣＨリソース上のＣＱＩ／ＰＭＩ／ＲＩの送信を停止することができる。

【００７８】

個別のシグナリングを使用して受信されてよいＰＵＣＣＨ構成を解放することもでき、たとえばＷＴＲＵは、個別のＰＵＣＣＨ構成を完全に削除してもよいし、少なくとも一部を削除してもよい。たとえば、ＵＬ　ＣＣの一部であるＷＴＲＵの構成のＵＬ　ＣＣ（たとえばＰＣｅｌｌ　ＵＬ）の、複数のＤＬ　ＣＣに対応する制御情報のためのＨＡＲＱＡ／Ｎおよび／またはＣＱＩ／ＰＭＩ／ＲＩへの明示的なリソース割当てのためのＲ１０構成が解放されてよい。ＷＴＲＵは、ＵＬ　ＣＣ（たとえばＰＣＣ）で送信されたＨＡＲＱフィードバック用のＡ／Ｎリソースを動的に選択することに戻ることができ、かつ／または、ＷＴＲＵは、ＣＱＩ／ＰＭＩ／ＲＩのＰＵＣＣＨリソース上のＱＩ／ＰＭＩ／ＲＩの送信を停止することができる。

【００７９】

一例として、ＰＣｅｌｌ　ＵＬのＴＡＴが終了すると、ＷＴＲＵは、明示的なＲ１０　ＰＵＣＣＨ　Ａ／Ｎリソース割当てを無効にし、かつ／またはＰＣｅｌｌ　ＵＬのＣＱＩ／ＰＭＩ／ＲＩのためのＲ１０　ＰＵＣＣＨ構成を解放してよい。

【００８０】

（ＰＵＣＣＨとＰＣＣが切り離され、ＰＣｅｌｌ　ＤＬに基づいてＰＣｅｌｌ　ＵＬが定義され得ると多分見なして）ＰＵＣＣＨ構成を有するＳＣｅｌｌ　ＵＬのＴＡＴが終了するので、ＷＴＲＵは、ＰＣｅｌｌ　ＵＬのＰＵＣＣＨ構成に切り換わることができる。ＵＬ　ＣＣがタイムアライメントされていると依然として見なされている（たとえば、ＵＬ　ＣＣは、ＴＡがもはや有効でないＵＬ　ＣＣセットの一部ではない）ＷＴＲＵ構成のＵＬ　ＣＣ（たとえばＰＣｅｌｌ　ＵＬ）の個別ＰＵＣＣＨ構成（複数のＤＬ　ＣＣに対応する制御情報用のＨＡＲＱ　Ａ／Ｎおよび／またはＣＱＩ／ＰＭＩ／ＲＩのためのＲ１０構成）を再構成することができる。たとえば、ＷＴＲＵは、有効なＴＡを依然として有し得るＵＬ　ＣＣ上の再構成されたリソース（たとえばＰＣｅｌｌ　ＵＬ）に関するアップリンク制御情報をＷＴＲＵが送信するように、そのＰＵＣＣＨ　Ａ／Ｎ構成から異なるリソースを選んでよい。また、例を挙げると、これは、第１のＵＬ　ＣＣについてＴＡが失われるとき第１のＵＬ　ＣＣ上の構成されたリソース（たとえばＡ／Ｎ用）と、第２のＵＬ　ＣＣ上の構成されたリソース（たとえばＰＣｅｌｌ　ＵＬ）との間の切換え、または１つまたは複数のＳ　Ｃｅｌｌについて ＴＡが終了すると（また恐らく暗黙的な非アクティブ化が行われると）、たとえばＰＣＣ上で異なる専用のリソース（たとえばＣＱＩ／ＰＭＩ／ＲＩ用）を使用することに等価と見なすことができる。

【００８１】

ＴＡＴが終了するので、ＷＴＲＵは、ＰＣｅｌｌ　ＤＬのＲＡＣＨを実施することだけが許され得る。実施形態は、ＴＡがもはや有効でないことがあるＵＬ　ＣＣセットの一部であるＳＣｅｌｌ　ＵＬに対応するそのＲＡＣＨリソースをＷＴＲＵが無効にし、かつ／またはＷＴＲＵの構成から削除できることを企図している。換言すると、一部の実施形態では、ＷＴＲＵは、Ｒ８／９選択および送信原理に従って単一のキャリア操作を使用してＵＬ／ＤＬ　ＣＣ対（たとえばＰＣｅｌｌ）上でランダムアクセス（ＲＡＣＨ）だけを開始することができる。

【００８２】

また、ＴＡＴが終了するので、ＷＴＲＵは、有効なＴＡを後に取り戻すことができ、ＷＴＲＵは、その構成のすべてのＵＬ／ＤＬ　ＣＣ対のＲ８／９に戻ってよい。ＷＴＲＵは、ＵＬ　ＣＣに有効なＴＡをその後に回復する場合、ＰＵＣＣＨ上のＡ／Ｎ送信のためのＲ８／９動作に戻り、ＵＬ　ＣＣのＰＵＣＣＨリソース上で送信することに戻ることができ、このリソースは、下記の少なくとも１つに基づいて決定される：ＤＬ割当てのためにＷＴＲＵがＰＤＣＣＨの復号化に成功する、ＤＬ　ＣＣのＵＬ／ＤＬリンク付け；または

、対応するＤＬ　ＣＣ（たとえばＰＣＣ用）のＳＩでブロードキャストされ、または個別のやり方で（たとえばＳＣＣ用に）受信されたＰＵＣＣＨ領域内のリソースの使用。

【００８３】

一例として、ＴＡＴが終了すると、ＷＴＲＵは、その構成のＳＣｅｌｌ内でランダムアクセスを実施するためのリソースを含めて、ＷＴＲＵのマルチキャリア構成を維持することができ、この場合、各ＣＣ対（たとえばＷＴＲＵの構成のＰＣｅｌｌまたはＳＣｅｌｌ対）について、ＷＴＲＵは、たとえばランダムアクセス手順の間にＴＡコマンドを受信するとき、有効なＴＡを回復すると、ＰＵＣＣＨ上のＡ／Ｎ送信にＲｅｌ－８／９動作を適用することができる

【００８４】

実施形態は、サービングセルが、タイマ終了前のダウンリンク１次キャリア（たとえばＰＣｅｌｌ）に対応することがあり、または、ＷＴＲＵがＵＬ　ＣＣセットに有効なタイムアライメントをもたない（たとえば、タイミングアドバンスタイマが実行されていない）場合、ＷＴＲＵが単一のキャリア（たとえばＲ８／９）操作に戻ってよいことを企図している。

【００８５】

上述された方法はすべて、ＴＡＴ終了に適用可能であってよく、暗黙的なＳＣｅｌｌ非アクティブ化（Ａ／ＮおよびＣＱＩ）に等しく適用可能とすることもできる。また上記方法は、ＳＣｅｌｌの非アクティブ化（非アクティブ化されたＳＣｅｌｌに対応するアップリンクリソースをＷＴＲＵが使用することを禁じるという点で類似の特性を有するが、たとえばＴＡＴと異なるタイマを使用した明示的または暗黙的な非アクティブ化）、またはＷＴＲＵ構成のＵＬ　ＣＣ（たとえば　ＳＣｅｌｌ　ＵＬ）を削除する明示的な再構成が行われると適用可能であってよい。

【００８６】

さらに、上記方法では、ＷＴＲＵは、ＰＵＣＣＨ上のＡ／Ｎの送信のためにＲ８／９動作に戻ってよい（たとえばＰＵＣＣＨリソースの動的な選択）。たとえば、ＴＡＴは、終了することがあり、ＷＴＲＵは、少なくとも１つのＳＣｅｌｌ　ＤＬを含めて構成を有することができ、サブフレーム内で２つ以上のキャリアについてのアップリンク制御情報を送信する手段をＷＴＲＵがまず回復するまで、たとえばＷＴＲＵが再構成されるまで、ＷＴＲＵが２つ以上のＤＬ　ＣＣの間、ＨＡＲＱ　Ａ／Ｎフィードバックおよび／またはＣＱＩ／ＰＭＩ／ＲＩを送信することが不可能となり得る（たとえばＷＴＲＵが複数のＤＬ　ＣＣを有し、ＲＡＣＨ手順の間、Ａ／Ｎ用の単一のＲ８／９　ＰＵＣＣＨリソースだけをＷＴＲＵが使用できる状況になり得る）。具体的には、ＷＴＲＵがランダムアクセス手順の間に単一のＵＬ　ＣＣ（たとえばＰＣｅｌｌ　ＵＬ）内にＡ／Ｎフィードバックだけを送信してよい場合、ランダムアクセスでは、再構成は、コンテンションベースのＲＡではＲＡ「ｍｓｇ４」の受信より後に起こることも、コンテンションなしのＲＡの場合ではＲＡ「ｍｓｇ２」の受信の後に続く第１のＰＤＳＣＨ割当てより後に起こることもある。

【００８７】

実施形態は、所与のサブフレームでＷＴＲＵが２つ以上のＤＬ割当てを受信する（ＷＴＲＵが所与のサブフレームで複数のＰＤＣＣＨの復号化に成功し得る）場合、ＰＣｅｌｌ　ＤＬのＰＤＳＣＨを考慮できるＷＴＲＵは、ＰＣｅｌｌ　ＤＬ上だけで受信されるＤＬ割当てに従ってＡ／Ｎフィードバックを生成することができる。

【００８８】

ＷＴＲＵが所与のサブフレームで２つ以上のＤＬ割当てを受信する（ＷＴＲＵが所与のサブフレームで複数のＰＤＣＣＨの復号化に成功し得る）場合、進行中のＲＡＣＨ手順に使用されたＤＬ　ＣＣのＰＤＳＣＨについて考慮することができるＷＴＲＵは、たとえばＲＡ　ｍｓｇ１（たとえばＲＡＣＨプリアンブル）の送信用に使用されたＵＬ　ＣＣに関連する／リンクされたＤＬ　ＣＣ上で受信されたＤＬ送信、および／またはＲＡ　ｍｓｇ３の送信（たとえば以前に受信されたＲＡ応答で許可されたリソースを使用した送信）へのＡ／Ｎフィードバックを生成してよい。

【００８９】
上記に述べられた実施形態のいずれについても、ＷＴＲＵは、（Ａ／Ｎのために）Ｒ８／９選択および送信に従ってＰＣｅｌｌ　ＵＬ上のＰＵＣＣＨリソースで送信することができ、またはＷＴＲＵは、ＰＣｅｌｌ　ＵＬ上でＲ８／９　Ａ／Ｎを送信してよい。ＷＴＲＵは、Ｒ８／９選択および送信に従って、Ａ／Ｎフィードバックがそのために生成されたＤＬ　ＣＣに関連する／リンクされたＵＬ　ＣＣ上のＰＵＣＣＨリソース上で送信することも、リンクされたＳＣｅｌｌ　ＵＬ上でＲ８／９　Ａ／Ｎを送信することもでき、または、ＷＴＲＵは、送信を控えてよく、たとえばＷＴＲＵは、フィードバックを送信しないことがあり、送信されたＤＬ割当てを恐らく無視することも、これをエラー状況と見なすこともある。

【００９０】
同じ周波数帯のすべてのＵＬキャリア部分が同じＵＬ　ＣＣセットの一部であると決定することを含む、複数のアップリンクキャリアとのタイムアライメントを維持するための方法が開示される。ＷＴＲＵは、各ＵＬ　ＣＣセットの数ビットのグループインデックスを定義することによって、複数のＴＡを使用できることを知らせる。ランダムアクセス応答メッセージで受信されたタイミングアドバンスコマンドは、ＵＬ　ＣＣセットの各ＵＬキャリアにＴＡ値を適用するために使用される。ＷＴＲＵは、たとえばタイミングアドバンスコマンドＭＡＣ制御要素によって、どのＤＬキャリアからコマンドが送信されたかに基づいて、どのＵＬ　ＣＣセットにＴＡ値を適用するか決定することができる。ＷＴＲＵは、コマンドで明示的に提供されているグループインデックスに基づいて、どのＵＬ　ＣＣ　セットにＴＡ値を適用するか決定することができる。ＷＴＲＵは、ＴＡＴが終了すると、マルチキャリア構成（たとえば１つまたは複数のＳＣｅｌｌｓの構成）の少なくとも一部を解放する。たとえば、ＷＴＲＵは、それぞれのＳＣｅｌｌ　ＵＬが、タイミングアライメントがもはや有効でないＵＬ　ＣＣセットの一部であるすべてのＳＣｅｌｌの構成を解放してよい。あるいは、たとえばＷＴＲＵは、ＰＣｅｌｌのタイミングアライメントがもはや有効でない場合、すべてのＳＣｅｌｌｓの構成を解放してよい。

【００９１】
ＷＴＲＵおよび／または基地局（または基地局もしくはｅＮｏｄｅ　Ｂ）の機能または能力を対象とする本明細書に述べられた諸実施形態のいずれもが、開示された機能または能力を実施するように構成された１つまたは複数のプロセッサによって実装されてよいことを理解されたい。たとえば、図１Ｂに関して述べられたプロセッサ１１８は、本明細書に全体的または部分的に開示された様々なＷＴＲＵ機能および能力の一部またはすべてを実施するように構成されてよい。また、例を挙げると、図１Ｃに関して述べられた基地局（基地ノード）またはｅＮｏｄｅ　Ｂに含まれたプロセッサは、本明細書に全体的または部分的に開示された様々な基地ノードまたはｅＮｏｄｅ　Ｂ機能および能力の一部またはすべてを実施するように構成されてよい。

【００９２】
図２では、例示的な実施形態は、少なくとも一部は、２０２で、ＷＴＲＵがそれで動作可能であり得る１つまたは複数のアップリンクキャリア、または無線通信網内で動作可能であってよい１つまたは複数のアップリンクキャリアを識別するように構成され得るワイヤレス送受信ユニット（ＷＴＲＵ）を企図している。２０４で、ＷＴＲＵは、１つまたは複数のアップリンクコンポーネントキャリアセット（ＵＬ　ＣＣセット）を決定するように構成することもできる。ＵＬ　ＣＣセットはそれぞれ、アップリンクキャリアのうちの１つまたは複数を備えてよく、各々のＵＬ　ＣＣセットを備えてよい１つまたは複数のアップリンクキャリアはそれぞれ、同じタイミングアドバンス（ＴＡ）で動作可能であってよい。ＷＴＲＵは、１つまたは複数のアップリンクキャリアのどれが１つまたは複数のＵＬ　ＣＣセットに対応し得るかの所定の識別に基づいてＵＬ　ＣＣセットの１つまたは複数のグループを決定するように構成されてよい。２０６で、ＷＴＲＵは、少なくとも１つのＵＬ　ＣＣセットを選択し、２０８で、選択された少なくとも１つのＵＬ　ＣＣセットのランダムアクセスチャネル（ＲＡＣＨ）通信が可能であってよい１つまたは複数のアッ

プリンクキャリアのうちの少なくとも１つを識別するようにするように構成することもできる。２１０で、ＷＴＲＵは、選択された少なくとも１つのＵＬ　ＣＣセットについて、識別された１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を開始して、２１２で、ＲＡＣＨ通信に応答してＴＡ値を受信するように構成されてよい。ＷＴＲＵは、２１４で、選択された少なくとも１つのＵＬ　ＣＣセットを備える１つまたは複数のアップリンクキャリアの各々にＴＡ値を適用するようにさらに構成されてよい。

【００９３】

実施形態は、選択された少なくとも１つのＵＬ　ＣＣセットが、関連するタイムアライメントタイマ（ＴＡＴ）を有することができ、２１６で、ＷＴＲＵがＴＡＴを開始し、またはＴＡＴを再開するようにさらに構成されてよいことを企図している。図３を参照すると、ＷＴＲＵは、３０２で、信号がＴＡ値を含み得るダウンリンクキャリアを介して信号を受信するように構成することもできる。ＷＴＲＵは、３０４で、ダウンリンクキャリアと対になり得る１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別し、３０６で、ダウンリンクキャリアと対になり得る１つまたは複数のアップリンクキャリアのうちの少なくとも１つに対応し得る１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別することができる。ＷＴＲＵは、３０８で、１つまたは複数のＵＬ　ＣＣセットのうちの識別された少なくとも１つを備える１つまたは複数のアップリンクキャリアのそれぞれにＴＡ値を適用してよい。

【００９４】

図４を参照すると、実施形態は、１つまたは複数のＵＬ　ＣＣセットが、各々の周波数帯に対応してよく、ＷＴＲＵが、４０２で、信号がＴＡ値を含み得るダウンリンクキャリアを介して信号を受信するよう構成され得ることを企図している。ＷＴＲＵは、４０４で、ダウンリンクキャリアに対応する周波数帯を識別し、それぞれの周波数帯がダウンリンクキャリアの周波数帯に対応し得る１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別するように構成されてよい。ＷＴＲＵは、４０６で、１つまたは複数のＵＬ　ＣＣセットのうちの識別された少なくとも１つを備えてよい１つまたは複数のアップリンクキャリアのそれぞれにＴＡ値を適用してよい。

【００９５】

図５を参照すると、実施形態は、選択された少なくとも１つのＵＬ　ＣＣセットが、個別の物理アップリンク制御チャネル（ＰＵＣＣＨ）構成を有する少なくとも１つのアップリンクキャリアを含んでよいことを企図している。ＷＴＲＵは、５０２で、ＴＡＴが終了すると、ＰＵＣＣＨに対応するリソース上で送信するのをやめるように構成されてよい。あるいは、またはさらに、ＷＴＲＵは、５０４で、ＴＡＴが終了すると、ＰＵＣＣＨ構成の少なくとも一部を削除するように構成されてよい。やはり、あるいはまたはさらに、ＷＴＲＵは、５０６で、ＴＡＴが終了すると、選択された少なくとも１つのＵＬ　ＣＣセットの構成から１つまたは複数のＲＡＣＨリソースを削除するように構成されてよい。

【００９６】

図６を参照すると、実施形態は、進化型Ｎｏｄｅ　Ｂ（ｅＮｏｄｅ　Ｂ）などのワイヤレスネットワークリソースが少なくとも一部、６０２で、ｅＮｏｄｅ　Ｂ（または無線ネットワーク）がそれで動作可能であり得る１つまたは複数のアップリンクキャリアを識別するように構成されてよい。ｅＮｏｄｅ　Ｂは、６０４で、１つまたは複数のインデックスを決定するように構成されてよい。１つまたは複数のインデックスはそれぞれ、１つまたは複数のアップリンクコンポーネントキャリアセット（ＵＬ　ＣＣセット）にそれぞれ対応してよい。また、ＵＬ　ＣＣセットはそれぞれ、アップリンクキャリアのうちの１つまたは複数を備えてよく、各々のＵＬ　ＣＣセットを備える１つまたは複数のアップリンクキャリアがそれぞれ、同じタイミングアドバンス（ＴＡ）で動作可能であってよい。ｅＮｏｄｅ　Ｂは、６０６で、１つまたは複数のインデックスを送信するように構成されてよい。

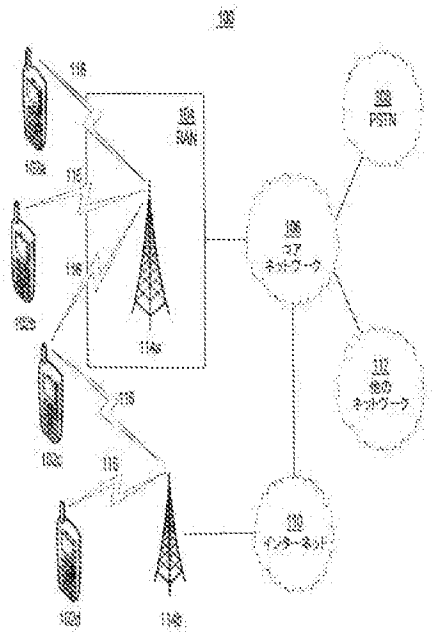
【００９７】

実施形態は、ｅＮｏｄｅ　Ｂが、６０８で、１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを備える１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を受信するように構成されてよく、６１０で、ＲＡＣＨ通信に応答してＴＡ値を送信してよいことを企図している。ＴＡ値は、１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを備える１つまたは複数のアップリンクキャリアのそれぞれに適用可能あってよい。あるいはまたはさらに、ｅＮｏｄｅ　Ｂは、６１２で、ＴＡ値とインジケータとを含んでよい信号を送信するように構成されてよい。インジケータは、たとえばグループインデックスであってよい。インジケータは、ＴＡ値が適用可能であり得る１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを示してよい。

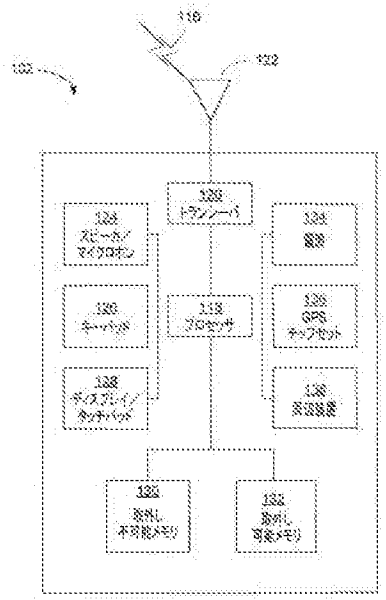
【００９８】

特徴および要素について上記に特定の組合せで述べられたが、それぞれの特徴または要素は、単独に使用されてもよいし、他の特徴および要素との任意の組合せで使用されてもよいことが当業者には理解されよう。さらに、本明細書に述べられた方法は、コンピュータまたはプロセッサによって実行するためにコンピュータ読取り可能媒体に組み込まれたコンピュータプログラム、ソフトウェアまたはファームウェアで実装されてよい。コンピュータ読取り可能媒体の例は、電子信号（有線接続または無線接続を介して送信される）およびコンピュータ読取り可能記憶媒体を含む。コンピュータ読取り可能記憶媒体の例には、それだけに限らないが、読取り専用メモリ（ＲＯＭ）、ランダムアクセスメモリ（ＲＡＭ）、レジスタ、キャッシュメモリ、半導体記憶デバイス、内部ハードディスクおよび取外し可能ディスクなどの磁気媒体、磁気光媒体、ならびにＣＤ－ＲＯＭディスクおよびＤＶＤ（ｄｉｇｉｔａｌ　ｖｅｒｓａｔｉｌｅ　ｄｉｓｋ）などの光媒体が含まれる。ＷＴＲＵ、ＵＥ、端末、基地局、ＲＮＣまたは任意のホストコンピュータで使用する無線周波数トランシーバを実装するために、ソフトウェアに関連するプロセッサが使用されてよい。

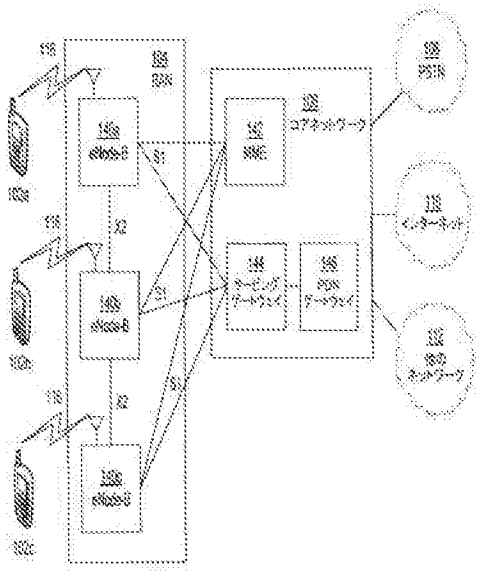
【図１Ａ】



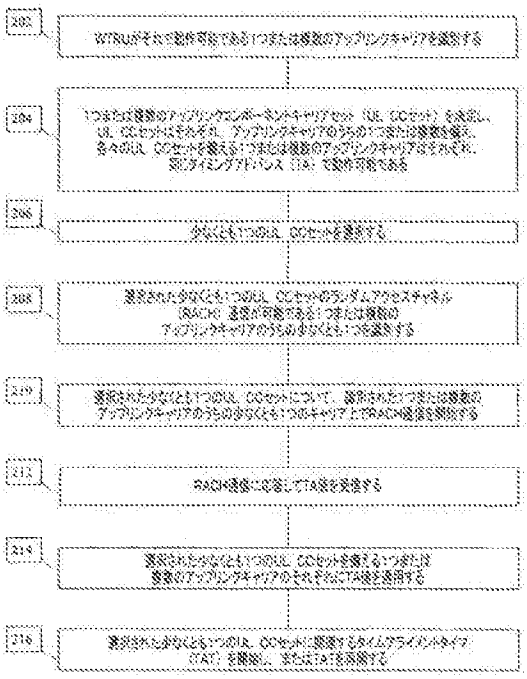
【図１Ｂ】



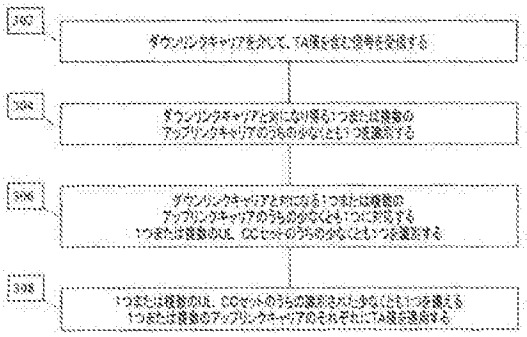
【図１Ｃ】



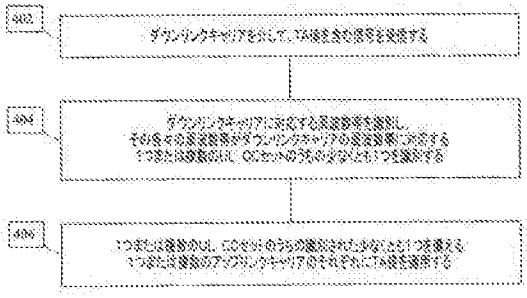
【図２】



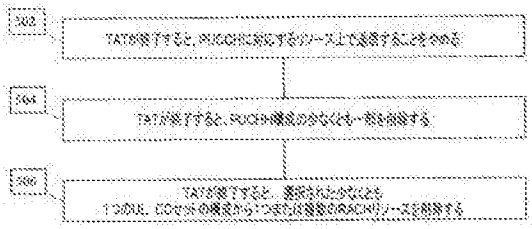

【図３】



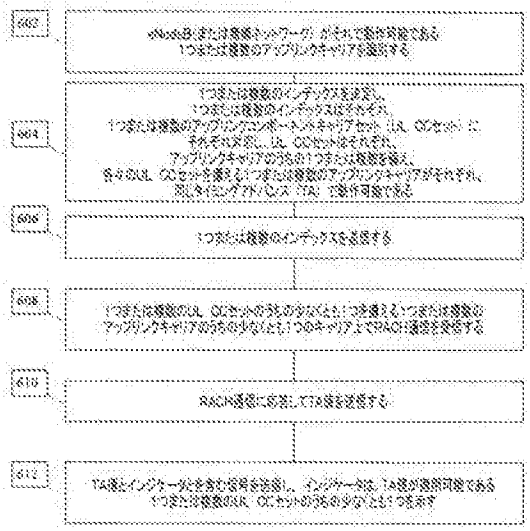

【図４】




【図５】




【図６】



【手続補正書】
【提出日】平成24年3月27日(2012.3.27)
【手続補正１】
【補正対象書類名】特許請求の範囲
【補正対象項目名】全文
【補正方法】変更
【補正の内容】
【特許請求の範囲】
【請求項１】
プロセッサを備えたワイヤレス送受信ユニット（ＷＴＲＵ）であって、
前記プロセッサは、少なくとも一部は、
前記ＷＡＴＵがそれで動作可能な１つまたは複数のアップリンクキャリアを識別し、
構成されたアップリンクコンポーネントキャリア（ＵＬ　ＣＣセット）を有する１つまたは複数のサービングセルセットを決定するように構成され、前記ＵＬ　ＣＣセットはそれぞれ、前記アップリンクキャリアのうちの１つまたは複数を備え、各々のＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアはそれぞれ、同じタイミングアドバンス（ＴＡ）でかつダウンリンク（ＤＬ）タイミング基準としてのダウンリンク（ＤＬ）キャリアで動作可能であり、前記プロセッサはさらに、
ＴＡ値を含む信号を受信し、
前記ＤＬキャリアが前記タイミング基準である前記１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別し、
前記ＤＬキャリアが前記タイミング基準である前記１つまたは複数のＵＬ　ＣＣセットのうちの前記少なくとも１つに対応する前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別するように構成されることを特徴とするＷＴＲＵ。
【請求項２】
前記プロセッサは、
少なくとも１つのＵＬ　ＣＣセットを選択し、
前記選択された少なくとも１つのＵＬ　ＣＣについて、ランダムアクセスチャネル（ＲＡＣＨ）通信が可能な前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別し、
前記選択された少なくとも１つのＵＬ　ＣＣについて、前記識別された１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を開始し、
前記ＲＡＣＨ通信に応答してＴＡ値を受信するようにさらに構成されることを特徴とする請求項１に記載のＷＴＲＵ。
【請求項３】
前記プロセッサは、前記選択された少なくとも１つのＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するようにさらに構成されることを特徴とする請求項２に記載のＷＴＲＵ。
【請求項４】
前記ＴＡ値は、前記ＲＡＣＨ通信に応答して受信されたランダムアクセス応答メッセージで受信されたタイミングアドバンスコマンドを使用して適用されることを特徴とする請求項３に記載のＷＴＲＵ。
【請求項５】
前記選択された少なくとも１つのＵＬ　ＣＣセットは、関連するタイムアライメントタイマ（ＴＡＴ）を有しており、前記プロセッサは、前記ＴＡＴを開始し、または前記ＴＡＴを再開するようにさらに構成されることを特徴とする請求項３に記載のＷＴＲＵ。
【請求項６】
前記プロセッサは、
前記１つまたは複数のＵＬ　ＣＣセットのうちの前記識別された少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するように

さらに構成され、前記ＴＡ値は、前記ＤＬタイミング基準に対するタイミング調整であることを特徴とする請求項１に記載のＷＴＲＵ。
【請求項７】
前記信号は、タイミングアドバンスコマンドメディアアクセス制御（ＭＡＣ）制御要素をさらに含むことを特徴とする請求項１に記載のＷＴＲＵ。
【請求項８】
前記１つまたは複数のＵＬ　ＣＣセットは、それぞれの周波数帯に対応し、前記プロセッサは、
前記ダウンリンクキャリアに対応する周波数帯を識別し、
その各々の周波数帯が前記ダウンリンクキャリアの前記周波数帯に対応する前記１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別し、
前記１つまたは複数のＵＬ　ＣＣセットのうちの前記識別された少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するようにさらに構成されることを特徴とする請求項１に記載のＷＴＲＵ。
【請求項９】
前記選択された少なくとも１つのＵＬ　ＣＣセットは、個別の物理アップリンク制御チャネル（ＰＵＣＣＨ）構成を有する少なくとも１つのアップリンクキャリアを含み、前記プロセッサは、前記ＴＡＴが終了すると、前記ＰＵＣＣＨに対応するリソース上で送信するのをやめるようにさらに構成されることを特徴とする請求項５に記載のＷＴＲＵ。
【請求項１０】
前記選択された少なくとも１つのＵＬ　ＣＣセットは、個別の物理アップリンク制御チャネル（ＰＵＣＣＨ）構成またはサウンディング基準信号（ＳＲＳ）構成のうちの少なくとも１つを有する少なくとも１つのアップリンクキャリアを含み、前記プロセッサは、前記ＴＡＴが終了すると、前記ＰＵＣＣＨ構成または前記ＳＲＳ構成の少なくとも一部を削除するようにさらに構成されることを特徴とする請求項５に記載のＷＴＲＵ。
【請求項１１】
前記プロセッサは、前記ＴＡＴが終了すると、前記選択された少なくとも１つのＵＬ　ＣＣセットに対応する１つまたは複数のハイブリッド自動反復要求（ＨＡＲＱ）バッファを削除するようにさらに構成されることを特徴とする請求項５に記載のＷＴＲＵ。
【請求項１２】
タイミングアドバンスを確立するための方法であって、
ワイヤレス通信網上で動作する１つまたは複数のアップリンクキャリアを識別するステップと、
構成されたアップリンクコンポーネントキャリア（ＵＬ　ＣＣセット）を有する１つまたは複数のサービングセルセットを決定するステップであって、前記ＵＬ　ＣＣセットはそれぞれ、前記アップリンクキャリアのうちの１つまたは複数を備え、各々のＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアはそれぞれ、同じタイミングアドバンス（ＴＡ）でかつダウンリンク（ＤＬ）タイミング基準としてのダウンリンク（ＤＬ）キャリアで動作可能である、ステップと、
ＴＡ値を含む信号を受信するステップと、
前記ＤＬキャリアが前記タイミング基準である前記１つまたは複数のＵＬ　ＣＣセットのうちの少なくとも１つを識別するステップと、
前記ＤＬキャリアが前記タイミング基準である前記１つまたは複数のＵＬ　ＣＣセットのうちの前記少なくとも１つに対応する前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別するステップとを備えることを特徴とする方法。
【請求項１３】
少なくとも１つのＵＬ　ＣＣセットを選択するステップと、
前記選択された少なくとも１つのＵＬ　ＣＣセットについて、ランダムアクセスチャネル（ＲＡＣＨ）通信可能な前記１つまたは複数のアップリンクキャリアのうちの少なくとも１つを識別するステップと、

前記選択された少なくとも１つのＵＬ　ＣＣセットについて、前記識別された１つまたは複数のアップリンクキャリアのうちの少なくとも１つのキャリア上でＲＡＣＨ通信を開始するステップと、

前記ＲＡＣＨ通信に応答してＴＡ値を受信するステップとをさらに備えることを特徴とする請求項１２に記載の方法。

【請求項１４】

前記選択された少なくとも１つのＵＬ　ＣＣセットを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するステップと、

タイムアライメントタイマ（ＴＡＴ）の開始または再開のうちの少なくとも１つを実行するステップであって、前記ＴＡＴは、前記選択された少なくとも１つのＵＬ　ＣＣセットに関連付けられる、ステップと

をさらに備えることを特徴とする請求項１３に記載の方法。

【請求項１５】

前記１つまたは複数の　ＵＬ　ＣＣセットのうちの前記識別された少なくとも１つを備える前記１つまたは複数のアップリンクキャリアのそれぞれに前記ＴＡ値を適用するステップ

をさらに備え、前記ＴＡ値は、前記ＤＬタイミング基準に対するタイミング調整であることを特徴とする請求項１２に記載の方法。

【国際調査報告】

## INTERNATIONAL SEARCH REPORT

International application No
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ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | HUAWEI: "Different Timing Advance Impact on Carrier Aggregation", 3GPP DRAFT; R2-095815 DIFFERENT TIMING ADVANCE IMPACT ON CARRIER AGGREGATION, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, no. Miyazaki; 20091012, 12 October 2009 (2009-10-12), XP050390299, [retrieved on 2009-10-06] Sections 2.1 and 2.2 ----- -/-- | 1-20 |

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
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| 14 June 2011 | 21/06/2011 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Chave, Julien |

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## INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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| A | CATT: "Consideration on RACH procedure and RLF", 3GPP DRAFT; R2-096506, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, no. Jeju; 20091109, 9 November 2009 (2009-11-09), XP050391093, [retrieved on 2009-11-03] Section 2.1 Random Access Procedure<br>----- | 4-7, 15-17, 19,20 |
| X,P | E-MAIL RAPPORTEUR (NTT DOCOMO ET AL: "CA support for multi-TA", 3GPP DRAFT; R2-101567, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG2, no. San Francisco, USA; 20100222, 18 February 2010 (2010-02-18), XP050421923, [retrieved on 2010-02-18] the whole document<br>----- | 1-20 |
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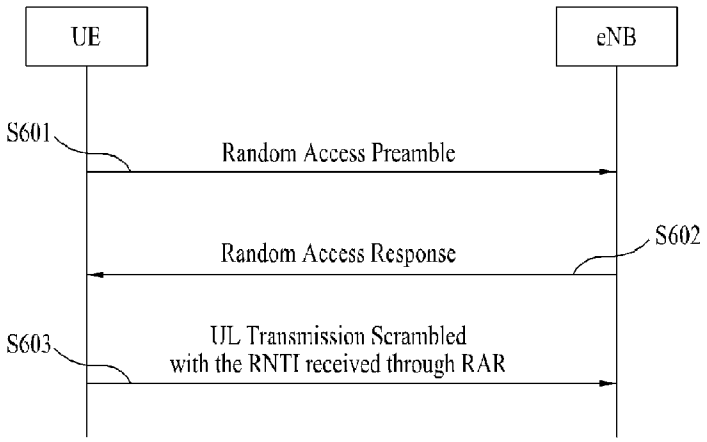
(54) Title: RANDOM ACCESS METHOD FOR IMPROVING SCRAMBLING EFFICIENCY

[Fig. 6]




(57) Abstract: A random access method for improving scrambling performance is disclosed. In particular, when a terminal performs a random access to a specific network, the present invention proposes a scheme for transmitting an uplink transmission signal corresponding to an uplink grant by scrambling the uplink transmission signal using a terminal identification information value received via a random access response message. Preferably, the terminal identification information value used for the scrambling is able to use a temporary C-RNTI received via the random access response message.

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# Description

# RANDOM ACCESS METHOD FOR IMPROVING SCRAMBLING EFFICIENCY

## Technical Field

[1] The present invention relates to a random access method for improving scrambling efficiency, and more particularly, to an apparatus for improving scrambling/descrambling performance and method thereof. Although the present invention is suitable for a wide scope of applications, it is particularly suitable for improving performance of scrambling/descrambling performed in a random access procedure within a mobile communication system.

## Background Art

[2] First of all, 3GPP LTE (3rd generation partnership project long term evolution: hereinafter called "LTE") communication system is schematically described as a mobile communication system to which the present invention is applicable.

[3] FIG. 1 is a schematic diagram of E-UMTS network structure as an example of a mobile communication system.

[4] Referring to FIG. 1, E-UMTS (evolved universal mobile telecommunications system) is the system having evolved from UMTS (universal mobile telecommunications system) and its basic standardization is ongoing by 3GPP. Generally, the E-UMTS can be called LTE system.

[5] E-UMTS network can be mainly divided into E-TRAN 101 and CN 102 (core network). The E-UTRAN (evolved-UMTS terrestrial radio access network) 101 consists of a user equipment (hereinafter abbreviated UE) 103, a base station (hereinafter named eNode B or eNB) 104, and an access gateway (hereinafter abbreviated AG) 105 located at an end point of the network to be externally connected to an external network. The AG 105 can be divided into one part responsible for user traffic processing and the other part for processing control traffic. In this case, the AG for new user traffic processing and the AG for processing control traffic can communicate with each other using a new interface.

[6] At least one cell can exist at one eNode B. Between eNode Bs, an interface for user or control traffic transmission is usable. And, the CN 102 can consist of a node for user registrations of the AG 105 and other UE 103. Moreover, an interface for discriminating the E-UTRAN 101 and the CN 102 is available.

[7] Layers of a radio interface protocol between a user equipment and a network can be divided into L1 (first layer), L2 (second layer) and L3 (third layer) based on three lower layers of the open system interconnection (OSI) reference model widely known

in the field of communication systems. A physical layer belonging to the first layer provides an information transfer service using a physical channel. A radio resource control (hereinafter abbreviated RRC) located on the third layer plays a role in controlling radio resources between the user equipment and the network. For this, the RRC layers exchange RRC messages between the user equipment and the network. The RRC layers can be distributed to network nodes including the eNode B 104, the AG 105 and the like. Moreover, the RRC layer can be provided to the eNode B 104 or the AG 105 only.

[8] FIG. 2 and FIG. 3 are diagrams for structures of a radio interface protocol between a user equipment and UTRAN based on the 3GPP radio access network specifications.

[9] Referring to FIG. 2 and FIG. 3, a radio interface protocol horizontally consists of a physical layer, a data link layer and a network layer. And, the radio interface protocol vertically consists of a user plane for data information transfer and a control plane for control signal delivery (signaling). In particular, FIG. 2 shows the respective layers of the radio protocol control plane and FIG. 3 shows the respective layers of the radio protocol user plane. The radio protocol layers shown in FIG. 2 and FIG. 3 can be divided into L1 (first layer), L2 (second layer) and L3 (third layer) based on three lower layers of the open system interconnection (OSI) reference model widely known in the field of communication systems.

[10] The respective layers of the radio protocol control plane shown in FIG. 2 and the respective layers of the radio protocol user plane shown in FIG. 3 are explained as follows.

[11] First of all, a physical (PHY) layer of a first layer provides an upper layer with an information transfer service using a physical channel. The physical (PHY) layer is connected to a medium access control (MAC) layer on an upper layer via a transport channel. And, data is transported between the medium access control (MAC) layer and the physical (PHY) layer via the transport channel. In this case, the transport channel can be classified into a dedicated transport channel or a common transport channel according to whether a channel is shared or not. Moreover, data are transported via the physical channel between different physical layers, i.e., between a physical layer of a transmitting side and a physical layer of a receiving side.

[12] Various layers exist in the second layer. First of all, a medium access control (hereinafter abbreviated "MAC") layer plays a role in mapping various logical channels to various transport channels. And, the MAC layer also plays a role as logical channel multiplexing in mapping several logical channels to one transport channel. The MAC layer is connected to a radio link control (RLC) layer of an upper layer via a logical channel. And, the logical channel can be mainly categorized into a control channel for transferring information of a control plane and a traffic channel for

transferring information of a user plane according to a type of the transferred information.

[13] A radio link control (hereinafter abbreviated RLC) of the second layer performs segmentation and concatenation on data received from an upper layer to play a role in adjusting a size of the data to be suitable for a lower layer to transfer the data to a radio section. And, the RLC layer provides three kinds of RLC modes including a transparent mode (hereinafter abbreviated TM), an unacknowledged mode (hereinafter abbreviated UM) and an acknowledged mode (hereinafter abbreviated AM) to secure various kinds of QoS demanded by each radio bearer (hereinafter abbreviated RB). In particular, the AM RLC performs a retransmission function through automatic repeat and request (ARQ) for the reliable data transfer.

[14] A packet data convergence protocol (hereinafter abbreviated PDCP) layer of the second layer performs a header compression function for reducing a size of an IP packet header containing relatively large and unnecessary control information to efficiently transmit such an IP packet as IPv4 and IPv6 in a radio section having a small bandwidth. This enables a header part of data to carry mandatory information only to play a role in increasing transmission efficiency of the radio section. Moreover, in the LTE system, the PDCP layer performs a security function as well. This consists of ciphering for preventing data interception conducted by a third party and integrity protection for preventing data manipulation conducted by a third party.

[15] A radio resource control (hereinafter abbreviated RRC) layer located at a most upper part of a third layer is defined in the control plane only and is responsible for controlling a logical channel, a transport channel and physical channels in association with configuration, reconfiguration and release of radio bearers (hereinafter abbreviated RBs). In this case, the RB means a logical path provided by the first and second layers of the radio protocol for the data delivery between the user equipment and the UTRAN. Generally, configuring an RB means to stipulate characteristics of radio protocol layers and channels required for providing a specific service and also means to configure detailed parameters and operational methods thereof. The RB can be classified into a signaling RB (SRB) or a data RB DRB). The SRB is used as a path for sending an RRC message in a control plane (C-plane) and the DRB is used as a path for transferring user data in a user plane (U-plane).

[16] As a downlink transport channel for transporting data to a user equipment from a network, there is a broadcast channel (BCH) for transmitting system information and a downlink shared channel (SCH) for transmitting a user traffic or a control message. Downlink multicast, traffic of a broadcast service or a control message can be transmitted on downlink SCH or a separate downlink MCH (multicast channel). Meanwhile, as an uplink transport channel for transmitting data to a network from a

user equipment, there is a random access channel (RACH) for transmitting an initial control message or an uplink shared channel (SCH) for transmitting user traffic or a control message.

[17] As a downlink physical channel for transmitting information transferred on a downlink transport channel to a radio section between a network and a user equipment, there is a physical broadcast channel for transferring information of BCH, a physical multicast channel (PMCH) for transmitting information of MCH, a physical downlink shared channel for transmitting information of PCH and downlink SCH or a physical downlink control (or called DL L1/L2 control channel) for transmitting control information provided by first and second layers.

[18] As an uplink physical channel for transmitting information forwarded on an uplink transport channel to a radio section between a network and a user equipment, there is a physical uplink shared channel (PUSCH) for transmitting information of uplink SCH, a physical random access channel (PRACH) for transmitting RACH information or a physical uplink control channel (PUCCH) for transmitting such control information, which is provided by first and second layers, as HARQ ACK, HARQ NACK, scheduling request (SR), channel quality indicator (CQI) report and the like.

[19] Based on the above description, a random access procedure provided by the LTE system is schematically explained as follows.

[20] First of all, a user equipment performs a random access procedure if one of following cases takes place.

[21] User equipment performs an initial access without an RRC connection with a base station.

[22] User equipment initially accesses a target cell in a handover process.

[23] - Random access process is requested according to a command given by a base station.

[24] Data to be transmitted in uplink is generated when time synchronization of uplink is not matched or a radio resource allocated for requesting a radio resource is not allocated.

[25] Reconstruction process is performed in case of radio link failure or handover failure.

[26] In selecting a random access preamble, the LTE system provides both a contention based random access procedure and a non-contention based random access procedure. In the contention based random access procedure, a user equipment randomly selects one preamble from a specific sequence group and then uses the randomly selected preamble at transmitting the random access preamble. In the non-contention based random access procedure, only a random access preamble assigned to a specific user equipment by a base station is used. Yet, the non-contention based random access procedure is available only in the above-described handover procedure or if it is

requested by the command given by the base station.

[27] Meanwhile, a process for a user equipment to perform a random access to a specific base station can mainly include the steps of: (1) transmitting a random access preamble to a base station from a user equipment (hereinafter named a "message 1 transmitting step" if not confused); (2) receiving a random access response from the base station in correspondence to the transmitted random access preamble (hereinafter named a "Message 2 receiving step" if not confused); (3) transmitting an uplink message using information contained in the received random access response message (hereinafter named a "Message 3 transmitting step" if not confused); and (4) receiving a downlink message corresponding to the uplink message from the base station (hereinafter named a "message 4 receiving step" if not confused). In this process, the user equipment facilitates identification of the uplink transmission from another uplink transmission of a different user equipment through scrambling using prescribed identification information attributed to the message 3 transmission.

[28] General scrambling of the LTE system is schematically explained in association with the above description as follows.

[29] First of all, in a mobile communication system, a transmitting side performs a scrambling operation in order to identify a user and a base station and to randomize data to transmit. This scrambling is performed in a manner of performing an operation on a sequence generated by pseudo-random method using Modulo 2 addition of transmission data. By this scrambling, transmission data has more random characteristics so that a transmission signal can have a balanced transmission power characteristic. And, a pseudo-random sequence is differently generated according to a user or a base station so that the user or the base station can be identified.

[30] And, it is able to generate the pseudo-random sequence using an identifier (RNTI) related to the corresponding data transmission. For instance, if a user equipment receives an uplink resource allocation (UL grant) via PDCCH (physical downlink control channel) on which a cell identifier (C-RNTI) of itself is marked, the user equipment transmits data in uplink through the resource allocated by the UL grant. In this case, a pseudo-random sequence is generated from the data using the C-RNTI of the user equipment and the scrambling is then performed by operating the sequence and the data together.

[31] However, relating to the above-described random access procedure, it is necessary to further discuss in detail what kind of identification information is used to perform the scrambling in each process and how to set the corresponding random access procedures and processing modules.

## Disclosure of Invention

## Technical Problem

[32] Accordingly, the present invention is directed to a random access method for improving scrambling efficiency that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[33] An object of the present invention is to provide an apparatus for improving scrambling/descrambling performance and method thereof, in which scrambling/descrambling is performed in a random access procedure within a mobile communication system.

[34] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

## Technical Solution

[35] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a method of performing a random access to a specific network by a terminal comprises transmitting a random access preamble message including a prescribed preamble, receiving terminal identification information and uplink (UL) grant information via a random access response message corresponding to the random access preamble message, scrambling an uplink transmission signal using the terminal identification information value received via the random access response message, and transmitting the scrambled uplink transmission signal to correspond to the uplink grant information.

[36] Preferably, the random access to the specific network corresponds to a contention based random access and the method further includes setting the terminal identification information value received via the random access response message before the scrambled uplink transmission signal is transmitted.

[37] More preferably, scrambling the uplink transmission signal includes delivering the received uplink grant information to a physical layer of the terminal from a MAC (medium access control) layer of the terminal, generating a scrambling sequence using the terminal identification information value at the physical layer of the terminal, and scrambling the uplink transmission signal using the generated scrambling sequence.

[38] Preferably, the method further includes retransmitting the uplink transmission signal after scrambling the uplink transmission signal using the terminal identification information value received via the random access response message.

[39] Preferably, the scrambled uplink transmission signal is transmitted via a physical

uplink sharing channel (PUSCH).

[40] Preferably, the terminal identification information received via the random access response message includes a temporary cell RNTI (temporary cell radio network temporary identifier).

[41] In another aspect of the present invention, a terminal, which performs a random access to a specific network, includes a transmitting module transmitting a random access preamble message and an uplink transmission signal corresponding to uplink (UL) grant information, a receiving module receiving a random access response message corresponding to the random access preamble message, and a scrambling module scrambling the uplink transmission signal using a terminal identification information value, wherein the transmitting module, the receiving module and the scrambling module is a physical layer module, and wherein the scrambling module scrambles the uplink transmission signal using a specific terminal identification information value received by the receiving module via the random access response message.

[42] Preferably, the receiving module additionally receives specific uplink grant information via the random access response message and the transmitting module transmits the uplink transmission signal scrambled by the scrambling module based on the specific uplink grant information.

[43] More preferably, the terminal further includes a MAC layer module, and the receiving module delivers the received random access response message to the MAC layer module.

[44] In this case, if the random access corresponds to a contention based random access, the MAC layer module sets the specific terminal identification information received via the random access response message before the transmitting module transmits the uplink transmission signal based on the specific uplink grant information.

[45] Moreover, the MAC layer module delivers the specific uplink grant information in the random access response message to the transmitting module, the scrambling module generates a scrambling sequence using the specific terminal identification information value set by the MAC layer module, and the scrambling module scrambles the uplink transmission signal using the generated scrambling sequence.

[46] Preferably, the transmitting module transmits the uplink transmission signal via a physical uplink sharing channel (PUSCH).

[47] Preferably, the specific terminal identification information received via the random access response message includes a temporary cell RNTI (temporary cell radio network temporary identifier).

[48] In a further aspect of the present invention, a method of controlling a random access of the terminal includes the steps of receiving a random access preamble message from

the terminal, transmitting terminal identification information and uplink (UL) grant information via a random access response message corresponding to the random access preamble message, receiving an uplink transmission message from the terminal to correspond to the uplink grant information, and descrambling the uplink transmission message using the terminal identification information transmitted via the random access response message.

[49] Preferably, the terminal identification information transmitted via the random access response message includes a temporary cell RNTI (temporary cell radio network temporary identifier).

[50] Accordingly, the present invention provides the following effects and/or advantages.

[51] First of all, a base station is able to normally perform a descrambling operation on a third message scrambled with an identifier of a user equipment. In particular, the base station is able to perform descrambling of the third message using a temporary C-RNTI transmitted via a second message transmission.

[52] Secondly, a user equipment failing to have a cell identifier allocated thereto is able to perform scrambling with its identifier. Therefore, randomization performance is raised and interference is minimized.

[53] Thirdly, in case that a temporary C-RNTI is used, a range of a pseudo-random sequence, which can be generated by a user equipment at a transmission timing point of a third message, is considerably extended. Therefore, randomization performance is raised and interference with an adjacent cell is minimized as well as interference within a cell of the user equipment.

[54] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

## Advantageous Effects

[55] According to the present embodiment, in the retransmission of the third message, the terminal performs the scrambling using the pseudo-random sequence generated using the temporary C-RNTI contained in the random access response information.

[56] As mentioned in the above descriptions of the embodiments of the present invention, scrambling of the third message is performed in a random access procedure using an identifier contained in a random access response message, e.g., a pseudo-random sequence generated using C-RNTI. Therefore, the base station is able to normally descramble the third message having been scrambled with the identifier of the terminal. In particular, the base station is able to descramble the third message using the temporary C-RNTI transmitted in the second message transmission.

[57] Meanwhile, according to the present embodiment, a terminal failing to have a cell

identifier assigned thereto is able to perform scrambling with its cell identifier. Therefore, randomization performance is raised and interference is minimized.

[58] Moreover, in case of using a temporary C-RNTI, since a range of a pseudo-random sequence, which can be generated by a terminal at a transmission timing point of a third message, is considerably extended, randomization performance is raised. And, interference with an adjacent cell can be minimized as well as interference within a cell of the terminal.

[59] Accordingly, the random access technology and the terminal structure for the same are described with reference to the example applied to the 3GPP LTE system and are also applicable to various mobile communication systems having the similar random access procedures.

## Brief Description of Drawings

[60] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[61] FIG. 1 is a schematic diagram of E-UMTS network structure as an example of a mobile communication system;

[62] FIG. 2 and FIG. 3 are diagrams for structures of a radio interface protocol between a user equipment and UTRAN based on the 3GPP radio access network specifications;

[63] FIG. 4 is a diagram for an operation process between a user equipment and a base station in a non-contention based random access procedure;

[64] FIG. 5 is a diagram for an operation process between a user equipment and a base station in a contention based random access procedure;

[65] FIG. 6 is a diagram for a method of performing a contention based random access between a user equipment and a base station according to one embodiment of the present invention;

[66] FIG. 7 is a diagram for a format of a random access response message received via a second message;

[67] FIG. 8 is a schematic block diagram of a user equipment for performing a random access according to one embodiment of the present invention; and

[68] FIG. 9 is a diagram for explaining a process that a user equipment performs a random access to a specific base station according to one embodiment of the present invention.

## Mode for the Invention

[69] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to

the same or like parts. In the following detailed description of the invention includes details to help the full understanding of the present invention. Yet, it is apparent to those skilled in the art that the present invention can be implemented without these details. For instance, although the following detailed description is made in detail on the assumption that a mobile communication system is the 3GPP LTE system, it is applicable to other prescribed mobile communication systems by excluding unique items of the 3GPP LTE.

[70] Occasionally, the structures and devices known to the public are omitted to avoid conceptional vagueness of the present invention or can be illustrated as block diagrams centering on their core functions.

[71] In the following description, assume that a terminal is a generic term of such a mobile or fixed user-end device as a user equipment (UE), a mobile station (MS) and the like. And, assume that a base station is a generic name of any node of a network end, which communicates with a terminal, such as a Node B, an eNnode B and the like.

[72] Relating to what kind of identification is used to perform scrambling in each process in association with a random access procedure and how to set up corresponding procedures and processing modules, the random access procedure, to which the present invention will be applied, is explained in detail as follows.

[73] FIG. 4 shows an operation process between a terminal and a base station in a non-contention based random access procedure.

[74] (1) Random Access Preamble Assignment

[75] As mentioned in the foregoing description, a non-contention based random access procedure can be performed in case of: (i) a handover process; and (ii) a request by a command given by a base station. Of course, in both of the above two cases, it is able to perform a contention based random access procedure.

[76] First of all, for a non-contention based random access procedure, it is important to receive a specified random access preamble, which is free from collision, from a base station. As a method of specifying the random access preamble, there is a method via a handover command or a method via a PDCCH command. Through this, a random access preamble is assigned to a terminal [S401].

[77] (2) First Message (Message-1) Transmission

[78] As mentioned in the above description, after the random access preamble specified to the terminal only has been assigned to the terminal, the terminal then transmits the preamble to a base station [S402].

[79] (3) Second Message (Message-2) Reception

[80] After the terminal has transmitted the random access preamble in the step S402, it attempts a reception of its random access response within a random access response

reception window instructed via system information or handover command of the base station [S403]. In particular, the random access response information can be transmitted in a format of MAC PDU (MAC packet data unit). In this case, the MAC PDU can be delivered via PDSCH (physical downlink shared channel).

[81] Preferably, in order to appropriately receive the information carried on the PDSCH, the terminal monitors PDCCH (physical downlink control channel). In particular, it is preferable that information of the terminal for receiving the PDSCH, a frequency of a radio resource of the PDSCH, time information, a transmission format of the PDSCH and the like are contained in the PDCCH.

[82] Once the terminal succeeds in the reception of the PDCCH transmitted to itself, it can appropriately receive a random access response carried on the PDSCH according to informations of the PDCCH. And, the random access response can include a random access preamble identifier (ID), an uplink grant (UL grant) indicating an uplink radio resource, a temporary cell identifier (temporary C-RNTI) and a time synchronization correction value (timing advance command: TAC).

[83] As mentioned in the above description, a random access preamble identifier is necessary for a random access response. Since random access response information for at least one terminals can be included in one random access response, it is necessary to indicate the uplink grant (UL grant), the temporary C-RNTI and TAC are valid for a prescribed terminal. In this step, it is assumed that the terminal selects a random access preamble identifier matching the former random access preamble selected by the terminal in the step S402.

[84] In the non-contention based random access procedure, it is determined the random access has been successfully performed if random access response information is received. It is then able to end the random access procedure.

[85] FIG. 5 is a diagram for an operation process between a terminal and a base station in a contention based random access procedure.

[86] (1) First Message Transmission

[87] First of all, a terminal randomly selects one random access preamble from a set of random access preambles indicated by system information or a handover command. The terminal selects a PRACH (physical RACH) resource capable of carrying the random access preamble and is then able to transmit the corresponding random access preamble [S501].

[88] (2) Second Message Reception

[89] A method of receiving random access response is similar to the aforesaid non-contention based random access procedure. In particular, after the terminal has transmitted the random access preamble, as shown in the step S501, the terminal attempts a reception of its random access response on PDCCH within a random access

response receiving window instructed by the system information or the handover command of a base station. The terminal then receives PDSCH via corresponding RA-RNTI information [S502]. Through the received PDSCH, the terminal is able to receive uplink grant (UL grant), temporary cell identifier (temporary C-RNTI), time synchronization correction value (timing advance command: TAC) and the like.

[90] (3) Third Message Transmission

[91] If the terminal receives a random access response valid to itself, the terminal processes informations contained in the random access response. In particular, the terminal applies the TAC and stores the temporary C-RNTI. The terminal also transmits data (i.e., a third message) to the base station using the UL grant [S503]. In this case, it is preferable that the third message contains an identifier of the terminal since a base station is unable to determine which terminal performs the random access procedure in the contention based random access procedure when the third message does not contains the identifier of the terminal. Thus it is preferable to identify a terminals for a future contention resolution.

[92] Two kinds of methods have been discussed as a method of having a terminal identifier included. In a first method, if a terminal has a valid cell identifier assigned in a corresponding cell prior to the random access procedure, the terminal transmits its cell identifier via an uplink transmission signal corresponding to the UL grant. If the valid cell identifier is not assigned prior to the random access procedure, the terminal transmits its unique identifier (e.g., S-TMSI, a random ID, etc.). The unique identifier is generally longer than the cell identifier. If the terminal transmits data corresponding to the UL grant, the terminal initiates a timer for collision solution (contention resolution timer).

[93] (4) Fourth Message Reception

[94] After the terminal has transmitted the data containing its identifier using the UL grant contained in the random access response, the terminal waits for an instruction of the base station for the contention resolution. In particular, the terminal attempts a reception of PDCCH to receive a specific message [S504].

[95] Two kinds of methods have been discussed as a method of receiving the PDCCH. As mentioned in the foregoing description, if the third message transmitted based on the UL grant is transmitted using it the cell identifier, the terminal attempts the reception of the PDCCH using its cell identifier. If the identifier is a unique identifier, the terminal is able to attempt the reception of the PDCCH using the temporary C-RNTI contained in the random access response.

[96] Thereafter, in the former case, if the terminal received the PDCCH through its cell identifier before the contention resolution timer expires, the terminal determines that the random access procedure is successfully performed. The terminal then ends the

random access procedure. In the latter case, if the terminal received the PDCCH via the temporary C-RNTI before the contention resolution timer expires, the terminal checks the data carried on the PDSCH instructed by the PDCCH. If the unique identifier of the terminal is included in the content of the data, the terminal determines that the random access procedure is successfully performed. The terminal then ends the random access procedure.

[97] Meanwhile, as mentioned in the foregoing description, in the random access procedure, and more particularly, in the contention based random access procedure, if the identifier of the terminal is included in the third message and the scrambling for the third message transmission is set to use the terminal identifier, the following problem may be caused. Namely, the base station is able to confirm the identifier of the terminal only if the base station normally receives the third message and succeeds in decoding of the third message. Yet, since a timing point for the base station to perform a descrambling operation after receiving the third message is a timing point for checking the identifier of the terminal, the base station is unable to know the identifier of the terminal in performing the descrambling operation. In particular, the base station should obtain the terminal identifier through the descrambling of the third message. If the terminal identifier is required for the descrambling of the third message, the base station is difficult to obtain the terminal identifier.

[98] At the third message transmission timing point, the terminal may or may not have the cell identifier, which was assigned by the base station, of the terminal. In case that the terminal fails to have the cell identifier assigned by the base station, the terminal is unable to scramble the third message with the identifier of the terminal. Therefore, interference between a corresponding cell and an adjacent cell may be raised.

[99] In a random access procedure according to one preferred embodiment of the present invention, in case that a terminal transmits data using a UL grant included in a random access response, an identifier used for the data scrambling is set to use identification information shared between the terminal and a base station. Preferably, a scrambling sequence is generated using a temporary C-RNTI carried by a second message. A third message is then transmitted using the scrambling sequence generated based on the temporary C-RNTI. Thus, the above-mentioned problem can be solved. This scheme is applicable to perform scrambling in transmitting an uplink transmission signal that follows the reception of the second message in a non-contention based random access procedure. Yet, in the following description, an example is explained centering on a contention based random access procedure for transmitting a third message in correspondence to a UL grant carried by a second message.

[100] FIG. 6 is a diagram for a method of performing a contention based random access between a terminal and a base station according to one embodiment of the present

invention.

[101] (1) First Message Transmission

[102] As a random access procedure is requested, a terminal randomly selects a random access preamble by a MAC layer and is then able to transmit the selected random access preamble to a base station [S601].

[103] (2) Second Message Reception

[104] The terminal receives a random access response including a random access preamble identifier corresponding to the random access preamble transmitted by itself [S602]. The random access response can include a random access preamble identifier (RA-RNTI), a UL grant, a temporary C-RNTI and TAC. Detailed structure of the random access response is shown in FIG. 7.

[105] FIG. 7 is a diagram for a format of a random access response message received via a second message.

[106] Referring to FIG. 7, "R" indicates a reserved bit and is assumed as set to 0. An uplink grant indicates an uplink resource that will be used for uplink transmission. A TAC field is used to control a size of timing adaptation a terminal should apply. And, a temporary C-RNTI indicates a temporary identifier a terminal uses for a random access procedure. In this case, the temporary C-RNTI has a 16-bit length.

[107] Meanwhile, a MAC layer of a terminal stores a temporary C-RNTI received via a random access response. And, the MAC layer of the terminal controls the physical layer to generate a pseudo-random sequence using the set temporary C-RNTI and scramble data using the generated peudo-random sequence at transmitting the message.

[108] Preferably, the terminal receives a random access response shown in FIG. 7, sets a temporary C-RNTI contained in the response no later than a third message transmission, and then directly informs a physical layer of the setting. In the present embodiment, since it is assumed that a temporary C-RNTI received via the second message is used in the transmission of the third message, if a timing point of enabling a MAC layer to set a temporary C-RNTI is behind a third message transmission timing point, it is difficult for the physical layer to apply scrambling to the third message transmission.

[109] (3) Third Message Transmission

[110] The terminal transmits a third message to the base station using the UL grant contained in the random access response [S603]. Preferably, a C-RNTI (or, a C-RNTU MAC control element) of the terminal or an uplink CCCH SDU is contained in the third message. And, it is assumed that the third message is transmitted via PUSCH. Moreover, the present embodiment proposes to perform scrambling using a pseudo-random sequence which is generated using terminal identification information secured to be shared between the base station and the terminal at a third message transmission

timing point, and preferably, using a temporary C-RNTI received via the random access response having the structure shown in FIG. 7.

[111] The identification information, which is secured to be shared between the base station and the terminal at the third message transmission timing point, can consider to use RA-RNTI or C-RNTI=0 as well as the temporary C-RNTI. Yet, the RA-RNTI is an identifier assigned to identify what kind of a time-frequency resource is used for the terminal to transmit a random access preamble. Since the number of available identifiers is smaller than that of the temporary RNTIs, it is difficult to identify a sufficient number of terminals in case of the RA-RNTI.

[112] Besides, performing the scrambling using the C-RNTI=0 has the same meaning of not applying the scrambling , which causes a problem that a randomization gain is not obtained from the scrambling.

[113] Thus, according to the present embodiment, the scrambling is performed using the temporary C-RNTI received via the second message and its details are explained as follows.

[114] First of all, a physical layer of a terminal generates a pseudo-random sequence as a scrambling sequence in a manner of setting a temporary C-RNTI set by a MAC layer to an initial value of the pseudo-random sequence. In case of the LTE system, a pseudo-random sequence is defined using the following gold sequence having a length of 31.

[115] MathFigure 1

[Math.1]

$$c(n) = \left(x_1(n+N_C) + x_2(n+N_C)\right) \bmod 2$$

$$x_1(n+31) = \left(x_1(n+3) + x_1(n)\right) \bmod 2$$

$$x_2(n+31) = \left(x_2(n+3) + x_2(n+2) + x_2(n+1) + x_2(n)\right) \bmod 2$$

[116] In Formula 1, an outputted pseudo-random sequence c(n) is provided by a first m-sequence $x_1(n)$ and a second m-sequence $x_2(n)$ [where n = 0, 1, 2, ..., $M_{PN}$-1]. And, it is $N_c$=1600. $M_{PN}$ indicates a sequence length. The first m-sequence is initialized into $x_1(0)$ =1 and $x_1(n)$=0, where n = 1, 2, ..., 30. And, the second 2m-seqeunce is initialized by

$$c_{init} = \sum_{i=0}^{30} x_2(i) \cdot 2^i$$

. In this case, a value of

$$c_{init}$$

is determined according to a usage of a sequence to use. And, the present embodiment proposes to use the following initial value in order to perform a third

message transmission via PSUCH.

[117] MathFigure 2

[Math.2]

$$c_{\text{init}} = n_{\text{RNTI}} \cdot 2^{14} + \lfloor n_s/2 \rfloor \cdot 2^9 + N_{\text{ID}}^{\text{cell}}$$

[118] In Formula 2,

$n_s$

indicates a slot number within a radio frame,

$N_{\text{ID}}^{\text{cell}}$

indicates a physical layer cell identifier, and

$n_{\text{RNTI}}$

indicates an RNTI value for a corresponding PUSCH transmission. Moreover,

$\lfloor n_s/2 \rfloor$

means a maximum integer which does not exceed

$n_s/2$

. Hence, in case of applying the present embodiment to the LTE system, the present embodiment proposes the following steps. First of all, an initial value

$c_{\text{init}}$

for a PUSCH transmission is generated by setting a temporary C-RNTI value to

$n_{\text{RNTI}}$

, a pseudo-random sequence is generated using the generated initial value for initialization of the second m-seqeunce, and this sequence is then used for the scrambling performed for a third message transmission.

[119] In the following description, a structure of a terminal performing the above-described embodiment is explained.

[120] FIG. 8 is a schematic block diagram of a terminal for performing a random access according to one embodiment of the present invention.

[121] Referring to FIG. 8, a terminal according to the present embodiment includes a physical layer module 801 and a MAC layer module 802. And, the physical layer module 801 is able to include a transmitting module 803, a receiving module 804, a scrambling module 805 and the like.

[122] Based on the above structure, operations according to the present embodiment are explained as follows.

[123] First of all, in case of a contention based random access procedure, a random access preamble selected by the MAC layer module 802 is delivered to the transmitting module 803. The transmitting module 803 is then able to transmit the random access preamble to a base station by having the random access preamble contained in the first message.

[124] Subsequently, the terminal monitors whether a signal indicating an RA-RNTI corresponding to a previously transmitted random access preamble is transmitted via PDCCH within a window having a prescribed size. If the signal indicating the RA-RNTI corresponding to the previously transmitted random access preamble is transmitted via the PDCCH within the corresponding window, a physical layer of the terminal, and more particularly, the receiving module 804 is able to deliver a transport block (TB), which includes a random access response (RAR), to a MAC layer.

[125] In this case, TAC information, UL grant information and temporary C-RNTI information, as shown in FIG. 7, are contained in the delivered MAC random access response message (MAC RAR).

[126] The MAC layer 802 of the terminal having obtained the above informations delivers the UL-grant information in the received RAR message to the physical layer 801.

[127] The MAC layer 802 of the present embodiment sets up a temporary C-RNTI value obtained through the RAR received prior to a transmission of the third message via the transmitting module 803 of the physical layer 801 and then delivers the setup value to the scrambling module 805 of the physical layer 801.

[128] The scrambling module 805 having received the temporary C-RNTI value from the MAC layer 802 generates a scrambling sequence using the temporary C-RNTI value as an initial value of the pseudo-random sequence and then scrambles an uplink transmission signal corresponding to a UL grant using the generated scrambling sequence. In case of the LTE system, the scrambling module 805 performs a process of adding up the uplink transmission signal corresponding to the UL grant and the generated scrambling sequence together using a Modulo-2 adder (not shown in the drawing).

[129] The transmission signal scrambled by the scrambling module 805 is delivered to the transmitting module 803. The transmitting module 803 is then able to transmit the scrambled uplink transmission signal through time-frequency resource region.

[130] Meanwhile, performing the scrambling using the identification information received via the second message in the above description is applicable to a retransmission of a third message as well as to an initial transmission of the third message.

[131] FIG. 9 is a diagram for explaining a process that a terminal performs a random access

to a specific base station according to one embodiment of the present invention.

[132] Referring to FIG. 9, a first message transmission S901, a second message reception S902 and a third message transmission S903 are identical to the former first message transmission S601, the former second message reception S602 and the former third message transmission S603 of FIG. 6, respectively.

[133] As mentioned in the foregoing description, after transmitting the third message scrambled using the temporary C-RNTI received via the second message, the terminal may not receive feedback information indicating a success of the third message reception from the base station. In particular, the terminal may receive NACK from the base station [S904]. If so, the terminal is able to perform a retransmission of the third message.

[134] According to the present embodiment, in the retransmission of the third message, the terminal performs the scrambling using the pseudo-random sequence generated using the temporary C-RNTI contained in the random access response information.

[135] As mentioned in the above descriptions of the embodiments of the present invention, scrambling of the third message is performed in a random access procedure using an identifier contained in a random access response message, e.g., a pseudo-random sequence generated using C-RNTI. Therefore, the base station is able to normally descramble the third message having been scrambled with the identifier of the terminal. In particular, the base station is able to descramble the third message using the temporary C-RNTI transmitted in the second message transmission.

[136] Meanwhile, according to the present embodiment, a terminal failing to have a cell identifier assigned thereto is able to perform scrambling with its cell identifier. Therefore, randomization performance is raised and interference is minimized.

[137] Moreover, in case of using a temporary C-RNTI, since a range of a pseudo-random sequence, which can be generated by a terminal at a transmission timing point of a third message, is considerably extended, randomization performance is raised. And, interference with an adjacent cell can be minimized as well as interference within a cell of the terminal.

## Industrial Applicability

[138] Accordingly, the random access technology and the terminal structure for the same are described with reference to the example applied to the 3GPP LTE system and are also applicable to various mobile communication systems having the similar random access procedures.

[139] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and

variations of this invention provided they come within the scope of the appended claims and their equivalents.

# Claims

[1] A method of performing a random access to a specific network by a terminal, the method comprising:
transmitting a random access preamble message including a prescribed preamble;
receiving terminal identification information and uplink (UL) grant information via a random access response message corresponding to the random access preamble message;
scrambling an uplink transmission signal using the terminal identification information received via the random access response message; and
transmitting the scrambled uplink transmission signal based on the uplink grant information.

[2] The method of claim 1, wherein the random access to the specific network is a contention based random access, and
wherein the method further comprises:
setting the terminal identification information received via the random access response message before the scrambled uplink transmission signal is transmitted.

[3] The method of claim 2, wherein scrambling the uplink transmission signal comprises:
delivering the received uplink grant information to a physical layer of the terminal from a MAC (medium access control) layer of the terminal;
generating a scrambling sequence using the terminal identification information at the physical layer of the terminal; and
scrambling the uplink transmission signal using the generated scrambling sequence.

[4] The method of claim 1, further comprising:
retransmitting the uplink transmission signal after scrambling the uplink transmission signal using the terminal identification information received via the random access response message.

[5] The method of claim 1, wherein the scrambled uplink transmission signal is transmitted via a physical uplink sharing channel (PUSCH).

[6] The method of claim 1, wherein the terminal identification information received via the random access response message comprises a temporary cell RNTI (temporary cell radio network temporary identifier).

[7] A terminal to perform a random access to a specific network, the terminal comprising:
a transmitting module transmitting a random access preamble message and an uplink transmission signal corresponding to uplink (UL) grant information;

a receiving module receiving a random access response message corresponding to the random access preamble message; and

a scrambling module scrambling the uplink transmission signal using a terminal identification information value,

wherein the transmitting module, the receiving module and the scrambling module is a physical layer module, and

wherein the scrambling module scrambles the uplink transmission signal using a specific terminal identification information value received by the receiving module via the random access response message.

[8] The terminal of claim 7, wherein the receiving module additionally receives specific uplink grant information via the random access response message, and wherein the transmitting module transmits the uplink transmission signal scrambled by the scrambling module based on the specific uplink grant information.

[9] The terminal of claim 8, further comprising a MAC layer module,

wherein the receiving module delivers the received random access response message to the MAC layer module.

[10] The terminal of claim 9, wherein if the random access corresponds to a contention based random access, the MAC layer module sets the specific terminal identification information received via the random access response message before the transmitting module transmits the uplink transmission signal based on the specific uplink grant information.

[11] The terminal of claim 10, wherein the MAC layer module delivers the specific uplink grant information in the random access response message to the transmitting module, and

wherein the scrambling module generates a scrambling sequence using the specific terminal identification information value set by the MAC layer module, and scrambles the uplink transmission signal using the generated scrambling sequence.

[12] The terminal of claim 7, wherein the transmitting module transmits the uplink transmission signal via a physical uplink sharing channel (PUSCH).

[13] The terminal of claim 7, wherein the specific terminal identification information received via the random access response message comprises a temporary cell RNTI (temporary cell radio network temporary identifier).

[14] A method of controlling a random access of a terminal, the method comprising:

receiving a random access preamble message from the terminal;

transmitting terminal identification information and uplink (UL) grant information via a random access response message corresponding to the random

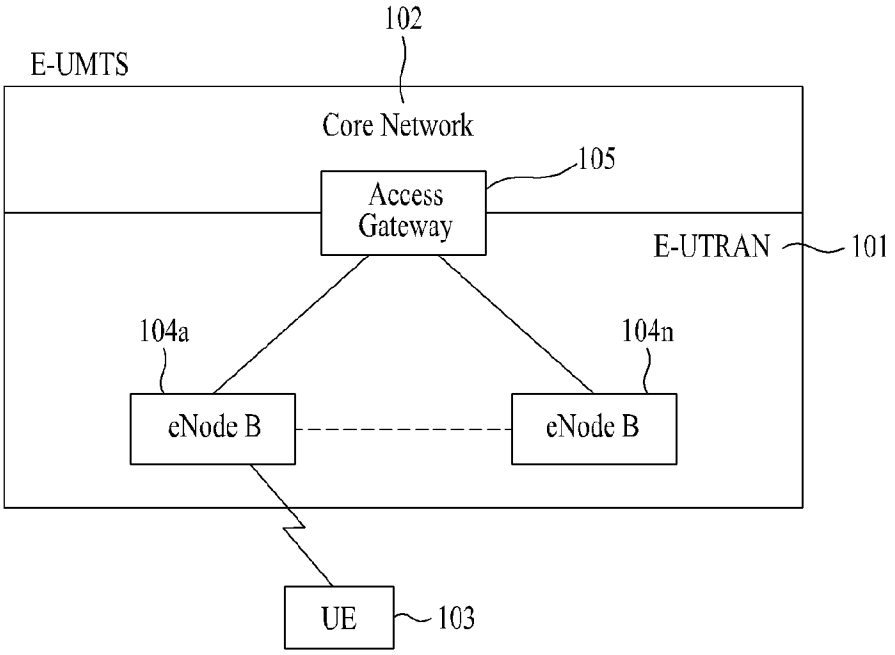
access preamble message;

receiving an uplink transmission message from the terminal to correspond to the uplink grant information; and

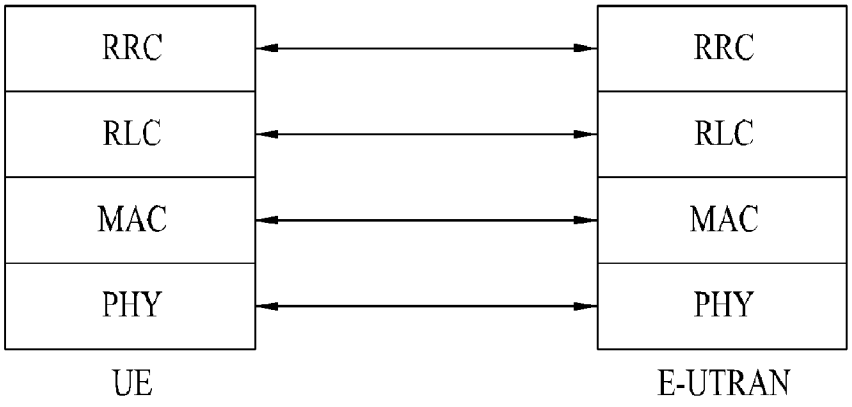
descrambling the uplink transmission message using the terminal identification information transmitted via the random access response message.

[15] The method of claim 14, wherein the terminal identification information transmitted via the random access response message comprises a temporary cell RNTI (temporary cell radio network temporary identifier).

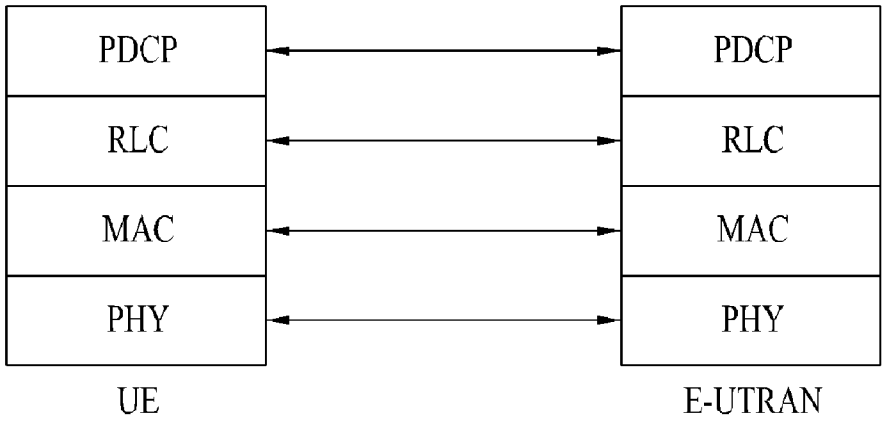
[Fig. 1]


102
E-UMTS
Core Network
105
Access Gateway
E-UTRAN
101
104a
104n
eNode B
eNode B
UE
103

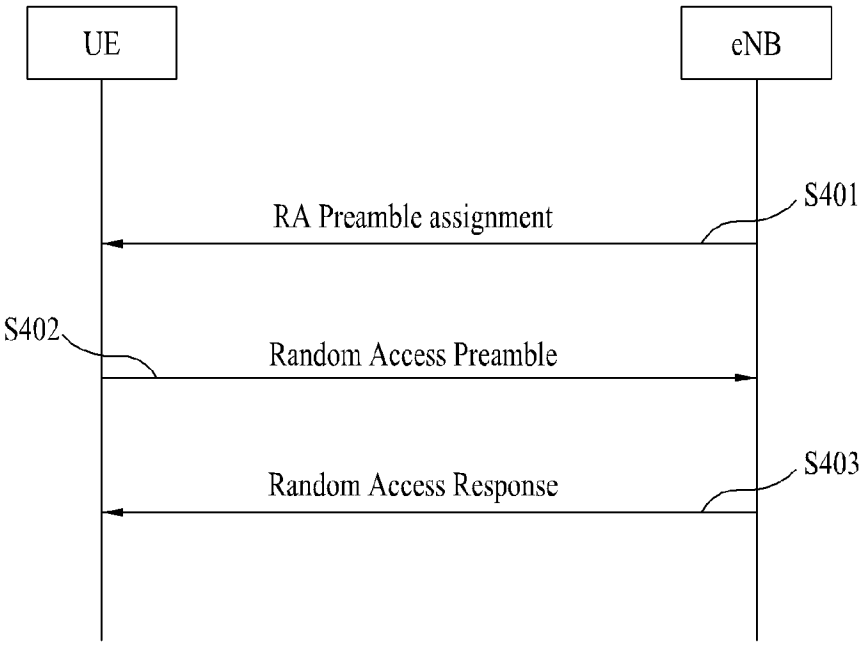
[Fig. 2]


RRC
RLC
MAC
PHY
RRC
RLC
MAC
PHY
UE
E-UTRAN

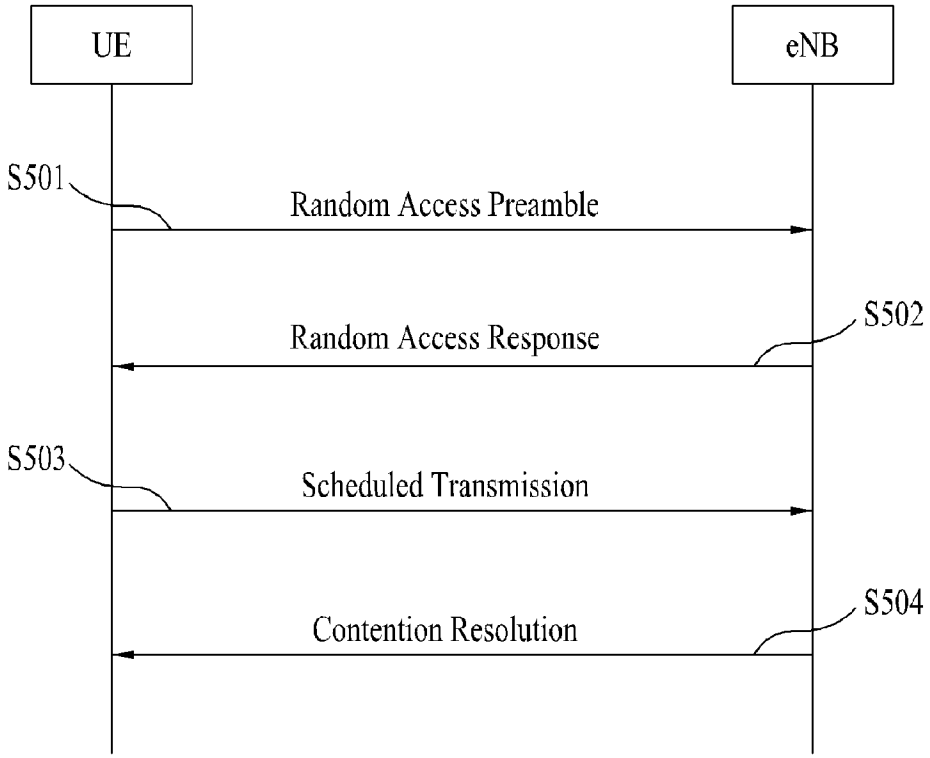
[Fig. 3]


PDCP
RLC
MAC
PHY
PDCP
RLC
MAC
PHY
UE
E-UTRAN

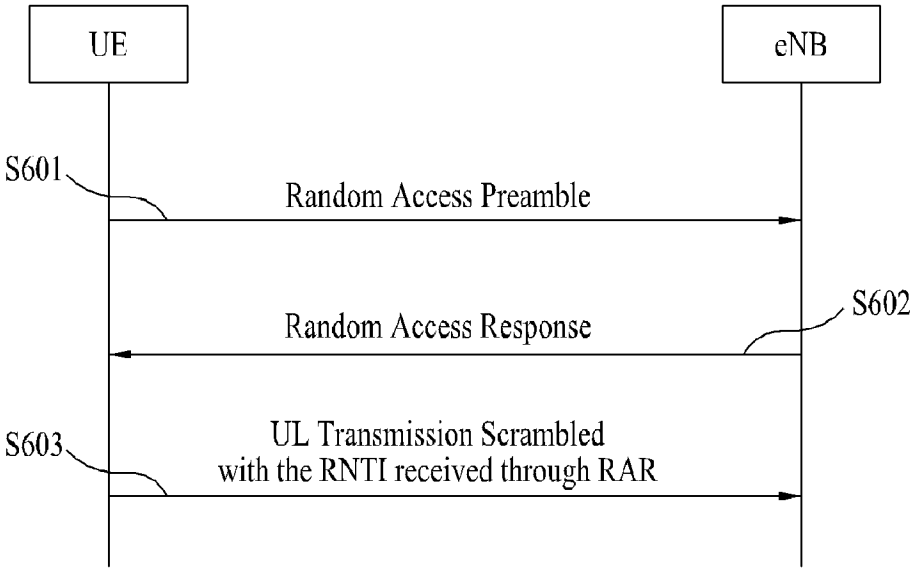
[Fig. 4]


UE
eNB
RA Preamble assignment
S401
S402
Random Access Preamble
Random Access Response
S403

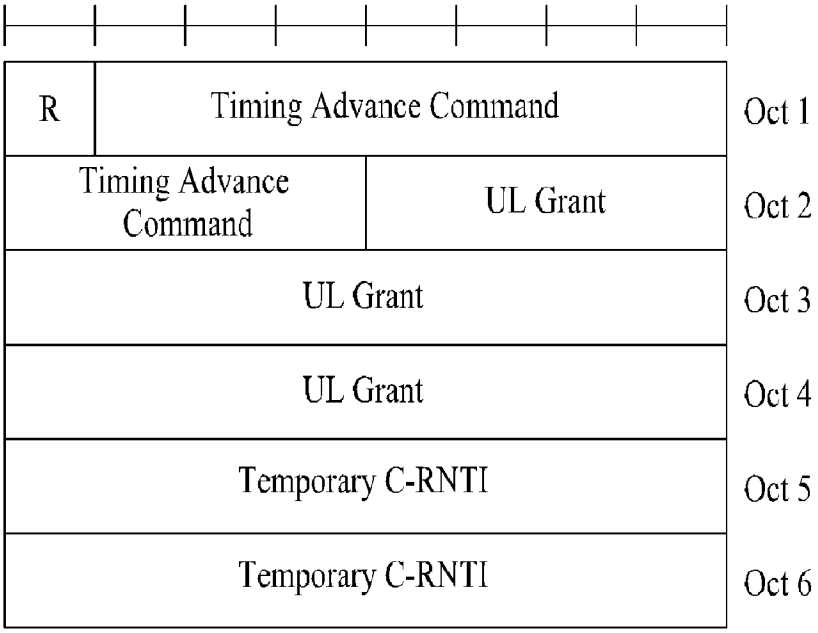
[Fig. 5]


UE
eNB
S501
Random Access Preamble
S502
Random Access Response
S503
Scheduled Transmission
S504
Contention Resolution

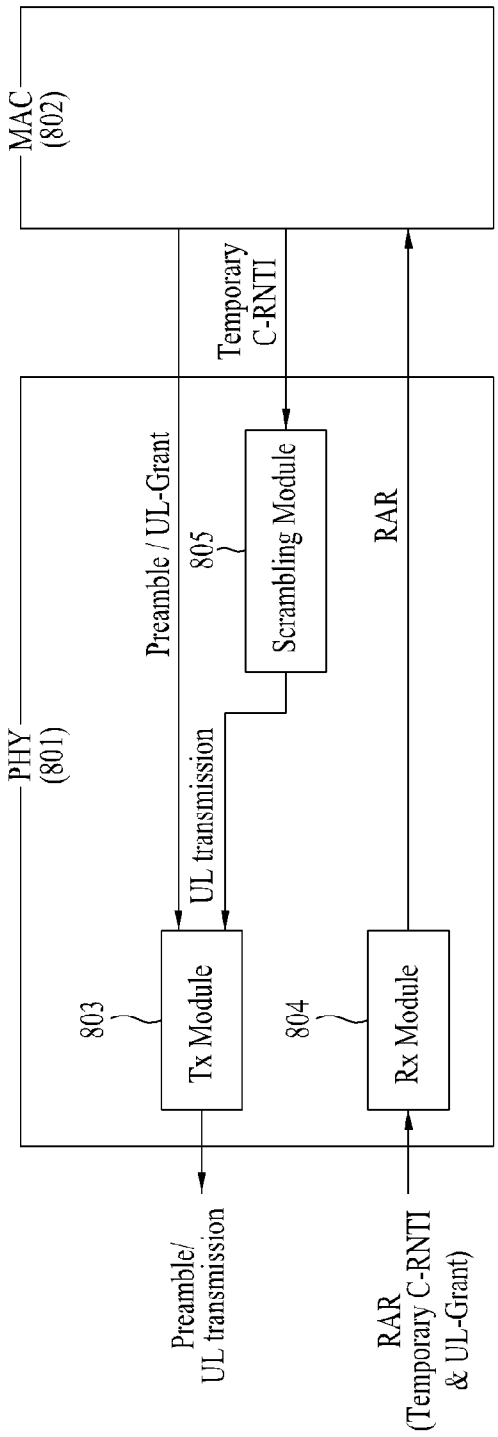
[Fig. 6]


UE
eNB
S601
Random Access Preamble
S602
Random Access Response
S603
UL Transmission Scrambled
with the RNTI received through RAR

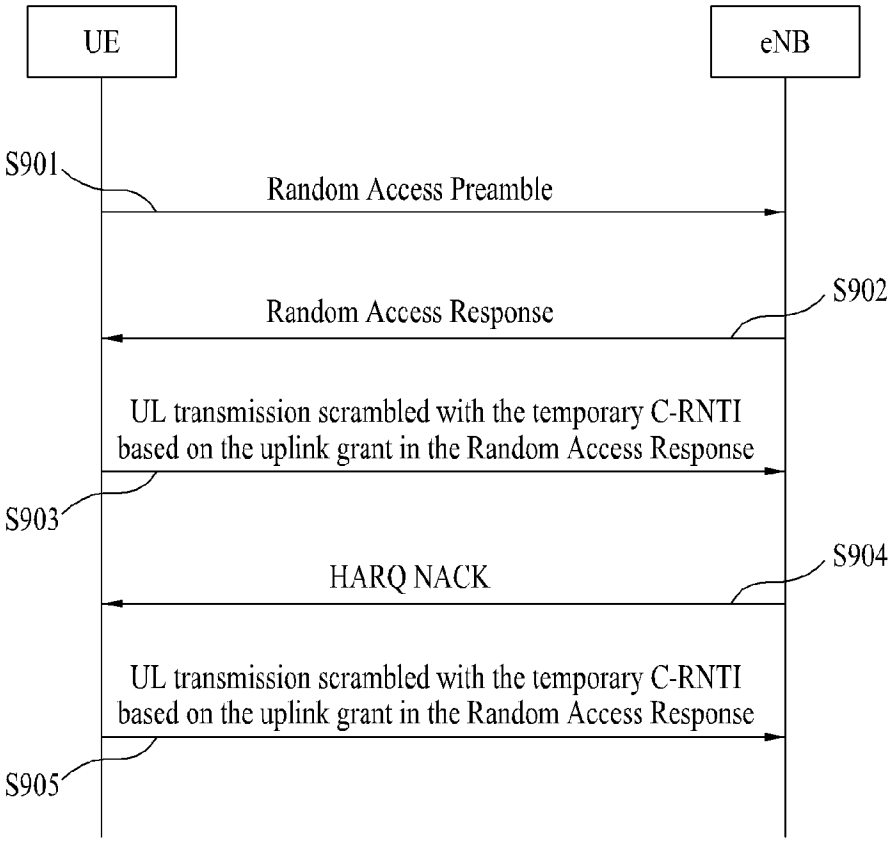
[Fig. 7]


R
Timing Advance Command
Oct 1
Timing Advance Command
UL Grant
Oct 2
UL Grant
Oct 3
UL Grant
Oct 4
Temporary C-RNTI
Oct 5
Temporary C-RNTI
Oct 6

[Fig. 8]


MAC
(802)
Temporary
C-RNTI
Preamble / UL-Grant
805
Scrambling Module
RAR
PHY
(801)
UL transmission
803
Tx Module
804
Rx Module
Preamble/
UL transmission
RAR
(Temporary C-RNTI
& UL-Grant)

[Fig. 9]


UE
eNB
S901
Random Access Preamble
S902
Random Access Response
UL transmission scrambled with the temporary C-RNTI based on the uplink grant in the Random Access Response
S903
S904
HARQ NACK
UL transmission scrambled with the temporary C-RNTI based on the uplink grant in the Random Access Response
S905

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 26431629 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 58027 |
| **Filer:** | Hae-Chan Park/Dongil Moon |
| **Filer Authorized By:** | Hae-Chan Park |
| **Attorney Docket Number:** | P4998USC1 |
| **Receipt Date:** | 22-JUL-2016 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 23:05:53 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P4998USC1-IDS.pdf | 1497180<br>e973a658c4ab1136906a697cb38610780f691336 | no | 4 |

**Warnings:**

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| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Foreign Reference | P4998USC1-JP2013-516917.pdf | 13386126<br>81222b01a4365be4f1c24f75d20ba0253a85cf82 | no | 34 |
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| **Information:** | | | | | |
| 3 | Foreign Reference | P4998USC1-WO2009113815.pdf | 835701<br>f5264183b313a244d9dd1d42761b1ab5eca5c74f | no | 29 |
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| **Information:** | | | | | |
| 4 | Non Patent Literature | P4998USC1-NPL1.pdf | 167612<br>eec10484911659cffd51f8f8e052ded4fd3a00b6 | no | 3 |
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| **Information:** | | | | | |
| 5 | Non Patent Literature | P4998USC1-NPL2.pdf | 105280<br>911433054 39a081e19e0f78952663301813 90822 | no | 2 |
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| **Information:** | | | | | |
| 6 | Non Patent Literature | P4998USC1-NPL3.pdf | 216901<br>53452d2f01275cabcc80378a0dbfa2fa898be4e0 | no | 4 |
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| **Information:** | | | | | |
| 7 | Non Patent Literature | P4998USC1-NPL4.pdf | 195898<br>75c067c3c81fcc6c2617ce9f13ebcdc41b3ca8d7 | no | 3 |
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**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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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 | 5097 |

58027 7590 12/30/2016

H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

| EXAMINER |
|---|
| TRUONG, LAN-HUONG |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2464 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 12/30/2016 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATENT@PARK-LAW.COM

| Office Action Summary | Application No. 14/733,068 | Applicant(s) KWON ET AL. | |
|---|---|---|---|
| | Examiner LAN-HUONG TRUONG | Art Unit 2464 | AIA (First Inventor to File) Status No |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *6/8/2015*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims***

5)☒ Claim(s) *1-3* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-3* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

**Application Papers**

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *6/8/2015* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a)☒ All b)☐ Some** c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

## DETAILED ACTION

### *Notice of Pre-AIA or AIA Status*

1. The present application is being examined under the pre-AIA first to invent provisions.

2. This action is response to the application filed on 06/08/2015.

3. Claims 1-3 are currently pending.

### *Priority*

4. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### *Information Disclosure Statement*

5. The information disclosure statements (IDS) submitted on 06/08/2015 and 07/22/2016 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

### *Claim Rejections - 35 USC § 103*

6. The following is a quotation of pre-AIA 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 negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

***Claims 1-3 are rejected under pre-AIA 35 U.S.C 103(a) as being unpatentable over of Yoo et al. (U.S. 2009/0279495) in view of Marinier et al. (U.S 2012/0008600) further in view of Narasimha et al. (U.S 2008/0268850).***

*For citation purposes, hereinafter, the Office Action refers to the cited by Marinier et al. with provisional 61/293271, which qualifies as prior art date.*

For Claim 1:

Yoo discloses a method for establishing an uplink (UL) synchronization in a wireless communication system by an evolved NodeB (eNB) *(see Yoo, paragraph [0007]; performed for uplink synchronization between the UE and the BS)*, the method comprising:

transmitting, to a User Equipment (UE), Radio Resource Control (RRC) signaling including a UL timing group information set through a primary Component Carrier (CC) *(see Yoo, paragraph [0012]; [0041] uplink transmission in a wireless communication system including RRC signaling exchange message between UE and the network, also see [0016]-[0017])*, the UL timing group information set comprising one or more UL timing groups, the one or more UL timing groups each comprising one or more UL CCs;

receiving a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group *(see Yoo, figure 7, step S220; paragraph [0051]; the BS measures a time alignment value (timing advance) via a random access preamble transmitted by the UE, and provides the time alignment value to the UE via a random access response)*; and

transmitting a Random Access Response (RAR) including a Timing Advance (TA) value for UL CCs in the respective UL timing group *(see Yoo, figure 7, step S230, transmit random access response including Timing Advanced).*

However, Yoo does not explicitly disclose the UL timing group information set comprising one or more UL timing groups, the one or more UL timing groups each comprising one or more UL CCs.

Marinier, from the same or similar fields of endeavor, discloses the timing advance (TA) value used by the WTRU for uplink (UL) time alignment is provided by the network in either the RACH response to the WTRU's RACH request message and perform a method of maintaining time alignment with multiple UL carriers wherein a group of carriers operating with the same TA is referred to as a UL control carrier (CC)

set and apply different TA values for different UL CC sets *(see Marinier, paragraph [0021]-[0029])*.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have a system comprises one or more UL timing groups as taught by Marinier. The motivation for doing this is to provide a system networks can utilize these resources, the WTRU is expected to be in sync with the network on these carriers.

However, Lee does not explicitly disclose wherein each TA value is calculated by the eNB for the respective UL timing group based on the received RAP associated with a delegate CC of the respective UL timing group, and wherein each TA value is configured to be applied to CCs in the respective UL timing group.

Narasimha, from the same or similar fields of endeavor, discloses the target base station can calculate the timing advanced for the mobile station for the timing advanced message *(see Narasimha, paragraph [0027]-[0028])*.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have a system comprises TA value is calculated by the eNB as taught by Narasimha. The motivation for doing this is to provide a system networks can help eliminate collision between UE's attempting to handover from the same source to the same target at the same RACH opportunity.

For Claim 2:

Yoo discloses a method for establishing an uplink (UL) synchronization by a User Equipment (UE) *(see Yoo, paragraph [0007]; performed for uplink synchronization between the UE and the BS)*, the method comprising:

receiving a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB) *(see Yoo, paragraph [0012]; [0041] uplink transmission in a wireless communication system including RRC signaling exchange message between UE and the network, also see [0016]-[0017])*;

configuring one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs;

transmitting a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group *(see Yoo, figure 7, step S220; paragraph [0051]; the BS measures a time alignment value (timing advance) via a random access preamble transmitted by the UE, and provides the time alignment value to the UE via a random access response)*;

receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group *(see Yoo, figure 7, step S230, transmit random access response including Timing Advanced).*

However, Yoo does not explicitly disclose configuring one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs.

Marinier, from the same or similar fields of endeavor, discloses the timing advance (TA) value used by the WTRU for uplink (UL) time alignment is provided by the network in either the RACH response to the WTRU's RACH request message and perform a method of maintaining time alignment with multiple UL carriers wherein a group of carriers operating with the same TA is referred to as a UL control carrier (CC)

set and apply different TA values for different UL CC sets *(see Marinier, paragraph [0021]-[0029])*.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have a system comprises one or more UL timing groups as taught by Marinier. The motivation for doing this is to provide a system networks can utilize these resources, the WTRU is expected to be in sync with the network on these carriers.

However, Yoo-Marinier does not explicitly disclose wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group; and applying each TA value to CCs in the respective UL timing group.

Narasimha, from the same or similar fields of endeavor, discloses the target base station can calculate the timing advanced for the mobile station for the timing advanced message *(see Narasimha, paragraph [0027]-[0028])*.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have a system comprises TA value is calculated by the eNB as taught by Narasimha. The motivation for doing this is to provide a system networks can help eliminate collision between UE's attempting to handover from the same source to the same target at the same RACH opportunity.

For Claim 3:

Yoo discloses a User Equipment (UE) to establish an uplink (UL) synchronization in a wireless communication system *(see Yoo, paragraph [0007]; performed for uplink synchronization between the UE and the BS)*, the UE comprising:

a transceiver configured to receive a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB) *(see Yoo, paragraph [0012]; [0041] uplink transmission in a wireless communication system including RRC signaling exchange message between UE and the network, also see [0016]-[0017])*;

a controller configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs,

wherein the transceiver transmits a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group *(see Yoo, figure 7, step S220; paragraph [0051]; the BS measures a time alignment value (timing advance) via a random access preamble transmitted by the UE, and provides the time alignment value to the UE via a random access response)*, and receives a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group *see Yoo, figure 7, step S230, transmit random access response including Timing Advanced)*.

However, Yoo does not explicitly disclose a controller configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs.

Marinier, from the same or similar fields of endeavor, discloses the timing advance (TA) value used by the WTRU for uplink (UL) time alignment is provided by the network in either the RACH response to the WTRU's RACH request message and perform a method of maintaining time alignment with multiple UL carriers wherein a

group of carriers operating with the same TA is referred to as a UL control carrier (CC) set and apply different TA values for different UL CC sets *(see Marinier, paragraph [0021]-[0029]).*

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have a system comprises one or more UL timing groups as taught by Marinier. The motivation for doing this is to provide a system networks can utilize these resources, the WTRU is expected to be in sync with the network on these carriers.

However, Yoo-Marinier does not explicitly disclose wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group, and wherein the controller applies each TA value to CCs in the respective UL timing group.

Narasimha, from the same or similar fields of endeavor, discloses the target base station can calculate the timing advanced for the mobile station for the timing advanced message *(see Narasimha, paragraph [0027]-[0028]).*

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have a system comprises TA value is calculated by the eNB as taught by Narasimha. The motivation for doing this is to provide a system networks can help eliminate collision between UE's attempting to handover from the same source to the same target at the same RACH opportunity.

***Conclusion***

The prior arts made or record and not relied upon are considered pertinent to applicant's disclosures. Lee et al. (U.S 2010/0142485); Fischer et al. (U.S

2008/0188219); Chun et al. (U.S 2010/0177747); Kim (U.S 2010/0238872); Jeong et al. (U.S 2008/0002660).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAN HUONG TRUONG whose telephone number is (571)270-5829. The examiner can normally be reached on Mon-Fri (7:30AM-5:00PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, RICKY NGO can be reached on 571-272-3139. 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.

Patent Examiner /L.T. /
Art Unit: 2464

/RICKY NGO/
Supervisory Patent Examiner, Art Unit 2464

| Notice of References Cited | Application/Control No. 14/733,068 | Applicant(s)/Patent Under Reexamination KWON ET AL. | |
|---|---|---|---|
| | Examiner LAN-HUONG TRUONG | Art Unit 2464 | 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-2009/0279495 A1 | 11-2009 | Yoo; Hee Chul | H04L5/0078 | 370/329 |
| * | B | US-2012/0008600 A1 | 01-2012 | Marinier; Paul | H04L5/001 | 370/336 |
| * | C | US-2008/0268850 A1 | 10-2008 | NARASIMHA; MURALI | H04W36/0072 | 455/437 |
| * | D | US-2010/0142485 A1 | 06-2010 | Lee; Eun Jong | H04W36/02 | 370/331 |
| * | E | US-2008/0188219 A1 | 08-2008 | Fischer; Patrick | H04W74/0866 | 455/434 |
| * | F | US-2010/0177747 A1 | 07-2010 | Chun; Sung-Duck | H04W56/009 | 370/336 |
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| | I | US- | | | | |
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| | L | US- | | | | |
| | M | US- | | | | |

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| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Country | Name | CPC Classification |
|---|---|---|---|---|---|---|
| | N | | | | | |
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| | R | | | | | |
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| * | | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
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| | U | |
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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.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
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# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | P4998USC1 |

**U.S.PATENTS**

| 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 |
|---|---|---|---|---|---|---|
| | 1 | | | | | |

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**U.S.PATENT APPLICATION PUBLICATIONS**

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| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] i | 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] |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2009/113815 | WO | | 2009-09-17 | LG ELECTRONICS INC. | | ☐ |
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**EXAMINER SIGNATURE**

| | | | |
|---|---|---|---|
| Examiner Signature | /LAN-HUONG TRUONG/ | Date Considered | 12/19/2016 |

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| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | P4998USC1 |

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☐ 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.

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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 | /dongil moon/ | Date (YYYY-MM-DD) | 2016-07-22 |
| Name/Print | Dongil Moon | Registration Number | 74,793 |

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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.

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

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

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

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# BIB DATA SHEET

**CONFIRMATION NO. 5097**

| SERIAL NUMBER | FILING or 371(c) DATE<br>RULE | CLASS | GROUP ART UNIT | ATTORNEY DOCKET NO. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | 370 | 2464 | P4998USC1 |

**APPLICANTS**

Pantech Co., Ltd., Seoul, KOREA, REPUBLIC OF;

**INVENTORS**

Kibum KWON, Seoul, KOREA, REPUBLIC OF;
Myungcheul JUNG, Seoul, KOREA, REPUBLIC OF;

**** CONTINUING DATA ***************************

This application is a CON of 13/578,531 08/10/2012 PAT 9054835
which is a 371 of PCT/KR2011/000909 02/10/2011

**** FOREIGN APPLICATIONS ***************************

REPUBLIC OF KOREA 10-2010-0012564 02/10/2010
REPUBLIC OF KOREA 10-2010-0027230 03/26/2010
REPUBLIC OF KOREA 10-2011-0008683 01/28/2011

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

06/17/2015

| Foreign Priority claimed | ☑ Yes ☐ No | ☐ Met after Allowance | STATE OR COUNTRY | SHEETS DRAWINGS | TOTAL CLAIMS | INDEPENDENT CLAIMS |
|---|---|---|---|---|---|---|
| 35 USC 119(a-d) conditions met | ☑ Yes ☐ No | | KOREA, REPUBLIC OF | 11 | 3 | 3 |
| Verified and Acknowledged | /LAN HUONG TRUONG/ Examiner's Signature | Initials | | | | |

**ADDRESS**

H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191
UNITED STATES

**TITLE**

APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

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| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | Examiner | Art Unit |
| | LAN HUONG TRUONG | 2464 |

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|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 12/19/2016 | | | | | | | | |
| | 1 | ✓ | | | | | | | | |
| | 2 | ✓ | | | | | | | | |
| | 3 | ✓ | | | | | | | | |

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. 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 | |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | |
| | Examiner Name | |
| | Attorney Docket Number | P4998USC1 |

| **U.S.PATENTS** | | | | | | |
|---|---|---|---|---|---|---|
| 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 |
| | 1 | 8606336 | | 2013-12-10 | Womack, et al. | |
| If you wish to add additional U.S. Patent citation information please click the Add button. | | | | | | |
| **U.S.PATENT APPLICATION PUBLICATIONS** | | | | | | |
| 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 | 20090274120 | | 2009-11-05 | Chou | Corresponding to KR 10-2009-0115913 |
| | 2 | 20100111005 | | 2010-05-06 | Ahn, et al. | Corresponding to KR 10-2008-0063023 |
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| | 5 | 20100323744 | | 2010-12-23 | Kim, et al. | |

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.T./

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| Receipt date: 06/08/2015 | Application Number | 14733068 - GAU: 2464 |
|---|---|---|
| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** ( Not for submission under 37 CFR 1.99) | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | |
| | Examiner Name | |
| | Attorney Docket Number | P4998USC1 |

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|---|---|---|---|---|---|---|
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| | 7 | 20110170495 | | 2011-07-14 | Earnshaw, et al. | |
| | 8 | 20090316642 | | 2009-12-24 | Yamada, et al. | |
| | 9 | 20090318175 | | 2009-12-24 | Sandberg | |
| | 10 | 20100086065 | | 2010-04-08 | Higuchi, et al. | |
| | 11 | 20090270094 | | 2009-10-29 | Ito, et al. | |
| | 12 | 20090116434 | | 2009-05-07 | Lohr, et al. | |

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**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] ¡ | 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] |
|---|---|---|---|---|---|---|---|---|
| | 1 | 10-2009-0115913 | KR | | 2009-11-10 | Industrial Technology Research Institute | Corresponding to US 20090274120 | ☐ |
| | 2 | 10-2008-0063023 | KR | | 2008-07-03 | Posdata Co., Ltd. | Corresponding to US 20100111005 | ☐ |

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| | Art Unit | |
| | Examiner Name | |
| | Attorney Docket Number | P4998USC1 |

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|---|---|---|---|---|---|---|---|---|
| | 3 | 10-2008-0079961 | KR | | 2008-09-02 | LG Electronics Inc. | Corresponding to US 20100041399 | ☐ |

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|---|---|---|---|
| | 1 | International Search Report of PCT/KR2011/000909 dated December 7, 2011. | ☐ |
| | 2 | Non Final Office Action issued on July 16, 2014, in U.S. Application No. 13/578,531. | ☐ |
| | 3 | Notice of Allowance issued on February 4, 2015, in U.S. Application No. 13/578,531. | ☐ |

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**EXAMINER SIGNATURE**

| Examiner Signature | /Lan-huong Truong/ (12/26/2016) | Date Considered | 12/26/2016 |
|---|---|---|---|

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☒ 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 | /dongil moon/ | Date (YYYY-MM-DD) | 2015-06-08 |
|---|---|---|---|
| Name/Print | Dongil Moon | Registration Number | L0830 |

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**EAST Search History**

**EAST Search History (Prior Art)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S1 | 37 | ((KIBUM) near2 (KWON)).INV. | US-PGPUB; USPAT | OR | ON | 2014/01/12 00:10 |
| S2 | 12 | ((MYUNGCHEUL) near2 (JUNG)).INV. | US-PGPUB; USPAT | OR | ON | 2014/01/12 00:10 |
| S3 | 6 | ("20080273610" \| "20090186613" \| "20090279495").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:16 |
| S4 | 8 | ("20090274120" \| "20100041399" \| "20100111005").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:24 |
| S5 | 216 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:32 |
| S6 | 43 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (terminal OR UE OR (user adj equipment)) and (CC OR carrier) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:33 |
| S7 | 3922 | (370/350).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:38 |
| S8 | 21823 | (370/329).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:38 |
| S9 | 2840 | (370/330).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; | OR | OFF | 2014/01/12 00:38 |

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| | | | EPO; JPO; DERWENT; IBM_TDB | | | |
| S10 | 2474 | (370/337).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S11 | 2290 | (370/345).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S12 | 3023 | (370/347).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S13 | 4 | ("20090005058").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:44 |
| S14 | 3 | ("20090116434").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:45 |
| S15 | 42 | ("2009/0116434").URPN. | USPAT | OR | ON | 2014/01/12 00:48 |
| S16 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH delegat$3 NEAR3 (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:51 |
| S17 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH delegat$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:52 |
| S18 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) WITH delegat$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:52 |

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|---|---|---|---|---|---|---|
| S19 | 8 | delegat$3 NEAR CC | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:53 |
| S20 | 2 | delegat$3 NEAR (component adj carrier) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:54 |
| S21 | 74 | S5 AND ( (H04W56/00 OR H04W74/002 OR H04W74/0833).CPC. ) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:56 |
| S22 | 1 | S5 AND ( (H04W56/00 OR H04W74/002 OR H04W74/0833).CPC. ) AND delegate | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:57 |
| S23 | 13 | set$4 WITH (CC OR (component adj carrier)) NEAR9 aggregation NEAR4 information | US-PGPUB; USPAT | OR | ON | 2014/01/12 09:39 |
| S24 | 2 | ("20120021756" \| "20120057490").PN. | US-PGPUB; USPAT | OR | ON | 2014/01/12 09:42 |
| S27 | 2 | ("20110267957").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 09:49 |
| S28 | 3 | ("20090092091").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 09:50 |
| S30 | 7 | ("2010148532").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 10:06 |
| S31 | 9068 | (UL OR uplink) WITH (sync OR synchronization) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 11:52 |

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|---|---|---|---|---|---|---|
| S32 | 61 | (UL OR uplink) WITH (sync OR synchronization) WITH receiv$3 NEAR3 (random near access near preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 11:53 |
| S33 | 2 | ("2010/0331003").URPN. | USPAT | OR | ON | 2014/01/12 11:57 |
| S35 | 2 | ("20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 12:13 |
| S37 | 20 | ("20030096631" \| "20100331003" \| "20060166688" \| "20070072600" \| "7054298" \| "20040077357" \| "20090186613").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 12:23 |
| S38 | 7 | ("2006/0166688").URPN. | USPAT | OR | ON | 2014/01/12 12:46 |
| S46 | 2 | ("20090239583").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/13 13:58 |
| S47 | 21 | ("20070133611" \| "20120057525" \| "20050099986" \| "20030125073" \| "20120135715" \| "20090239582" \| "20090239583" \| "20120004013").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/13 14:00 |
| S50 | 3 | ("20100080155").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/13 14:19 |
| S51 | 11 | ("2010/0182992").URPN. | USPAT | OR | ON | 2014/01/13 14:25 |
| S52 | 2 | "US 20130034087" | US-PGPUB; USPAT; USOCR; DERWENT | OR | ON | 2014/01/13 14:38 |
| S53 | 304 | (establish$3 OR creat$3) WITH (UL OR uplink) NEAR3 (sync OR synchronization) and (select$3 OR pick$3 OR choos$3) WITH (UE OR mobile near station OR user near equipment) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 11:41 |
| S54 | 3925 | (370/350).CCLS. | US-PGPUB; | OR | OFF | 2014/01/14 |

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|---|---|---|---|---|---|---|
| | | | USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | 11:46 |
| S55 | 20 | S53 and S54 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 11:48 |
| S56 | 5 | S53 and S54 and (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 13:43 |
| S57 | 15 | ("20080060249" \| "20080305822" \| "20070230394" \| "20080119979" \| "20070000967" \| "20070254656").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 13:46 |
| S58 | 2 | "delegate component carrier" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:19 |
| S60 | 5 | "delegate CC" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:20 |
| S61 | 21 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing and (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:38 |
| S62 | 276 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:34 |
| S63 | 1 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH UL NEAR3 synchronization | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:35 |
| S64 | 4 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH synchronization | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:35 |
| S66 | 31 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH state | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:36 |
| S67 | 256 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:38 |

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|---|---|---|---|---|---|---|
| | | OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | | | | |
| S68 | 1007 | (370/324).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 09:39 |
| S69 | 0 | S62 and S68 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 09:40 |
| S70 | 21847 | (370/329).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 09:40 |
| S71 | 10 | S62 and S70 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 09:40 |
| S72 | 3 | ("2011/0292887").URPN. | USPAT | OR | ON | 2014/01/15 09:51 |
| S73 | 3 | ("2011/0292887").URPN. | USPAT | OR | ON | 2014/01/15 09:56 |
| S74 | 2 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" and establish$3 near3 uplink | US-PGPUB; USPAT | OR | ON | 2014/01/15 10:04 |
| S75 | 2 | ("2012/0063425").URPN. | USPAT | OR | ON | 2014/01/15 10:04 |
| S76 | 2 | (13/556165).APP. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 10:16 |
| S78 | 13343 | retransmission near data | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 10:56 |
| S80 | 357 | retransmission near data WITH receiv$3 NEAR4 terminals | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; | OR | ON | 2014/01/15 11:00 |

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|---|---|---|---|---|---|---|
| | | | DERWENT; IBM_TDB | | | |
| S81 | 21 | retransmission near data WITH receiv$3 NEAR4 terminals WITH threshold | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 11:00 |
| S83 | 4 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (terminal OR UE OR (user adj equipment)) and (CC OR carrier) WITH characteristic | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 19:59 |
| S86 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH macro | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 21:58 |
| S87 | 11 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (threshold OR predetermin$3 OR predefin$3 OR preset$3) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 22:00 |
| S88 | 1308 | form$3 WITH timing near synchronization | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 10:13 |
| S89 | 13 | form$3 WITH timing near4 synchronization NEAR7 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 10:14 |
| S90 | 4 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing NEAR20 (simultaneously OR concurrently) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 11:03 |
| S91 | 4 | ("2008/0037502").URPN. | USPAT | OR | ON | 2014/01/16 11:12 |
| S94 | 62 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:19 |

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|---|---|---|---|---|---|---|
| | | "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. | | | | |
| S95 | 62 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |
| S96 | 0 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and stimutaneous | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |
| S97 | 22 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |

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|---|---|---|---|---|---|---|
| | | "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and timing | | | | |
| S98 | 4 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and timing WITH synchron$5 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:21 |
| S99 | 44 | ("2007/0293224").URPN. | USPAT | OR | ON | 2014/02/15 17:23 |
| S100 | 17 | ("2012/0250520").URPN. | USPAT | OR | ON | 2014/02/15 21:09 |
| S101 | 17 | ("2012/0250520").URPN. | USPAT | OR | ON | 2014/02/15 21:13 |
| S102 | 13 | ("20100158147" \| "20110038271" \| "20110243016" \| "20100273515" \| "20090163211" \| "20090163211" \| "20090318180").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 21:41 |
| S103 | 435 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:47 |

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|---|---|---|---|---|---|---|---|
| | | "20080285691" \| "20100238903" \| | | | | | |
| | | "20040242195" \| "20090264164" \| | | | | | |
| | | "20030165122" \| "20040148427" \| | | | | | |
| | | "20070155390" \| "20090124259" \| | | | | | |
| | | "20100238799" \| "20090005051" \| | | | | | |
| | | "20070177569" \| "20060126554" \| | | | | | |
| | | "20050041610" \| "20030123485" \| | | | | | |
| | | "20070248075" \| "6567409" \| | | | | | |
| | | "20050085254" \| "20070291673" \| | | | | | |
| | | "20070258591" \| "20050232271" \| | | | | | |
| | | "20080076359" \| "20100309877" \| | | | | | |
| | | "6795419" \| "20040229605" \| | | | | | |
| | | "20050063347" \| "20070293224" \| | | | | | |
| | | "20040042507" \| "20070155389" \| | | | | | |
| | | "20110207427" \| "7039425" \| "5588009" | | | | | |
| | | \| "20030165133" \| "20080181127" \| | | | | | |
| | | "20020028690" \| "20010017850" \| | | | | | |
| | | "20020057663" \| "20080056198" \| | | | | | |
| | | "20070206531" \| "20100165901" \| | | | | | |
| | | "8064676" \| "20090207771" \| | | | | | |
| | | "20100265896" \| "20010034791" \| | | | | | |
| | | "20090239538" \| "20070041382" \| | | | | | |
| | | "7525908" \| "20080188223" \| "0776951" | | | | | |
| | | \| "7606370" \| "20070291729" \| | | | | | |
| | | "20030207696" \| "20070291719" \| | | | | | |
| | | "20050009527" \| "20060262811" \| | | | | | |
| | | "20100046384" \| "20080280567" \| | | | | | |
| | | "20100128669" \| "20070047452" \| | | | | | |
| | | "20100227614" \| "20100254340" \| | | | | | |
| | | "20080268850" \| "20120002589" \| | | | | | |
| | | "20050100048" \| "20030119488" \| | | | | | |
| | | "20020059464" \| "20020091860" \| | | | | | |
| | | "20050094670" \| "20060126570" \| | | | | | |
| | | "20070165635" \| "20100195568" \| | | | | | |
| | | "20050053029" \| "20060142019" \| | | | | | |
| | | "20040014452" \| "6725267" \| | | | | | |
| | | "20030189922" \| "20050141462" \| | | | | | |
| | | "20040185837" \| "20080225744" \| | | | | | |
| | | "20030050078" \| "20050265294" \| | | | | | |
| | | "20090086659" \| "20090181710" \| | | | | | |
| | | "20090318170" \| "20100027413" \| | | | | | |
| | | "7443813" \| "20060251105" \| | | | | | |
| | | "20070291646" \| "20020059464" \| | | | | | |
| | | "20080240439" \| "20080316959" \| | | | | | |
| | | "20060013165" \| "20110090836" \| | | | | | |
| | | "20080186946" \| "20040039830" \| | | | | | |
| | | "20050037767" \| "20050160184" \| | | | | | |
| | | "20050286470" \| "20080240439" \| | | | | | |
| | | "20090022107" \| "6233430" \| | | | | | |
| | | "20080167089" \| "20040117860" \| | | | | | |
| | | "20050185620" \| "20050238051" \| | | | | | |
| | | "20070291673" \| "20070178875" \| | | | | | |
| | | "20080273610" \| "20080009289" \| | | | | | |
| | | "20080089285" \| "20070291788" \| | | | | | |
| | | "20080095185" \| "20080225765" \| | | | | | |
| | | "20090086710" \| "20090109912" \| | | | | | |
| | | "20100061330" \| "7801527" \| | | | | | |
| | | "20030147371" \| "20040042507" \| | | | | | |
| | | "20040148427" \| "20050286470" \| | | | | | |
| | | "20070165635" \| "20070291695" \| | | | | | |
| | | "7865731" \| "20030123485" \| | | | | | |
| | | "20100075635" \| "20040147269" \| | | | | | |
| | | "20040233870" \| "20070291728" \| | | | | | |
| | | "20050176474" \| "20070206531" \| | | | | | |

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| | | "20040253959" \| "20050041681" \| "20060165045" \| "20060245417" \| "20080056273" \| "20070047582" \| "20060067324" \| "20040100940" \| "20050032555" \| "20040180675" \| "20080182594" \| "20030165122" \| "20050160184" \| "20070064631" \| "20080004058" \| "20100067495" \| "20040087320" \| "20090040982" \| "20110261743" \| "20070064665" \| "20030139170" \| "20050249188" \| "20060039309").PN. | | | | |
| S104 | 75 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| "20080285691" \| "20100238903" \| "20040242195" \| "20090264164" \| "20030165122" \| "20040148427" \| "20070155390" \| "20090124259" \| "20100238799" \| "20090005051" \| "20070177569" \| "20060126554" \| "20050041610" \| "20030123485" \| "20070248075" \| "6567409" \| "20050085254" \| "20070291673" \| "20070258591" \| "20050232271" \| "20080076359" \| "20100309877" \| "6795419" \| "20040229605" \| "20050063347" \| "20070293224" \| "20040042507" \| "20070155389" \| "20110207427" \| "7039425" \| "5588009" \| "20030165133" \| "20080181127" \| "20020028690" \| "20010017850" \| "20020057663" \| "20080056198" \| "20070206531" \| "20100165901" \| "8064676" \| "20090207771" \| "20100265896" \| "20010034791" \| "20090239538" \| "20070041382" \| "7525908" \| "20080188223" \| "0776951" \| "7606370" \| "20070291729" \| "20030207696" \| "20070291719" \| "20050009527" \| "20060262811" \| "20100046384" \| "20080280567" \| "20100128669" \| "20070047452" \| "20100227614" \| "20100254340" \| "20080268850" \| "20120002589" \| "20050100048" \| "20030119488" \| "20020059464" \| "20020091860" \| "20050094670" \| "20060126570" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:51 |

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| | | "20070165635" \| "20100195568" \| "20050053029" \| "20060142019" \| "20040014452" \| "6725267" \| "20030189922" \| "20050141462" \| "20040185837" \| "20080225744" \| "20030050078" \| "20050265294" \| "20090086659" \| "20090181710" \| "20090318170" \| "20100027413" \| "7443813" \| "20060251105" \| "20070291646" \| "20020059464" \| "20080240439" \| "20080316959" \| "20060013165" \| "20110090836" \| "20080186946" \| "20040039830" \| "20050037767" \| "20050160184" \| "20050286470" \| "20080240439" \| "20090022107" \| "6233430" \| "20080167089" \| "20040117860" \| "20050185620" \| "20050238051" \| "20070291673" \| "20070178875" \| "20080273610" \| "20080009289" \| "20080089285" \| "20070291788" \| "20080095185" \| "20080225765" \| "20090086710" \| "20090109912" \| "20100061330" \| "7801527" \| "20030147371" \| "20040042507" \| "20040148427" \| "20050286470" \| "20070165635" \| "20070291695" \| "7865731" \| "20030123485" \| "20100075635" \| "20040147269" \| "20040233870" \| "20070291728" \| "20050176474" \| "20070206531" \| "20040253959" \| "20050041681" \| "20060165045" \| "20060245417" \| "20080056273" \| "20070047582" \| "20060067324" \| "20040100940" \| "20050032555" \| "20040180675" \| "20080182594" \| "20030165122" \| "20050160184" \| "20070064631" \| "20080004058" \| "20100067495" \| "20040087320" \| "20090040982" \| "20110261743" \| "20070064665" \| "20030139170" \| "20050249188" \| "20060039309").PN. and synchronization | | | | |
| S105 | 11 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| "20080285691" \| "20100238903" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:54 |

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| | | "20040242195" \| "20090264164" \| "20030165122" \| "20040148427" \| "20070155390" \| "20090124259" \| "20100238799" \| "20090005051" \| "20070177569" \| "20060126554" \| "20050041610" \| "20030123485" \| "20070248075" \| "6567409" \| "20050085254" \| "20070291673" \| "20070258591" \| "20050232271" \| "20080076359" \| "20100309877" \| "6795419" \| "20040229605" \| "20050063347" \| "20070293224" \| "20040042507" \| "20070155389" \| "20110207427" \| "7039425" \| "5588009" \| "20030165133" \| "20080181127" \| "20020028690" \| "20010017850" \| "20020057663" \| "20080056198" \| "20070206531" \| "20100165901" \| "8064676" \| "20090207771" \| "20100265896" \| "20010034791" \| "20090239538" \| "20070041382" \| "7525908" \| "20080188223" \| "0776951" \| "7606370" \| "20070291729" \| "20030207696" \| "20070291719" \| "20050009527" \| "20060262811" \| "20100046384" \| "20080280567" \| "20100128669" \| "20070047452" \| "20100227614" \| "20100254340" \| "20080268850" \| "20120002589" \| "20050100048" \| "20030119488" \| "20020059464" \| "20020091860" \| "20050094670" \| "20060126570" \| "20070165635" \| "20100195568" \| "20050053029" \| "20060142019" \| "20040014452" \| "6725267" \| "20030189922" \| "20050141462" \| "20040185837" \| "20080225744" \| "20030050078" \| "20050265294" \| "20090086659" \| "20090181710" \| "20090318170" \| "20100027413" \| "7443813" \| "20060251105" \| "20070291646" \| "20020059464" \| "20080240439" \| "20080316959" \| "20060013165" \| "20110090836" \| "20080186946" \| "20040039830" \| "20050037767" \| "20050160184" \| "20050286470" \| "20080240439" \| "20090022107" \| "6233430" \| "20080167089" \| "20040117860" \| "20050185620" \| "20050238051" \| "20070291673" \| "20070178875" \| "20080273610" \| "20080009289" \| "20080089285" \| "20070291788" \| "20080095185" \| "20080225765" \| "20090086710" \| "20090109912" \| "20100061330" \| "7801527" \| "20030147371" \| "20040042507" \| "20040148427" \| "20050286470" \| "20070165635" \| "20070291695" \| "7865731" \| "20030123485" \| "20100075635" \| "20040147269" \| "20040233870" \| "20070291728" \| "20050176474" \| "20070206531" \| "20040253959" \| "20050041681" \| | | | | |

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|---|---|---|---|---|---|---|
| | | "20060165045" \| "20060245417" \| "20080056273" \| "20070047582" \| "20060067324" \| "20040100940" \| "20050032555" \| "20040180675" \| "20080182594" \| "20030165122" \| "20050160184" \| "20070064631" \| "20080004058" \| "20100067495" \| "20040087320" \| "20090040982" \| "20110261743" \| "20070064665" \| "20030139170" \| "20050249188" \| "20060039309").PN. and synchronization WITH uplink | | | | |
| S106 | 44 | ("2007/0293224").URPN. | USPAT | OR | ON | 2014/02/15 23:15 |
| S107 | 15703 | H04W72/04.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:47 |
| S108 | 230 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:47 |
| S109 | 6136 | H04W72/00.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S111 | 1564 | H04B7/216.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S112 | 7 | S107 and S108 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S114 | 3 | S109 and S108 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:49 |
| S115 | 260 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | US-PGPUB; USPAT | OR | ON | 2014/05/19 13:52 |
| S116 | 2 | ("20120307821").PN. | US-PGPUB; | OR | OFF | 2014/06/27 |

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|---|---|---|---|---|---|---|
| | | | USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | 23:56 |
| S117 | 1 | ("20120307821").PN. | DERWENT | OR | OFF | 2014/06/27 23:56 |
| S118 | 3 | ("20130121264").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/06/28 22:01 |
| S119 | 31095 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:29 |
| S120 | 31048 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:30 |
| S121 | 885 | (H04B1/7087).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S122 | 343 | (establish$3 OR creat$3) WITH (UL OR uplink) NEAR3 (sync OR synchronization) and (select$3 OR pick$3 OR choos$3) WITH (UE OR mobile near station OR user near equipment) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S123 | 53 | S119 and S122 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S124 | 19 | S120 and S122 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:32 |
| S125 | 2 | S121 and S122 | US-PGPUB; USPAT; USOCR; FPRS; | OR | ON | 2014/06/29 00:32 |

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|---|---|---|---|---|---|---|
| | | | EPO; JPO; DERWENT; IBM_TDB | | | |
| S126 | 2 | ("20090186613").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/06/29 01:17 |
| S127 | 14 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing and (CC OR (component adj carrier)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 09:56 |
| S128 | 9 | ("20030076812" \| "20090161599" \| "20090290555" \| "20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 10:03 |
| S129 | 31136 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:22 |
| S130 | 12 | (UL OR uplink) NEAR4 timing WITH distinguished and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:28 |
| S131 | 165 | (UL OR uplink) NEAR4 timing WITH error and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:32 |
| S132 | 15 | S129 and S131 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:33 |
| S133 | 26 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (RACH OR random NEAR access NEAR channel) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/07 22:46 |
| S134 | 0 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR | US-PGPUB; USPAT; | OR | ON | 2014/12/07 23:05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | message OR data) WITH (UL OR uplink) NEAR4 timing WITH (RACH OR random NEAR access NEAR channel) WITH response | USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S135 | 46 | ("20100260156" \| "8077671" \| "20070015511" \| "8274947" \| "20110103347" \| "7450944" \| "20100142485" \| "20090046665" \| "20100056160" \| "20100003981" \| "20120177006" \| "5440561" \| "20090070469" \| "20020160779" \| "7469142" \| "20030053431" \| "20030147370" \| "20100278150").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/07 23:09 |
| S136 | 19 | ("2010/0142485").URPN. | USPAT | OR | ON | 2014/12/07 23:15 |
| S137 | 13 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH contention | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/16 11:47 |
| S138 | 75 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) WITH contention | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/16 11:49 |
| S139 | 51 | (component NEAR carrier AND (primary NEAR CC)).clm. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2015/01/13 11:31 |
| S140 | 47 | ((KIBUM) near2 (KWON)).INV. | US-PGPUB; USPAT | OR | ON | 2015/01/13 12:46 |
| S141 | 1 | ("2012/0108254").URPN. | USPAT | OR | ON | 2015/01/13 13:26 |
| S142 | 14 | ((MYUNGCHEUL) near2 (JUNG)).INV. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:28 |
| S162 | 41 | ("20090116434" \| "20090274120" \| "8606336" \| "20110170495" \| "20090318175" \| "20100086065" \| "20100238857" \| "20100323744" \| "20100041399" \| "20090270094" \| "20090316642" \| "20100111005" \| "20100118720").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2015/01/13 13:51 |
| S177 | 2316 | (TA OR (timing NEAR2 advanced)) AND (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 11:59 |
| S178 | 421 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR2 advanced)) AND (random NEAR2 access NEAR3 | US-PGPUB; USPAT; USOCR; | OR | ON | 2016/12/12 12:04 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | preamble) | FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S179 | 421 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) AND (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:05 |
| S180 | 230 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:05 |
| S181 | 185 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:06 |
| S182 | 169 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:07 |
| S183 | 3 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100210" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:08 |
| S184 | 9 | ("20030076812" \| "20090161599" \| "20090290555" \| "20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:17 |
| S185 | 2 | tim$4 NEAR3 group SAME (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 15:08 |
| S186 | 50 | ("2012/0307811").URPN. | USPAT | OR | ON | 2016/12/12 15:18 |
| S187 | 17 | ("20070189205" \| "20100227569" \| "20110261776" \| "20110268032" \| "20110299489" \| "20120113941" \| "20120300743" \| "20120307811").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; | OR | ON | 2016/12/14 16:27 |

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|---|---|---|---|---|---|---|
| | | | DERWENT; IBM_TDB | | | |
| S188 | 3 | ("8982805").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/14 16:47 |
| S189 | 34 | ("20110039593" \| "20110159903" \| "20110045837" \| "20110243048" \| "20090279495" \| "20100232382" \| "20110026475" \| "20110243106" \| "20080310395" \| "20100177747" \| "20110235609" \| "20110317777" \| "20100296467" \| "20110134774" \| "20070293224").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/14 17:02 |
| S190 | 182 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) AND (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S191 | 180 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) SAME (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S192 | 0 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) SAME (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100210" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S193 | 243 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:36 |
| S194 | 178 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:36 |
| S195 | 185 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:37 |
| S196 | 204 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) | US-PGPUB; USPAT; | OR | ON | 2016/12/19 11:37 |

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|---|---|---|---|---|---|---|
| | | OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR4 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S197 | 196 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR2 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:38 |
| S198 | 1 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) NEAR5 value SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR2 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:38 |
| S199 | 17 | ("20080002660" \| "20140293853" \| "20140073337" \| "20160100374" \| "20080279131" \| "20130116002").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:39 |
| S200 | 6 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random ADJ access ADJ response) NEAR5 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 12:11 |
| S201 | 10 | ("20100238908" \| "20110243111" \| "20120063425" \| "20120099577").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 12:13 |
| S202 | 120 | random ADJ access NEAR2 (response OR reply) SAME timing NEAR2 advanc$3 AND @ad<"20100210" AND (calculat$4 OR comput$3 OR determin$3 OR estimat$3) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 13:18 |
| S203 | 42 | random ADJ access NEAR2 (response OR reply) SAME timing NEAR2 advanc$3 AND @ad<"20100210" AND (calculat$4 OR comput$3 OR determin$3 OR estimat$3) WITH timing NEAR2 advanc$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 13:19 |
| S204 | 2533 | (H04J3/00).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 15:12 |

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|---|---|---|---|---|---|---|
| S205 | 2 | ("20150271770").PN. | US-PGPUB; USPAT; USOCR; DERWENT | OR | ON | 2016/12/20 09:10 |
| S206 | 56 | delegat$3 NEAR2 (carrier OR CC OR CCs) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 11:59 |
| S207 | 26 | delegat$3 NEAR2 (carrier OR CC OR CCs) AND synchronization | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 12:00 |
| S208 | 6 | ("20080273610" \| "20090186613" \| "20090279495").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 12:09 |
| S209 | 3 | ("20100118720").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/24 12:20 |
| S210 | 148 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic AND ((UL NEAR PCC) OR Pcell OR primary) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 14:16 |
| S211 | 309 | set$4 WITH (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:02 |
| S212 | 8428 | (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:03 |
| S213 | 561 | (TA OR timing ADJ advanced) SAME (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:04 |
| S214 | 10 | (calculat$3 OR comput$4 OR estimat$4) SAME (TA OR timing ADJ advanced) | US-PGPUB; USPAT; | OR | ON | 2016/12/25 00:05 |

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|---|---|---|---|---|---|---|
| | | SAME (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S215 | 2 | ("20100222059").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/26 02:02 |
| S216 | 34 | ("2010/0222059").URPN. | USPAT | OR | ON | 2016/12/26 02:06 |
| S217 | 9 | set$4 WITH (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) AND tim$3 ADJ2 group and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/26 13:11 |
| S218 | 2 | ("20100142485").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/26 15:28 |

**EAST Search History (Interference)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S143 | 3665 | (370/350).CCLS. | US-PGPUB; USPAT | OR | OFF | 2015/01/13 11:08 |
| S144 | 51 | (component NEAR carrier AND (primary NEAR CC)).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:31 |
| S145 | 7 | uplink NEAR timing NEAR group.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:31 |
| S146 | 22 | UL NEAR group.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:31 |
| S147 | 83 | synchronization NEAR request NEAR message.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:32 |
| S148 | 9 | S143 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:34 |
| S149 | 2 | S146 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:36 |
| S150 | 1 | S144 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:36 |
| S151 | 5348 | uplink AND synchronization.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:37 |

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|---|---|---|---|---|---|---|
| S152 | 646 | S143 AND S151 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S153 | 1 | S146 AND S152 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S154 | 1 | S147 AND S152 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S155 | 3 | UL NEAR timing NEAR group.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:42 |
| S156 | 15 | (component NEAR carrier AND (primary NEAR CC) AND (second NEAR CC)).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:44 |
| S157 | 3 | delegate ADJ CC.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:32 |
| S158 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:32 |
| S159 | 1 | S147 AND S158 | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:33 |
| S160 | 10 | S144 AND S158 | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:33 |
| S161 | 64 | (primary ADJ CC) AND (radio NEAR resource NEAR control) AND timing.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:34 |
| S163 | 8801 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S164 | 213 | (H04B1/7087).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S165 | 8686 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S166 | 3665 | (370/350).CCLS. | US-PGPUB; USPAT | OR | OFF | 2015/01/13 15:01 |
| S167 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S168 | 7 | S163 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S169 | 86 | S167 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S170 | 56 | S165 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:02 |
| S171 | 5348 | uplink AND synchronization.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |

| | | | | | | |
|---|---|---|---|---|---|---|
| S172 | 431 | S163 AND S171 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |
| S173 | 3 | S167 AND S172 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |
| S174 | 8686 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:31 |
| S175 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:32 |
| S176 | 56 | S174 AND S175 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:32 |

**12/26/2016 7:49:53 PM**
**C:\Users\ltruong1\Documents\EAST\Workspaces\14-733068_CON_578531.wsp**

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | Examiner | Art Unit |
| | LAN HUONG TRUONG | 2464 |

| CPC- SEARCHED | | |
|---|---|---|
| Symbol | Date | Examiner |
| H04W56/00; H04W74/002; 74/0833; H04W72/04 | 12/19/2016 | LT |
| H04Q7/20 | 12/19/2016 | LT |
| H04J3/00 | 12/19/2016 | LT |

| CPC COMBINATION SETS - SEARCHED | | |
|---|---|---|
| Symbol | Date | Examiner |
| | | |

| US CLASSIFICATION SEARCHED | | | |
|---|---|---|---|
| Class | Subclass | Date | Examiner |
| | | | |

| SEARCH NOTES | | |
|---|---|---|
| Search Notes | Date | Examiner |
| CPC searching performed | 12/19/2016 | LT |
| East searching performed | 12/19/2016 | LT |
| Double Patenting searching performed | 12/19/2016 | LT |
| Text searching performed | 12/19/2016 | LT |

| INTERFERENCE SEARCH | | | |
|---|---|---|---|
| US Class/ CPC Symbol | US Subclass / CPC Group | Date | Examiner |
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PTO/SB/08a (03-15)
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# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | P4998USC1 |

**U.S.PATENTS**

| 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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|---|---|---|---|

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 14733068 |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | 2464 |
| | Examiner Name | TRUONG, LAN-HUONG |
| | Attorney Docket Number | P4998USC1 |

| | | | |
|---|---|---|---|
| | 1 | CATT, " L3 Anchor Carrier", 3GPP TSG-RAN WG2 Meeting #67, R2-094322, August 24-28, 2009, 2 pages, Shenzhen, China. | ☐ |
| | 2 | Nokia Corporation, Nokia Siemens Networks, "RACH and carrier aggregation", 3GPP TSG-RAN WG2 Meeting #67bis, 2009.10.12-16, 3 pages, Miyazaki, Japan. | ☐ |

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| 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 | 14733068 |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | 2464 |
| | Examiner Name | TRUONG, LAN-HUONG |
| | Attorney Docket Number | P4998USC1 |

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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 | /Christopher B. Kilner/ | Date (YYYY-MM-DD) | 2017-01-25 |
|---|---|---|---|
| Name/Print | Christopher B. Kilner | Registration Number | 45,381 |

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| **EFS ID:** | 28163763 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 58027 |
| **Filer:** | Hae-Chan Park/Ethan Song |
| **Filer Authorized By:** | Hae-Chan Park |
| **Attorney Docket Number:** | P4998USC1 |
| **Receipt Date:** | 25-JAN-2017 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 14:30:49 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P4998USC1_IDS.pdf | 72717<br>1e9aa7140e71891b8cfe5ab67d6825124f491d4e | no | 4 |

**Warnings:**

| Information: | | | | | |
|---|---|---|---|---|---|
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Non Patent Literature | NPL1_L3_Anchor_Carrier.pdf | 309921<br>0c4ef6a4b6140e34798bb3116bd5278a1e1eca72 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | NPL2_RACH_and_carrier_aggregation.pdf | 73107<br>611e58b41ae3877372396460 1fd91104b8248e85 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | | **Total Files Size (in bytes):** | 455745 | |

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**New Applications Under 35 U.S.C. 111**

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

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

**New International Application Filed with the USPTO as a Receiving Office**

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

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| *In re* Patent Application of: | Docket No.: P4998USC1 |
| Kibum KWON *et al.* | |
| Serial No.: 14/733,068 | Group Art Unit: 2464 |
| Confirmation No.: 5097 | |
| Filed: June 8, 2015 | Examiner: TRUONG, LAN-HUONG |

For: **APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM**

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**REPLY UNDER 37 C.F.R. § 1.111**

Dear Commissioner:

In response to the Non-Final Office Action mailed December 30, 2016 ("Office Action"), Applicants respectfully request reconsideration of the Application in view of the following Remarks.

A **Claim List** begins on page 2.

**Remarks** begin on page 5.

No extensions of time are required at this time. If extensions of time are necessary to prevent abandonment of this Application, then they are petitioned for under 37 C.F.R. § 1.136(a). No fees for net addition of claims are required at this time. Any fees required for extensions of time or for the net addition of claims may be charged to Deposit Account No. 50-3698.

## CLAIM LIST

This claim list replaces all prior claim lists in the Application.

1. (Original) A method for establishing an uplink (UL) synchronization in a wireless communication system by an evolved NodeB (eNB), the method comprising:

transmitting, to a User Equipment (UE), Radio Resource Control (RRC) signaling including a UL timing group information set through a primary Component Carrier (CC), the UL timing group information set comprising one or more UL timing groups, the one or more UL timing groups each comprising one or more UL CCs;

receiving a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group; and

transmitting a Random Access Response (RAR) including a Timing Advance (TA) value for UL CCs in the respective UL timing group,

wherein each TA value is calculated by the eNB for the respective UL timing group based on the received RAP associated with a delegate CC of the respective UL timing group, and

wherein each TA value is configured to be applied to CCs in the respective UL timing group.

2. (Original) A method for establishing an uplink (UL) synchronization by a User Equipment (UE), the method comprising:

receiving a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);

configuring one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs;

transmitting a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group;

receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group; and

applying each TA value to CCs in the respective UL timing group.

3. (Original) A User Equipment (UE) to establish an uplink (UL) synchronization in a wireless communication system, the UE comprising:

a transceiver configured to receive a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB);

a controller configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs,

wherein the transceiver transmits a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group, and receives a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group,

wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group, and

wherein the controller applies each TA value to CCs in the respective UL timing group.



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## REMARKS

The claims have not been amended. Accordingly, claims 1, 2, and 3 are currently pending in the Application, of which claims 1, 2, and 3 are independent.

In view of the following Remarks, Applicants respectfully request reconsideration and timely withdrawal of the pending rejections for the reasons discussed below.

***Rejections Under 35 U.S.C. § 103***

Claims 1-3 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent Application Publication No. 2009/0279495, applied for by Yoo, *et al.* ("Yoo") in view of U.S. Patent Application Publication No. 2012/0008600, applied for by Marinier, *et al.* ("Marinier") further in view of U.S. Patent Application Publication No. 2008/0268850, applied for by Narasimha, *et al.* ("Narasimha"). Applicants respectfully traverse this rejection for at least the following reasons.

To establish an obviousness rejection under 35 U.S.C. § 103(a), four factual inquiries must be examined. The four factual inquiries include (a) determining the scope and contents of the prior art; (b) ascertaining the differences between the prior art and the claims in issue; (c) resolving the level of ordinary skill in the pertinent art; and (d) evaluating evidence of secondary consideration. *Graham v. John Deere*, 383 U.S. 1, 17-18 (1966).

In view of these four factors, the analysis supporting a rejection under 35 U.S.C. § 103(a) should be made explicit, and should "identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed. *KSR Int'l. Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 82 USPQ2d 1385, 1396 (2007). The Federal Circuit requires that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational

underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006).

Finally, even if the prior art may be combined, there must be a reasonable expectation of success, and the reference or references, when combined, must disclose or suggest every claimed feature. *See In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Claim 1 recites, *inter alia*:

> transmitting, to a User Equipment (UE), Radio Resource Control (RRC) signaling including a UL timing group information set through a primary Component Carrier (CC), ***the UL timing group information set*** comprising one or more ***UL timing groups***, the one or more UL timing groups each comprising one or more UL CCs;
> receiving a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a ***delegate CC*** in the respective ***UL timing group***; and
> transmitting a Random Access Response (RAR) including a Timing Advance (TA) value for UL CCs in the respective UL timing group,
> wherein each TA value is calculated by the eNB for the respective UL timing group based on the received RAP associated with ***a delegate CC of the respective UL timing group***, and
> wherein each TA value is configured to be ***applied to CCs in the respective UL timing group*** (emphasis added).

In rejecting claim 1, the Office Action acknowledges that Yoo does not explicitly disclose "the UL timing group information set comprising one or more UL timing groups, the one or more UL timing groups each comprising one or more UL CCs," as recited in claim 1, and alleges that Marinier teaches such feature. Office Action, pages 4-5. Applicants respectfully disagree.

Marinier discloses in FIG. 2, that at 204, the WTRU may be configured to determine one or more uplink component carrier sets (UL CC sets) which may comprise one or more of the uplink carriers which may be capable of operating with the same Timing Advance (TA). Marinier, para. [0104]. At 206, the WTRU may also be configured to select at least one UL CC set and, at 208, identify at least one of the one or more uplink carriers that may be capable if random access channel (RACH) communication for the selected at least one UL CC set. *Id.* At 210, the WTRU may be configured to initiate a RACH communication on at least one of the identified

one or more uplink carriers for the selected at least one UL CC set and, at 212, to receive a TA value in response to the RACH communication. *Id.* The WTRU may be further configured, at 214, to apply the TA value to each of the one or more uplink carriers that comprise the selected at least one UL CC set. *Id.* As such, Marinier teaches that the WTRU may be configured to receive a Time Advance (TA) value and apply the TA value to each of the one or more "uplink carriers" that comprise the selected UL CC. However, Marinier fails to disclose or teach at least the RRC including a "UL timing group information set" comprising "one or more UL timing groups," the one or more UL timing groups each comprising one or more UL CCs. Accordingly, Marinier also fails to disclose or teach "each TA value is configured to be applied to CCs in the respective UL timing group," as recited in claim 1.

Further, the Office Action acknowledges that the Yoo-Marnier combination fails to disclose "wherein each TA value is calculated by the eNB for the respective UL timing group based on the received RAP associated with a delegate CC of the respective UL timing group," but alleges that Narasimha discloses such feature. Office Action, page 5. Applicants respectfully disagree.

Narasimha teaches that in response to receiving random access channel preamble, the target base station 130 can send a timing advance message addressed by the random access channel preamble and a source bases station identifier. Narasimha, para. [0027]. Narasimha further teaches that the target base station 130 can calculate the timing advance for the mobile stations for the timing advance message which can include at least one of the timing advance for the mobile station and an uplink grant for the mobile station. *Id.* at para. [0028]. However, Narasimha fails to disclose a TA value calculated for the respective "UL timing group" or a "delegate CC of the respective UL timing group." As such, Narasimha fails to disclose or teach at least "wherein each TA value is calculated by the eNB for the respective UL timing group based on the received RAP associated with a delegate CC of the respective UL timing group."

Claims 2 and 3 recite similar features as noted above with respect to claim 1, and should be deemed allowable for similar reasons.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. § 103(a) rejection of claims 1, 2, and 3. Since none of the alleged prior art of record, whether taken alone or in any combination, discloses or suggests all the features of the claimed subject matter, Applicants respectfully submit that independent claims 1, 2, and 3 are allowable.

## CONCLUSION

A full and complete response has been made to the pending Office Action, and all of the grounds for rejection have been overcome or rendered moot. Accordingly, all pending claims are allowable, and the Application is in condition for allowance.

The Examiner is invited to contact Applicants' undersigned representative at the number below if it would expedite prosecution. Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,

/Christopher B. Kilner/

Christopher B. Kilner
Reg. No. 45,381

Date: March 27, 2017

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CBK/YSK/yhj

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. OMB 0651-0035
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# POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

☒ Practitioners associated with Customer Number: 58027

OR

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

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |
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| | | | |
| | | | |
| | | | |
| | | | |

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

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

☒ The address associated with Customer Number: 58027

OR

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

Assignee Name and Address: Pantech Inc.
179 Seongam-ro, Mapo-gu, Seoul, Republic of Korea

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

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

| | | | |
|---|---|---|---|
| Signature | 이 정 석 | Date | November 19, 2015 |
| Name | Jong-Seok Lee | Telephone | 82-2-2030-0491 |
| Title | IP Legal Team Leader | | |

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

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# STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: PANTECH INC.

Application No./Patent No.: 14/733,068 Filed/Issue Date: 2015-06-08

Titled: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

PANTECH INC., 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:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: KWON et al. To: PANTECH CO., LTD.

   The document was recorded in the United States Patent and Trademark Office at

   Reel 028776, Frame 0338, or for which a copy thereof is attached.

2. From: PANTECH CO., LTD. To: PANTECH INC.

   The document was recorded in the United States Patent and Trademark Office at

   Reel 039428, Frame 0268, or for which a copy thereof is attached.



This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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## STATEMENT UNDER 37 CFR 3.73(c)

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☐ 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.

| /Christopher B. Kilner/ | 2017-03-27 |
|---|---|
| Signature | Date |
| Christopher B. Kilner | 45,381 |
| 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.

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| *In re* Patent Application of: | Docket No.: P4998USC1 |
| Kibum KWON *et al.* | |
| Serial No.: 14/733,068 | Group Art Unit: 2464 |
| Confirmation No.: 5097 | |
| Filed: June 8, 2015 | Examiner: TRUONG, LAN-HUONG |

For: **APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM**

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

## REQUEST FOR CORRECTED OFFICIAL FILING RECEIPT

Applicant respectfully requests a corrected Official Filing Receipt for the above-identified patent application. In particular, it is requested that the Applicant's name be corrected from "PANTECH CO., LTD." to "PANTECH INC.", as indicated in the accompanying marked-up version of the Filing Receipt and the concurrently filed corrected Application Data Sheet.

Respectfully submitted,

/Christopher B. Kilner/

Christopher B. Kilner
Reg. No. 45,381

Date: March 27, 2017

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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| APPLICATION NUMBER | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | 2414 | 1740 | P4998USC1 | 3 | 3 |

**CONFIRMATION NO. 5097**

**UPDATED FILING RECEIPT**

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

OC000000077030516

Date Mailed: 08/24/2015

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)**

Kibum KWON, Seoul, KOREA, REPUBLIC OF;
Myungcheul JUNG, Seoul, KOREA, REPUBLIC OF;

**Applicant(s)**

~~Pantech Co., Ltd.~~, Seoul, KOREA, REPUBLIC OF; Pantech Inc.

**Power of Attorney:** The patent practitioners associated with Customer Number 58027

**Domestic Priority data as claimed by applicant**

This application is a CON of 13/578,531 08/10/2012 PAT 9054835
which is a 371 of PCT/KR2011/000909 02/10/2011

**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.)
REPUBLIC OF KOREA 10-2010-0012564 02/10/2010
REPUBLIC OF KOREA 10-2010-0027230 03/26/2010
REPUBLIC OF KOREA 10-2011-0008683 01/28/2011

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

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

**If Required, Foreign Filing License Granted:** 06/17/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/733,068**

**Projected Publication Date:** 09/24/2015

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

**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 AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

**NOT GRANTED**

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

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# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 28748944 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 58027 |
| **Filer:** | Hae-Chan Park/Grace Gao |
| **Filer Authorized By:** | Hae-Chan Park |
| **Attorney Docket Number:** | P4998USC1 |
| **Receipt Date:** | 27-MAR-2017 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 16:45:57 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | P4998USC1_NFOA_Response.pdf | 123411<br>67443a6f9167c6d83d7248f5856c69101422b00f | yes | 9 |

| | Multipart Description/PDF files in .zip description | | |
|---|---|---|---|
| | **Document Description** | **Start** | **End** |
| | Amendment/Req. Reconsideration-After Non-Final Reject | 1 | 1 |
| | Claims | 2 | 4 |
| | Applicant Arguments/Remarks Made in an Amendment | 5 | 9 |

| | | | | | |
|---|---|---|---|---|---|
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Power of Attorney | P4998USC1_POA.pdf | 713356<br>83d78cf7ce26e59afe1076e2ed645f52b9a9c8e9 | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Request for Corrected Filing Receipt | P4998USC1_Request_for_Corrected_FilingReceipt.pdf | 4210048<br>1204f3ebc71970db6047e9023872e8cfcc5624cd | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 5046815 | | |

**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.**

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

**CORRECTED ADS FORM**

| | |
|---|---|
| Application Number | 14733068 |
| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |

**Inventor Information**

****If no data is shown, no data has been corrected****

| | Data of Record | Updated Data |
|---|---|---|
| Order Number | | |
| Name | | |
| **Residence Information** | | |
| Residency | | |
| City | | |
| State | | |
| Country of Residence | | |
| **Mailing Address of Inventor** | | |
| Address 1 | | |
| Address 2 | | |
| City,State/Province, Postal Code | | |
| Country | | |

**Application Information**

| | Data of Record | Updated Data |
|---|---|---|
| Title of Invention | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM | |
| Attorney Docket Number | P4998USC1 | |
| Entity Type | Regular Undiscounted | |

## Domestic Benefit/National Stage Information

****If no data is shown, no data has been corrected****

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 this 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(a).

| | | Data of Record | Updated Data |
|---|---|---|---|
| | Prior Application Status | | |
| | Application Number | | |
| | Continuity Type | | |
| | Prior Application Number | | |
| | Filing Date (YYYY-MM-DD) | | |
| | Patent Number | | |
| | Issue Date (YYYY-MM-DD) | | |

## Foreign Priority Information

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

****If no data is shown, no data has been corrected****

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) 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).

| | | Data of Record | Updated Data |
|---|---|---|---|
| | Application Number | | |
| | Country | | |
| | Filing Date | | |
| | Access Code | | |

## Applicant Information

****If no data is shown, no data has been corrected****
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.

| | Data of Record | Updated Data |
|---|---|---|
| Applicant Type | ASG | |
| 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 | | |
| Applicant is an Organization | Yes | |
| Name | | |
| Organization Name | ~~Pantech Co., Ltd.~~ | Pantech Inc. |
| Address 1 | | 179 Seongam-ro, Mapo-gu |
| Address 2 | | |

| | | |
|---|---|---|
| City,State/Province,Postal Code | Seoul | |
| Country | KR | |
| Phone Number | | |
| Fax Number | | |
| Email Address | | |

## Assignee Information including Non-Applicant Assignee Information

****If no data is shown, no data has been corrected****
Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office

| | Data of Record | Updated Data |
|---|---|---|
| Order | | |
| Applicant is an Organization | | |
| Name | | |
| Organization Name | | |
| **Mailing Address** | | |
| Address 1 | | |
| Address 2 | | |
| City,State/Province,Postal Code | | |
| Country | | |
| Phone Number | | |
| Fax Number | | |
| Email Address | | |

## Signature

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b).

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 | /Christopher B. Kilner/ | Registration Number | 45381 |
| First Name | Christopher | Last Name | Kilner |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 28740564 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | |
| **Customer Number:** | 58027 |
| **Filer:** | Hae-Chan Park/Grace Gao |
| **Filer Authorized By:** | Hae-Chan Park |
| **Attorney Docket Number:** | P4998USC1 |
| **Receipt Date:** | 27-MAR-2017 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 16:51:45 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Application Data Sheet to update/ correct info | CorrectedADS.pdf | 64778<br>85efbfe41db5419badf81f600dc39d69971f2b00 | no | 5 |

**Warnings:**

| Information: | |
|---|---|
| Total Files Size (in bytes): | 64778 |

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

**New Applications Under 35 U.S.C. 111**

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

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

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

**New International Application Filed with the USPTO as a Receiving Office**

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

# PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT4338128

| | |
|---|---|
| **SUBMISSION TYPE:** | NEW ASSIGNMENT |
| **NATURE OF CONVEYANCE:** | ASSIGNMENT |

**CONVEYING PARTY DATA**

| Name | Execution Date |
|---|---|
| PANTECH INC | 10/31/2016 |

**RECEIVING PARTY DATA**

| | |
|---|---|
| **Name:** | GOLDPEAK INNOVATIONS INC |
| **Street Address:** | SUITE #806, DIGITAL-RO 34-GIL, 55, GURO-GU |
| **City:** | SEOUL |
| **State/Country:** | KOREA, REPUBLIC OF |

**PROPERTY NUMBERS Total: 96**

| Property Type | Number |
|---|---|
| **Patent Number:** | 9548839 |
| **Patent Number:** | 9048991 |
| **Patent Number:** | 8631297 |
| **Patent Number:** | 8631298 |
| **Patent Number:** | 8681599 |
| **Patent Number:** | 9288824 |
| **Patent Number:** | 8611297 |
| **Patent Number:** | 8380227 |
| **Patent Number:** | 8583147 |
| **Patent Number:** | 9357486 |
| **Patent Number:** | 8606303 |
| **Patent Number:** | 7505776 |
| **Patent Number:** | 7853852 |
| **Patent Number:** | 9270365 |
| **Patent Number:** | 9419739 |
| **Patent Number:** | 9485072 |
| **Patent Number:** | 8588185 |
| **Patent Number:** | 9392582 |
| **Patent Number:** | 9131482 |
| **Patent Number:** | 9265034 |
| **Patent Number:** | 9369251 |

| Property Type | Number |
|---|---|
| **Patent Number:** | 8897182 |
| **Patent Number:** | 9344245 |
| **Patent Number:** | 9380581 |
| **Patent Number:** | 8576822 |
| **Patent Number:** | 9474025 |
| **Patent Number:** | 9516538 |
| **Patent Number:** | 9531574 |
| **Patent Number:** | 9264273 |
| **Patent Number:** | 8531939 |
| **Patent Number:** | 9124688 |
| **Patent Number:** | 8675844 |
| **Patent Number:** | 8933955 |
| **Patent Number:** | 8706168 |
| **Patent Number:** | 8554185 |
| **Patent Number:** | RE44620 |
| **Patent Number:** | RE42996 |
| **Patent Number:** | 7292561 |
| **Patent Number:** | 8433379 |
| **Patent Number:** | 7991958 |
| **Patent Number:** | 9178982 |
| **Patent Number:** | 8699987 |
| **Patent Number:** | 7643815 |
| **Patent Number:** | 8260349 |
| **Patent Number:** | 9237278 |
| **Patent Number:** | 8750927 |
| **Patent Number:** | 8271035 |
| **Patent Number:** | 7894854 |
| **Patent Number:** | 7912482 |
| **Patent Number:** | 7668553 |
| **Patent Number:** | 6784829 |
| **Patent Number:** | 9495730 |
| **Patent Number:** | 8767018 |
| **Patent Number:** | 8120626 |
| **Patent Number:** | 7755647 |
| **Patent Number:** | 8446915 |
| **Patent Number:** | 7693163 |
| **Patent Number:** | 7660592 |
| **Patent Number:** | 9204118 |

| Property Type | Number |
|---|---|
| **Patent Number:** | 7668569 |
| **Patent Number:** | 7412262 |
| **Patent Number:** | 9319507 |
| **Patent Number:** | 8923927 |
| **Patent Number:** | 8532626 |
| **Patent Number:** | 7420566 |
| **Patent Number:** | 8588755 |
| **Patent Number:** | 8565724 |
| **Patent Number:** | 7386297 |
| **Application Number:** | 15406403 |
| **Application Number:** | 15069340 |
| **Application Number:** | 15167367 |
| **Application Number:** | 15014792 |
| **Application Number:** | 15077466 |
| **Application Number:** | 14493673 |
| **Application Number:** | 15222068 |
| **Application Number:** | 15335679 |
| **Application Number:** | 14733068 |
| **Application Number:** | 15206508 |
| **Application Number:** | 14703360 |
| **Application Number:** | 15180153 |
| **Application Number:** | 15151296 |
| **Application Number:** | 15192233 |
| **Application Number:** | 15131725 |
| **Application Number:** | 15279139 |
| **Application Number:** | 15183158 |
| **Application Number:** | 14560838 |
| **Application Number:** | 15341296 |
| **Application Number:** | 15200980 |
| **Application Number:** | 15390278 |
| **Application Number:** | 14061316 |
| **Application Number:** | 13861177 |
| **Application Number:** | 14929965 |
| **Application Number:** | 14993007 |
| **Application Number:** | 15349218 |
| **Application Number:** | 15131746 |
| **Application Number:** | 15399077 |

**CORRESPONDENCE DATA**

**Fax Number:**

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


**Email:** edward.park@fidelis-laws.com

**Correspondent Name:** FIDELIS LAW GROUP, PLLC

**Address Line 1:** 444 W BROAD ST UNIT 426

**Address Line 4:** FALLS CHURCH, VIRGINIA 22046


| | |
|---|---|
| **NAME OF SUBMITTER:** | EDWARD PARK |
| **SIGNATURE:** | /sjp/ |
| **DATE SIGNED:** | 03/27/2017 |
| | This document serves as an Oath/Declaration (37 CFR 1.63). |

**Total Attachments: 4**

source=Patent Assignment Agreement_2016.11 executed_Redacted#page1.tif
source=Patent Assignment Agreement_2016.11 executed_Redacted#page2.tif
source=Patent Assignment Agreement_2016.11 executed_Redacted#page3.tif
source=Patent Assignment Agreement_2016.11 executed_Redacted#page4.tif

# PATENT ASSIGNMENT

This Patent Assignment (the "Assignment") is made from **PANTECH INC** ("Assignor"), a corporation organized and existing under the laws of Korea with its principal place at Pantech Building, 179 Seongam-ro Mapo-go, Seoul, Korea, to **GoldPeak Innovations Inc** ("Assignee"), a corporation organized under the laws of the Republic of Korea, having an address at suite # 806, Digital-ro 34-gil, 55, Guro-gu, Seoul, Korea.

**WHEREAS,** Assignor and Assignee have entered into that certain Patent Assignment Agreement dated as of October 31, 2016 (the "Agreement"), whereby, among other things, Assignor has agreed to assign, and Assignee has agreed to accept, all of those patents and patent applications listed on Annex A hereto, and all existing and any future Patents that may be granted therefore throughout the world, all of their foreign counterparts, reissues, re-examinations, renewals, extensions, provisional, divisional and continuation applications including continuation in part, and any United States and foreign applications and patents that claimed, claim and will claim priorities to those listed above, as well as all patents and applications from which those listed above derive, relate, or claim priority (collectively, the "Patent Rights").

**NOW THEREFORE**, in exchange for good and valuable consideration under the Agreement, the receipt and sufficiency of which Assignor hereby acknowledges, and as a condition to Assignee entering into the Agreement, Assignor hereby assigns and transfers to Assignee and Assignee accepts, all of the right, title and interest of Assignor throughout the world in and to any and all inventions claimed or disclosed in the Patent Rights.

This Assignment includes all of Assignor's right, title and interest in, to and under each of the Patent Rights (including without limitation, rights to damages and payments for past, present and future infringements or misappropriations, including the right to collect and receive any royalties, or settlements for such infringements, all rights to sue for injunctive or other equitable relief, and any and all causes of action relating to any of the inventions or discoveries thereof), and, as agreed to between the parties, all continuations, continuations-in-part, divisionals, substitutes, reexaminations, post-opposition foreign counterpart patents and applications, reissues and extensions thereof, if any, and, Assignor requests the Commissioner of Patents of the United States (and all foreign officials, whose duty it is to issue patents and applications as aforesaid) to record Assignee as the owner of such Patent Rights, to the same extent as held by Assignor, and to issue the Letters Patent for such Patent Rights in the name of Assignee, as assignee of the Patent Rights.

This instrument shall inure to the benefit of Assignee and its successors and assigns, and shall be binding upon Assignor and its successors and assigns.

Assignor hereby covenants that it has full right to convey the entire interest herein assigned, and that it has not executed, and will not execute, any agreement in conflict with this Assignment. Assignor hereby further covenants and agrees that it will communicate to Assignee any and all facts known to it respecting the Patent Rights, including the existing licenses, encumbrances or other restrictions that are expressly binding on successors to the Patent Rights, and testify in any

JC

legal proceeding, sign all lawful papers, execute and deliver all papers and take any actions that may be necessary or desirable to perfect the title to any aforementioned patents and inventions, execute all divisional, continuation, reexamination, reissue, substitute applications, and any similar and equivalent procedure under current and future legislations and regulations throughout the world, and make all rightful oaths to aid Assignee to obtain and enforce proper patent protection for said inventions in all countries.

Date of: _____

**PANTECH INC.**

_____
Signature

Joon CHUNG
Name

CEO
Title

**GoldPeak Innovations Inc. :**

_____
Signature

Youngjoon Rhee
Name

CEO
Title

Annex A

**Patents and/or Patent Applications**

| NO | Category | Application No | Filing Date | Patent No | Issued Date |
|---|---|---|---|---|---|
| 1 | [redacted] | 12/388,243 | 2/18/2009 | US 7894330 | 2/22/2011 |
| 2 | | 12/347,352 | 12/31/2008 | US 8102804 | 1/24/2012 |
| 3 | | 11/165,744 | 6/24/2005 | US 7505775 | 3/17/2009 |
| 4 | | 11/320,374 | 12/27/2005 | US 7725796 | 5/25/2010 |
| 5 | | 13/715,278 | 12/14/2012 | US 8873519 | 10/28/2014 |
| 6 | | 14/357,557 | 3/9/2014 | US 9313743 | 4/12/2016 |
| 7 | | 13/481,481 | 5/25/2012 | US 8848674 | 9/30/2014 |
| 8 | | 13/332,089 | 12/20/2011 | US 8649346 | 2/11/2014 |
| 9 | | 13/877,827 | 4/4/2013 | US 9237566 | 1/12/2016 |
| 10 | | 14/056,474 | 10/17/2013 | US 9008046 | 4/14/2015 |
| 11 | | 13/098,056 | 4/29/2011 | US 8780860 | 7/15/2014 |
| 12 | | 13/578,531 | 8/10/2012 | US 9054835 | 6/9/2015 |
| 13 | | 13/504,908 | 4/27/2012 | US 9077510 | 7/7/2015 |
| 14 | | 12/916,203 | 10/29/2010 | US 8538411 | 9/17/2013 |
| 15 | | 13/891,522 | 5/10/2013 | US 9025485 | 5/5/2015 |
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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875 | Application or Docket Number<br>14/733,068 | Filing Date<br>06/08/2015 | ☐ To be Mailed |
|---|---|---|---|

**ENTITY:** ☒ LARGE ☐ SMALL ☐ MICRO

## APPLICATION AS FILED – PART I

| FOR | (Column 1) NUMBER FILED | (Column 2) NUMBER EXTRA | RATE ($) | FEE ($) |
|---|---|---|---|---|
| ☐ BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | |
| ☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | |
| ☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | |
| TOTAL CLAIMS (37 CFR 1.16(i)) | minus 20 = | * | X $ = | |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | minus 3 = | * | X $ = | |
| ☐ 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

| AMENDMENT | 03/27/2017 | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | RATE ($) | ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|
| | Total (37 CFR 1.16(i)) | * 3 | Minus | ** 20 | = 0 | X $80 = | 0 |
| | Independent (37 CFR 1.16(h)) | * 3 | Minus | ***3 | = 0 | X $420 = | 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) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | RATE ($) | ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|
| | Total (37 CFR 1.16(i)) | * | Minus | ** | = | X $ = | |
| | Independent (37 CFR 1.16(h)) | * | Minus | *** | = | X $ = | |
| | ☐ 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.
** 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 number found in the appropriate box in column 1.

LIE
LAWANDA MILTON

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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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 |

**CONFIRMATION NO. 5097**

**POA ACCEPTANCE LETTER**

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

*OC000000090303264*

Date Mailed: 03/31/2017

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/27/2017.

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**.

/cvorachack/

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 |
|---|---|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | 2464 | 1740 | P4998USC1 | 3 | 3 |

**CONFIRMATION NO. 5097**

**CORRECTED FILING RECEIPT**

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

OC000000090303279

Date Mailed: 03/31/2017

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)**

Kibum KWON, Seoul, KOREA, REPUBLIC OF;
Myungcheul JUNG, Seoul, KOREA, REPUBLIC OF;

**Applicant(s)**

Pantech Inc., Seoul, KOREA, REPUBLIC OF;

**Power of Attorney:** The patent practitioners associated with Customer Number 58027

**Domestic Priority data as claimed by applicant**

This application is a CON of 13/578,531 08/10/2012 PAT 9054835
which is a 371 of PCT/KR2011/000909 02/10/2011

**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.)
REPUBLIC OF KOREA 10-2010-0012564 02/10/2010
REPUBLIC OF KOREA 10-2010-0027230 03/26/2010
REPUBLIC OF KOREA 10-2011-0008683 01/28/2011

**Permission to Access Application via Priority Document Exchange:** Yes

**Permission to Access Search Results:** No

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

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

**If Required, Foreign Filing License Granted:** 06/17/2015
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/733,068**
**Projected Publication Date:** Not Applicable
**Non-Publication Request:** No
**Early Publication Request:** No
**Title**

APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

**Preliminary Class**

370

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

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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).

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## Title 35, United States Code, Section 184

## Title 37, Code of Federal Regulations, 5.11 & 5.15

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# POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

■ Practitioners associated with Customer Number: 146410

**OR**

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

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

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

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

■ The address associated with Customer Number: 146410

**OR**

| | | | | |
|---|---|---|---|---|
| ☐ | Firm or Individual Name | Fidelis Law Group, PLLC | | |
| | Address | 444 W Broad St unit 426 | | |
| | City | Falls Church | State VA | Zip 22046 |
| | Country | USA | | |
| | Telephone | 571.730.4572 | Email | edward.park@fidelis-laws.com |

Assignee Name and Address: GOLDPEAK INNOVATIONS INC
SUITE #806, DIGITAL-RO 34-GIL, 55, GURO-GU
SEOUL, REPUBLIC OF KOREA

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

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

| | | | |
|---|---|---|---|
| Signature | | Date | 27 / Mar / 2017 |
| Name | Youngjoon Rhee | Telephone | +82.10.8929.1905 |
| Title | CEO | | |

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

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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.

PTO/AIA/96 (08-12)
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# STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: GOLDPEAK INNOVATIONS INC

Application No./Patent No.: 14733068 Filed/Issue Date: 06/08/2015

Titled: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

GOLDPEAK INNOVATIONS INC, 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:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: PANTECH CO., LTD. To: PANTECH INC.

   The document was recorded in the United States Patent and Trademark Office at
   Reel 039428, Frame 0268, or for which a copy thereof is attached.

2. From: PANTECH INC. To: GOLDPEAK INNOVATIONS INC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 042098, Frame 0653, or for which a copy thereof is attached.



This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
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## STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

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4. From: _____ To: _____

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6. From: _____ To: _____

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☐ 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.

| | |
|---|---|
| /sjp/ | 4/4/2017 |
| Signature | Date |
| Seong Jun PARK | 73,534 |
| 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.

# APPLICATION DATA SHEET 37 CFR 1.76

****If no data is shown, no data has been corrected/updated****

## APPLICANT INFORMATION

Applicant Authority Type:: Assignee

Organization:: Yes

Applicant name:: ~~Pantech Inc.~~ GOLDPEAK INNOVATIONS INC

Street of mailing address:: ~~179 Seongam-ro, Mapo-gu~~ SUITE #806, DIGITAL-RO 34-GIL, 55, GURO-GU

City of mailing address:: Seoul

Country of mailing address:: KR

Postal or Zip Code of mailing address:: 08378

## SIGNATURE OF REGISTERED U.S. PATENT PRACTITIONER

| | | | |
|---|---|---|---|
| Signature | /sjp/ | Date | 5/4/2017 |
| Name | Seong Jun PARK | Reg No. | 73,534 |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 29123031 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 58027 |
| **Filer:** | Seong Jun Park |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | P4998USC1 |
| **Receipt Date:** | 05-MAY-2017 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 00:41:40 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Power of Attorney | POA.pdf | 1045958<br>a87949d5c25ca9a30afe1aff1de0bb07b1b67cde | no | 2 |

**Warnings:**

| | | | | | |
|---|---|---|---|---|---|
| **Information:** | | | | | |
| 2 | Assignee showing of ownership per 37 CFR 3.73 | 14733068.pdf | 122035<br>9abcd05565d617bf3dd271665f867c3ffd007829 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Application Data Sheet | 14733068CorrectedADS.pdf | 27131<br>d3f46f719d4adcf4fa7f337a6b80d94758686cef | no | 1 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied ADS fillable form | | | | | |
| | | | **Total Files Size (in bytes):** | 1195124 | |

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

**New Applications Under 35 U.S.C. 111**

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

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

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

**New International Application Filed with the USPTO as a Receiving Office**

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 |

**CONFIRMATION NO. 5097**

**POA ACCEPTANCE LETTER**

146410
Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

*OC000000091182410*

Date Mailed: 05/09/2017

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/05/2017.

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**.

/tlulu/

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 |

**CONFIRMATION NO. 5097**

**POWER OF ATTORNEY NOTICE**

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

*OC000000091182406*

Date Mailed: 05/09/2017

## NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/05/2017.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

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

/tlulu/

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 |
|---|---|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | 2464 | 1740 | P4998USC1 | 3 | 3 |

**CONFIRMATION NO. 5097**

**CORRECTED FILING RECEIPT**

146410
Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

OC000000091182411

Date Mailed: 05/09/2017

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)**

Kibum KWON, Seoul, KOREA, REPUBLIC OF;
Myungcheul JUNG, Seoul, KOREA, REPUBLIC OF;

**Applicant(s)**

GOLDPEAK INNOVATIONS INC, Seoul, KOREA, REPUBLIC OF;

**Power of Attorney:** The patent practitioners associated with Customer Number 146410

**Domestic Priority data as claimed by applicant**

This application is a CON of 13/578,531 08/10/2012 PAT 9054835
which is a 371 of PCT/KR2011/000909 02/10/2011

**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.)
REPUBLIC OF KOREA 10-2010-0012564 02/10/2010
REPUBLIC OF KOREA 10-2010-0027230 03/26/2010
REPUBLIC OF KOREA 10-2011-0008683 01/28/2011

**Permission to Access Application via Priority Document Exchange:** Yes

**Permission to Access Search Results:** No

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

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

**If Required, Foreign Filing License Granted:** 06/17/2015
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/733,068**
**Projected Publication Date:** Not Applicable
**Non-Publication Request:** No
**Early Publication Request:** No
**Title**

APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

**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 AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

**NOT GRANTED**

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

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technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

UNITED STATES PATENT AND TRADEMARK OFFICE

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Alexandria, Virginia 22313-1450
www.uspto.gov

# NOTICE OF ALLOWANCE AND FEE(S) DUE

146410 7590 05/11/2017

Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

| EXAMINER |
|---|
| TRUONG, LAN-HUONG |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2464 | |

DATE MAILED: 05/11/2017

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 | 5097 |

TITLE OF INVENTION: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

| APPLN. TYPE | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | UNDISCOUNTED | $960 | $0 | $0 | $960 | 08/11/2017 |

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

**HOW TO REPLY TO THIS NOTICE:**

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

## PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail** **Mail Stop ISSUE FEE**
**Commissioner for Patents**
**P.O. Box 1450**
**Alexandria, Virginia 22313-1450**
**or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

146410 7590 05/11/2017
Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

**Certificate of Mailing or Transmission**
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being 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. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 | 5097 |

TITLE OF INVENTION: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

| APPLN. TYPE | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | UNDISCOUNTED | $960 | $0 | $0 | $960 | 08/11/2017 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| TRUONG, LAN-HUONG | 2464 | 370-350000 |

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 03-02 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 patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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.

(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. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue 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 _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee 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. _____



PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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
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www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | P4998USC1 | 5097 |

146410 7590 05/11/2017

Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

| EXAMINER | |
|---|---|
| TRUONG, LAN-HUONG | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2464 | |

DATE MAILED: 05/11/2017

**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 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, 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. 14/733,068 | Applicant(s) KWON ET AL. | |
|---|---|---|---|
| | Examiner LAN-HUONG TRUONG | Art Unit 2464 | AIA (First Inventor to File) Status No |

***-- 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 *03/27/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-3*. 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 _____.

/RICKY NGO/
Supervisory Patent Examiner, Art Unit 2464

**DETAILED ACTION**

1. The present application is being examined under the pre-AIA first to invent provisions.

2. This action is in response to the amendment filed on 03/27/2017.

***Allowable Subject Matter***

3. Claims 1-3 are allowed.

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

Claim 1 is allowable because the Prior Art of record, singly or in combination fails to teach the feature of claim(s) limitations in the context of claim as a whole. Specially, inter alia, it fails to show or render obvious a method for establishing an uplink (UL) synchronization in a wireless communication system by an evolved NodeB (eNB), the method comprising: transmitting, to a User Equipment (UE), Radio Resource Control (RRC) signaling including a UL timing group information set through a primary Component Carrier (CC), the UL timing group information set comprising one or more UL timing groups, the one or more UL timing groups each comprising one or more UL CCs; receiving a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group; and transmitting a Random Access Response (RAR) including a Timing Advance (TA) value for UL CCs in the respective UL timing group, wherein each TA value is calculated by the eNB for the respective UL timing group based on the received RAP associated with a delegate CC of the respective UL timing group, and wherein each TA value is configured to be applied to CCs in the respective UL timing group.

Claim 2 is allowable because the Prior Art of record, singly or in combination fails to teach the feature of claim(s) limitations in the context of claim as a whole. Specially, inter alia, it fails to show or render obvious a method for establishing an uplink (UL) synchronization by a User Equipment (UE), the method comprising: receiving a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB); configuring one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs; transmitting a Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group; receiving a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group; and applying each TA value to CCs in the respective UL timing group.

Claim 3 is allowable because the Prior Art of record, singly or in combination fails to teach the feature of claim(s) limitations in the context of claim as a whole. Specially, inter alia, it fails to show or render obvious A User Equipment (UE) to establish an uplink (UL) synchronization in a wireless communication system, the UE comprising: a transceiver configured to receive a Radio Resource Control (RRC) signaling including a UL timing group information set, which has been set by an evolved NodeB (eNB); a controller configured to configure one or more UL timing groups based on the UL timing group information set, the one or more UL timing groups each comprising one or more UL CCs, wherein the transceiver transmits a

Random Access Preamble (RAP) through one or more UL CCs, each of the one or more UL CCs transmitting an RAP being set as a delegate CC in the respective UL timing group, and receives a Random Access Response (RAR) including a Timing Advanced (TA) value for UL CCs in the respective UL timing group, wherein each TA value is transmitted from the eNB for the respective UL timing group based on the transmitted RAP associated with a delegate CC of the respective UL timing group, and wherein the controller applies each TA value to CCs in the respective UL timing group.

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 LAN HUONG TRUONG whose telephone number is (571)270-5829. The examiner can normally be reached on Mon-Fri (7:30AM-5:00PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, RICKY NGO can be reached on 571-272-3139. 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.

Patent Examiner /L.T. /
Art Unit: 2464

/RICKY NGO/
Supervisory Patent Examiner, Art Unit 2464

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | Examiner | Art Unit |
| | LAN HUONG TRUONG | 2464 |

| CPC- SEARCHED | | |
|---|---|---|
| Symbol | Date | Examiner |
| H04W56/00; H04W74/002; 74/0833; H04W72/04 | 12/19/2016 | LT |
| H04Q7/20 | 12/19/2016 | LT |
| H04J3/00 | 12/19/2016 | LT |

| CPC COMBINATION SETS - SEARCHED | | |
|---|---|---|
| Symbol | Date | Examiner |
| | | |

| US CLASSIFICATION SEARCHED | | | |
|---|---|---|---|
| Class | Subclass | Date | Examiner |
| | | | |

| SEARCH NOTES | | |
|---|---|---|
| Search Notes | Date | Examiner |
| CPC searching performed | 12/19/2016 | LT |
| East searching performed | 12/19/2016 | LT |
| Double Patenting searching performed | 12/19/2016 | LT |
| Text searching performed | 12/19/2016 | LT |
| CPC and East search updated | 4/19/2017 | LT |

| INTERFERENCE SEARCH | | | |
|---|---|---|---|
| US Class/ CPC Symbol | US Subclass / CPC Group | Date | Examiner |
| H04W56/00; H04W74/002; | 74/0833; H04W72/04 | 4/19/2017 | LT |
| H04Q7/20 | | 4/19/2017 | LT |
| H04J3/00 | | 4/19/2017 | LT |
| US-PGPUB, UPAT | Database Interference Search | 4/19/2017 | LT |

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| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | **Examiner** | **Art Unit** |
| | LAN HUONG TRUONG | 2464 |

| CPC | | | | | | |
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| **Symbol** | | | | | **Type** | **Version** |
| H04W | | 56 | / | 0005 | F | 2013-01-01 |
| H04L | | 5 | / | 0007 | A | 2013-01-01 |
| H04L | | 5 | / | 001 | I | 2013-01-01 |
| H04W | | 88 | / | 08 | A | 2013-01-01 |
| H04W | | 92 | / | 10 | A | 2013-01-01 |
| H04B | | 1 | / | 7087 | A | 2013-01-01 |
| H04W | | 56 | / | 0045 | I | 2013-01-01 |
| H04W | | 74 | / | 004 | I | 2013-01-01 |
| H04W | | 76 | / | 046 | I | 2013-01-01 |
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| /LAN HUONG TRUONG/<br>Examiner.Art Unit 2464 | 04/20/2017 | **Total Claims Allowed:** | |
| (Assistant Examiner) | (Date) | 3 | |
| /RICKY NGO/<br>Supervisory Patent Examiner.Art Unit 2464 | 04/24/2017 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 1 | Figure 9 |

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | **Examiner** | **Art Unit** |
| | LAN HUONG TRUONG | 2464 |

| US ORIGINAL CLASSIFICATION | | INTERNATIONAL CLASSIFICATION | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLASS | SUBCLASS | CLAIMED | | | | | NON-CLAIMED | | | | | |
| | | H | 0 | 4 | J | 3 / 06 (2006.01.01) | | | | | | |
| CROSS REFERENCE(S) | | | | | | | | | | | | |
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| /LAN HUONG TRUONG/<br>Examiner.Art Unit 2464 | 04/20/2017 | **Total Claims Allowed:** | |
| (Assistant Examiner) | (Date) | 3 | |
| /RICKY NGO/<br>Supervisory Patent Examiner.Art Unit 2464 | 04/24/2017 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 1 | Figure 9 |

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | **Examiner** | **Art Unit** |
| | LAN HUONG TRUONG | 2464 |

☒ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

| Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original |
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| /LAN HUONG TRUONG/<br>Examiner.Art Unit 2464 | 04/20/2017 | **Total Claims Allowed:** | |
| (Assistant Examiner) | (Date) | 3 | |
| /RICKY NGO/<br>Supervisory Patent Examiner.Art Unit 2464 | 04/24/2017 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 1 | Figure 9 |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | **Examiner** | **Art Unit** |
| | LAN HUONG TRUONG | 2464 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 12/19/2016 | 04/19/2017 | | | | | | | |
| | 1 | ✓ | = | | | | | | | |
| | 2 | ✓ | = | | | | | | | |
| | 3 | ✓ | = | | | | | | | |

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
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.

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | P4998USC1 |

**U.S.PATENTS**

| 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 |
|---|---|---|---|---|---|---|
| | 1 | | | | | |

If you wish to add additional U.S. Patent citation information please click the Add button.

**U.S.PATENT APPLICATION PUBLICATIONS**

| 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 | | | | | |

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**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] i | 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] |
|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | ☐ |

If you wish to add additional Foreign Patent Document citation information please click the Add button

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.T/

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 14733068 |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | 2464 |
| | Examiner Name | TRUONG, LAN-HUONG |
| | Attorney Docket Number | P4998USC1 |

| | | | |
|---|---|---|---|
| | 1 | CATT, " L3 Anchor Carrier", 3GPP TSG-RAN WG2 Meeting #67, R2-094322, August 24-28, 2009, 2 pages, Shenzhen, China. | ☐ |
| | 2 | Nokia Corporation, Nokia Siemens Networks, "RACH and carrier aggregation", 3GPP TSG-RAN WG2 Meeting #67bis, 2009.10.12-16, 3 pages, Miyazaki, Japan. | ☐ |

If you wish to add additional non-patent literature document citation information please click the Add button

**EXAMINER SIGNATURE**

| Examiner Signature | /LAN-HUONG TRUONG/ | Date Considered | 04/20/2017 |
|---|---|---|---|

*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.



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.T/

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | P4998USC1 |

## 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 | /Christopher B. Kilner/ | Date (YYYY-MM-DD) | 2017-01-25 |
| Name/Print | Christopher B. Kilner | Registration Number | 45,381 |

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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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 record s.

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)).

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. /L.T/

**EAST Search History**

**EAST Search History (Prior Art)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S1 | 37 | ((KIBUM) near2 (KWON)).INV. | US-PGPUB; USPAT | OR | ON | 2014/01/12 00:10 |
| S2 | 12 | ((MYUNGCHEUL) near2 (JUNG)).INV. | US-PGPUB; USPAT | OR | ON | 2014/01/12 00:10 |
| S3 | 6 | ("20080273610" \| "20090186613" \| "20090279495").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:16 |
| S4 | 8 | ("20090274120" \| "20100041399" \| "20100111005").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:24 |
| S5 | 216 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:32 |
| S6 | 43 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (terminal OR UE OR (user adj equipment)) and (CC OR carrier) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:33 |
| S7 | 3922 | (370/350).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:38 |
| S8 | 21823 | (370/329).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:38 |
| S9 | 2840 | (370/330).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; | OR | OFF | 2014/01/12 00:38 |

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| | | | EPO; JPO; DERWENT; IBM_TDB | | | |
| S10 | 2474 | (370/337).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S11 | 2290 | (370/345).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S12 | 3023 | (370/347).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S13 | 4 | ("20090005058").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:44 |
| S14 | 3 | ("20090116434").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:45 |
| S15 | 42 | ("2009/0116434").URPN. | USPAT | OR | ON | 2014/01/12 00:48 |
| S16 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH delegat$3 NEAR3 (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:51 |
| S17 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH delegat$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:52 |
| S18 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) WITH delegat$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:52 |

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|---|---|---|---|---|---|---|
| S19 | 8 | delegat$3 NEAR CC | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:53 |
| S20 | 2 | delegat$3 NEAR (component adj carrier) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:54 |
| S21 | 74 | S5 AND ( (H04W56/00 OR H04W74/002 OR H04W74/0833).CPC. ) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:56 |
| S22 | 1 | S5 AND ( (H04W56/00 OR H04W74/002 OR H04W74/0833).CPC. ) AND delegate | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:57 |
| S23 | 13 | set$4 WITH (CC OR (component adj carrier)) NEAR9 aggregation NEAR4 information | US-PGPUB; USPAT | OR | ON | 2014/01/12 09:39 |
| S24 | 2 | ("20120021756" \| "20120057490").PN. | US-PGPUB; USPAT | OR | ON | 2014/01/12 09:42 |
| S27 | 2 | ("20110267957").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 09:49 |
| S28 | 3 | ("20090092091").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 09:50 |
| S30 | 7 | ("2010148532").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 10:06 |
| S31 | 9068 | (UL OR uplink) WITH (sync OR synchronization) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 11:52 |

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|---|---|---|---|---|---|---|
| S32 | 61 | (UL OR uplink) WITH (sync OR synchronization) WITH receiv$3 NEAR3 (random near access near preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 11:53 |
| S33 | 2 | ("2010/0331003").URPN. | USPAT | OR | ON | 2014/01/12 11:57 |
| S35 | 2 | ("20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 12:13 |
| S37 | 20 | ("20030096631" \| "20100331003" \| "20060166688" \| "20070072600" \| "7054298" \| "20040077357" \| "20090186613").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 12:23 |
| S38 | 7 | ("2006/0166688").URPN. | USPAT | OR | ON | 2014/01/12 12:46 |
| S46 | 2 | ("20090239583").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/13 13:58 |
| S47 | 21 | ("20070133611" \| "20120057525" \| "20050099986" \| "20030125073" \| "20120135715" \| "20090239582" \| "20090239583" \| "20120004013").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/13 14:00 |
| S50 | 3 | ("20100080155").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/13 14:19 |
| S51 | 11 | ("2010/0182992").URPN. | USPAT | OR | ON | 2014/01/13 14:25 |
| S52 | 2 | "US 20130034087" | US-PGPUB; USPAT; USOCR; DERWENT | OR | ON | 2014/01/13 14:38 |
| S53 | 304 | (establish$3 OR creat$3) WITH (UL OR uplink) NEAR3 (sync OR synchronization) and (select$3 OR pick$3 OR choos$3) WITH (UE OR mobile near station OR user near equipment) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 11:41 |
| S54 | 3925 | (370/350).CCLS. | US-PGPUB; | OR | OFF | 2014/01/14 |

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|---|---|---|---|---|---|---|
| | | | USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | 11:46 |
| S55 | 20 | S53 and S54 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 11:48 |
| S56 | 5 | S53 and S54 and (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 13:43 |
| S57 | 15 | ("20080060249" \| "20080305822" \| "20070230394" \| "20080119979" \| "20070000967" \| "20070254656").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 13:46 |
| S58 | 2 | "delegate component carrier" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:19 |
| S60 | 5 | "delegate CC" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:20 |
| S61 | 21 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing and (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:38 |
| S62 | 276 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:34 |
| S63 | 1 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH UL NEAR3 synchronization | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:35 |
| S64 | 4 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH synchronization | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:35 |
| S66 | 31 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH state | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:36 |
| S67 | 256 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:38 |

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|---|---|---|---|---|---|---|
| | | OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | | | | |
| S68 | 1007 | (370/324).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 09:39 |
| S69 | 0 | S62 and S68 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 09:40 |
| S70 | 21847 | (370/329).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 09:40 |
| S71 | 10 | S62 and S70 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 09:40 |
| S72 | 3 | ("2011/0292887").URPN. | USPAT | OR | ON | 2014/01/15 09:51 |
| S73 | 3 | ("2011/0292887").URPN. | USPAT | OR | ON | 2014/01/15 09:56 |
| S74 | 2 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" and establish$3 near3 uplink | US-PGPUB; USPAT | OR | ON | 2014/01/15 10:04 |
| S75 | 2 | ("2012/0063425").URPN. | USPAT | OR | ON | 2014/01/15 10:04 |
| S76 | 2 | (13/556165).APP. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 10:16 |
| S78 | 13343 | retransmission near data | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 10:56 |
| S80 | 357 | retransmission near data WITH receiv$3 NEAR4 terminals | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; | OR | ON | 2014/01/15 11:00 |

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|---|---|---|---|---|---|---|
| | | | DERWENT; IBM_TDB | | | |
| S81 | 21 | retransmission near data WITH receiv$3 NEAR4 terminals WITH threshold | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 11:00 |
| S83 | 4 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (terminal OR UE OR (user adj equipment)) and (CC OR carrier) WITH characteristic | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 19:59 |
| S86 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH macro | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 21:58 |
| S87 | 11 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (threshold OR predetermin$3 OR predefin$3 OR preset$3) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 22:00 |
| S88 | 1308 | form$3 WITH timing near synchronization | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 10:13 |
| S89 | 13 | form$3 WITH timing near4 synchronization NEAR7 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 10:14 |
| S90 | 4 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing NEAR20 (simultaneously OR concurrently) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 11:03 |
| S91 | 4 | ("2008/0037502").URPN. | USPAT | OR | ON | 2014/01/16 11:12 |
| S94 | 62 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:19 |

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|---|---|---|---|---|---|---|
| | | "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. | | | | |
| S95 | 62 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |
| S96 | 0 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and stimutaneous | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |
| S97 | 22 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |

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|---|---|---|---|---|---|---|
| | | "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and timing | | | | |
| S98 | 4 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and timing WITH synchron$5 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:21 |
| S99 | 44 | ("2007/0293224").URPN. | USPAT | OR | ON | 2014/02/15 17:23 |
| S100 | 17 | ("2012/0250520").URPN. | USPAT | OR | ON | 2014/02/15 21:09 |
| S101 | 17 | ("2012/0250520").URPN. | USPAT | OR | ON | 2014/02/15 21:13 |
| S102 | 13 | ("20100158147" \| "20110038271" \| "20110243016" \| "20100273515" \| "20090163211" \| "20090163211" \| "20090318180").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 21:41 |
| S103 | 435 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:47 |

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|---|---|---|---|---|---|---|---|
| | | "20080285691" \| "20100238903" \| "20040242195" \| "20090264164" \| "20030165122" \| "20040148427" \| "20070155390" \| "20090124259" \| "20100238799" \| "20090005051" \| "20070177569" \| "20060126554" \| "20050041610" \| "20030123485" \| "20070248075" \| "6567409" \| "20050085254" \| "20070291673" \| "20070258591" \| "20050232271" \| "20080076359" \| "20100309877" \| "6795419" \| "20040229605" \| "20050063347" \| "20070293224" \| "20040042507" \| "20070155389" \| "20110207427" \| "7039425" \| "5588009" \| "20030165133" \| "20080181127" \| "20020028690" \| "20010017850" \| "20020057663" \| "20080056198" \| "20070206531" \| "20100165901" \| "8064676" \| "20090207771" \| "20100265896" \| "20010034791" \| "20090239538" \| "20070041382" \| "7525908" \| "20080188223" \| "0776951" \| "7606370" \| "20070291729" \| "20030207696" \| "20070291719" \| "20050009527" \| "20060262811" \| "20100046384" \| "20080280567" \| "20100128669" \| "20070047452" \| "20100227614" \| "20100254340" \| "20080268850" \| "20120002589" \| "20050100048" \| "20030119488" \| "20020059464" \| "20020091860" \| "20050094670" \| "20060126570" \| "20070165635" \| "20100195568" \| "20050053029" \| "20060142019" \| "20040014452" \| "6725267" \| "20030189922" \| "20050141462" \| "20040185837" \| "20080225744" \| "20030050078" \| "20050265294" \| "20090086659" \| "20090181710" \| "20090318170" \| "20100027413" \| "7443813" \| "20060251105" \| "20070291646" \| "20020059464" \| "20080240439" \| "20080316959" \| "20060013165" \| "20110090836" \| "20080186946" \| "20040039830" \| "20050037767" \| "20050160184" \| "20050286470" \| "20080240439" \| "20090022107" \| "6233430" \| "20080167089" \| "20040117860" \| "20050185620" \| "20050238051" \| "20070291673" \| "20070178875" \| "20080273610" \| "20080009289" \| "20080089285" \| "20070291788" \| "20080095185" \| "20080225765" \| "20090086710" \| "20090109912" \| "20100061330" \| "7801527" \| "20030147371" \| "20040042507" \| "20040148427" \| "20050286470" \| "20070165635" \| "20070291695" \| "7865731" \| "20030123485" \| "20100075635" \| "20040147269" \| "20040233870" \| "20070291728" \| "20050176474" \| "20070206531" \| | | | |

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|---|---|---|---|---|---|---|
| | | "20040253959" \| "20050041681" \| "20060165045" \| "20060245417" \| "20080056273" \| "20070047582" \| "20060067324" \| "20040100940" \| "20050032555" \| "20040180675" \| "20080182594" \| "20030165122" \| "20050160184" \| "20070064631" \| "20080004058" \| "20100067495" \| "20040087320" \| "20090040982" \| "20110261743" \| "20070064665" \| "20030139170" \| "20050249188" \| "20060039309").PN. | | | | |
| S104 | 75 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| "20080285691" \| "20100238903" \| "20040242195" \| "20090264164" \| "20030165122" \| "20040148427" \| "20070155390" \| "20090124259" \| "20100238799" \| "20090005051" \| "20070177569" \| "20060126554" \| "20050041610" \| "20030123485" \| "20070248075" \| "6567409" \| "20050085254" \| "20070291673" \| "20070258591" \| "20050232271" \| "20080076359" \| "20100309877" \| "6795419" \| "20040229605" \| "20050063347" \| "20070293224" \| "20040042507" \| "20070155389" \| "20110207427" \| "7039425" \| "5588009" \| "20030165133" \| "20080181127" \| "20020028690" \| "20010017850" \| "20020057663" \| "20080056198" \| "20070206531" \| "20100165901" \| "8064676" \| "20090207771" \| "20100265896" \| "20010034791" \| "20090239538" \| "20070041382" \| "7525908" \| "20080188223" \| "0776951" \| "7606370" \| "20070291729" \| "20030207696" \| "20070291719" \| "20050009527" \| "20060262811" \| "20100046384" \| "20080280567" \| "20100128669" \| "20070047452" \| "20100227614" \| "20100254340" \| "20080268850" \| "20120002589" \| "20050100048" \| "20030119488" \| "20020059464" \| "20020091860" \| "20050094670" \| "20060126570" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:51 |

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| | | "20070165635" \| "20100195568" \| "20050053029" \| "20060142019" \| "20040014452" \| "6725267" \| "20030189922" \| "20050141462" \| "20040185837" \| "20080225744" \| "20030050078" \| "20050265294" \| "20090086659" \| "20090181710" \| "20090318170" \| "20100027413" \| "7443813" \| "20060251105" \| "20070291646" \| "20020059464" \| "20080240439" \| "20080316959" \| "20060013165" \| "20110090836" \| "20080186946" \| "20040039830" \| "20050037767" \| "20050160184" \| "20050286470" \| "20080240439" \| "20090022107" \| "6233430" \| "20080167089" \| "20040117860" \| "20050185620" \| "20050238051" \| "20070291673" \| "20070178875" \| "20080273610" \| "20080009289" \| "20080089285" \| "20070291788" \| "20080095185" \| "20080225765" \| "20090086710" \| "20090109912" \| "20100061330" \| "7801527" \| "20030147371" \| "20040042507" \| "20040148427" \| "20050286470" \| "20070165635" \| "20070291695" \| "7865731" \| "20030123485" \| "20100075635" \| "20040147269" \| "20040233870" \| "20070291728" \| "20050176474" \| "20070206531" \| "20040253959" \| "20050041681" \| "20060165045" \| "20060245417" \| "20080056273" \| "20070047582" \| "20060067324" \| "20040100940" \| "20050032555" \| "20040180675" \| "20080182594" \| "20030165122" \| "20050160184" \| "20070064631" \| "20080004058" \| "20100067495" \| "20040087320" \| "20090040982" \| "20110261743" \| "20070064665" \| "20030139170" \| "20050249188" \| "20060039309").PN. and synchronization | | | | |
| S105 | 11 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| "20080285691" \| "20100238903" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:54 |

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| | | "20040242195" \| "20090264164" \| "20030165122" \| "20040148427" \| "20070155390" \| "20090124259" \| "20100238799" \| "20090005051" \| "20070177569" \| "20060126554" \| "20050041610" \| "20030123485" \| "20070248075" \| "6567409" \| "20050085254" \| "20070291673" \| "20070258591" \| "20050232271" \| "20080076359" \| "20100309877" \| "6795419" \| "20040229605" \| "20050063347" \| "20070293224" \| "20040042507" \| "20070155389" \| "20110207427" \| "7039425" \| "5588009" \| "20030165133" \| "20080181127" \| "20020028690" \| "20010017850" \| "20020057663" \| "20080056198" \| "20070206531" \| "20100165901" \| "8064676" \| "20090207771" \| "20100265896" \| "20010034791" \| "20090239538" \| "20070041382" \| "7525908" \| "20080188223" \| "0776951" \| "7606370" \| "20070291729" \| "20030207696" \| "20070291719" \| "20050009527" \| "20060262811" \| "20100046384" \| "20080280567" \| "20100128669" \| "20070047452" \| "20100227614" \| "20100254340" \| "20080268850" \| "20120002589" \| "20050100048" \| "20030119488" \| "20020059464" \| "20020091860" \| "20050094670" \| "20060126570" \| "20070165635" \| "20100195568" \| "20050053029" \| "20060142019" \| "20040014452" \| "6725267" \| "20030189922" \| "20050141462" \| "20040185837" \| "20080225744" \| "20030050078" \| "20050265294" \| "20090086659" \| "20090181710" \| "20090318170" \| "20100027413" \| "7443813" \| "20060251105" \| "20070291646" \| "20020059464" \| "20080240439" \| "20080316959" \| "20060013165" \| "20110090836" \| "20080186946" \| "20040039830" \| "20050037767" \| "20050160184" \| "20050286470" \| "20080240439" \| "20090022107" \| "6233430" \| "20080167089" \| "20040117860" \| "20050185620" \| "20050238051" \| "20070291673" \| "20070178875" \| "20080273610" \| "20080009289" \| "20080089285" \| "20070291788" \| "20080095185" \| "20080225765" \| "20090086710" \| "20090109912" \| "20100061330" \| "7801527" \| "20030147371" \| "20040042507" \| "20040148427" \| "20050286470" \| "20070165635" \| "20070291695" \| "7865731" \| "20030123485" \| "20100075635" \| "20040147269" \| "20040233870" \| "20070291728" \| "20050176474" \| "20070206531" \| "20040253959" \| "20050041681" \| | | | | |

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|---|---|---|---|---|---|---|
| | | "20060165045" \| "20060245417" \| "20080056273" \| "20070047582" \| "20060067324" \| "20040100940" \| "20050032555" \| "20040180675" \| "20080182594" \| "20030165122" \| "20050160184" \| "20070064631" \| "20080004058" \| "20100067495" \| "20040087320" \| "20090040982" \| "20110261743" \| "20070064665" \| "20030139170" \| "20050249188" \| "20060039309").PN. and synchronization WITH uplink | | | | |
| S106 | 44 | ("2007/0293224").URPN. | USPAT | OR | ON | 2014/02/15 23:15 |
| S107 | 15703 | H04W72/04.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:47 |
| S108 | 230 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:47 |
| S109 | 6136 | H04W72/00.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S111 | 1564 | H04B7/216.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S112 | 7 | S107 and S108 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S114 | 3 | S109 and S108 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:49 |
| S115 | 260 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | US-PGPUB; USPAT | OR | ON | 2014/05/19 13:52 |
| S116 | 2 | ("20120307821").PN. | US-PGPUB; | OR | OFF | 2014/06/27 |

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|---|---|---|---|---|---|---|
| | | | USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | 23:56 |
| S117 | 1 | ("20120307821").PN. | DERWENT | OR | OFF | 2014/06/27 23:56 |
| S118 | 3 | ("20130121264").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/06/28 22:01 |
| S119 | 31095 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:29 |
| S120 | 31048 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:30 |
| S121 | 885 | (H04B1/7087).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S122 | 343 | (establish$3 OR creat$3) WITH (UL OR uplink) NEAR3 (sync OR synchronization) and (select$3 OR pick$3 OR choos$3) WITH (UE OR mobile near station OR user near equipment) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S123 | 53 | S119 and S122 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S124 | 19 | S120 and S122 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:32 |
| S125 | 2 | S121 and S122 | US-PGPUB; USPAT; USOCR; FPRS; | OR | ON | 2014/06/29 00:32 |

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|---|---|---|---|---|---|---|
| | | | EPO; JPO; DERWENT; IBM_TDB | | | |
| S126 | 2 | ("20090186613").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/06/29 01:17 |
| S127 | 14 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing and (CC OR (component adj carrier)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 09:56 |
| S128 | 9 | ("20030076812" \| "20090161599" \| "20090290555" \| "20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 10:03 |
| S129 | 31136 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:22 |
| S130 | 12 | (UL OR uplink) NEAR4 timing WITH distinguished and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:28 |
| S131 | 165 | (UL OR uplink) NEAR4 timing WITH error and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:32 |
| S132 | 15 | S129 and S131 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:33 |
| S133 | 26 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (RACH OR random NEAR access NEAR channel) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/07 22:46 |
| S134 | 0 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR | US-PGPUB; USPAT; | OR | ON | 2014/12/07 23:05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | message OR data) WITH (UL OR uplink) NEAR4 timing WITH (RACH OR random NEAR access NEAR channel) WITH response | USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S135 | 46 | ("20100260156" \| "8077671" \| "20070015511" \| "8274947" \| "20110103347" \| "7450944" \| "20100142485" \| "20090046665" \| "20100056160" \| "20100003981" \| "20120177006" \| "5440561" \| "20090070469" \| "20020160779" \| "7469142" \| "20030053431" \| "20030147370" \| "20100278150").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/07 23:09 |
| S136 | 19 | ("2010/0142485").URPN. | USPAT | OR | ON | 2014/12/07 23:15 |
| S137 | 13 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH contention | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/16 11:47 |
| S138 | 75 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) WITH contention | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/16 11:49 |
| S139 | 51 | (component NEAR carrier AND (primary NEAR CC)).clm. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2015/01/13 11:31 |
| S140 | 47 | ((KIBUM) near2 (KWON)).INV. | US-PGPUB; USPAT | OR | ON | 2015/01/13 12:46 |
| S141 | 1 | ("2012/0108254").URPN. | USPAT | OR | ON | 2015/01/13 13:26 |
| S142 | 14 | ((MYUNGCHEUL) near2 (JUNG)).INV. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:28 |
| S162 | 41 | ("20090116434" \| "20090274120" \| "8606336" \| "20110170495" \| "20090318175" \| "20100086065" \| "20100238857" \| "20100323744" \| "20100041399" \| "20090270094" \| "20090316642" \| "20100111005" \| "20100118720").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2015/01/13 13:51 |
| S177 | 2316 | (TA OR (timing NEAR2 advanced)) AND (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 11:59 |
| S178 | 421 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR2 advanced)) AND (random NEAR2 access NEAR3 | US-PGPUB; USPAT; USOCR; | OR | ON | 2016/12/12 12:04 |

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|---|---|---|---|---|---|---|
| | | preamble) | FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S179 | 421 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) AND (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:05 |
| S180 | 230 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:05 |
| S181 | 185 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:06 |
| S182 | 169 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:07 |
| S183 | 3 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100210" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:08 |
| S184 | 9 | ("20030076812" \| "20090161599" \| "20090290555" \| "20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:17 |
| S185 | 2 | tim$4 NEAR3 group SAME (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 15:08 |
| S186 | 50 | ("2012/0307811").URPN. | USPAT | OR | ON | 2016/12/12 15:18 |
| S187 | 17 | ("20070189205" \| "20100227569" \| "20110261776" \| "20110268032" \| "20110299489" \| "20120113941" \| "20120300743" \| "20120307811").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; | OR | ON | 2016/12/14 16:27 |

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|---|---|---|---|---|---|---|
| | | | DERWENT; IBM_TDB | | | |
| S188 | 3 | ("8982805").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/14 16:47 |
| S189 | 34 | ("20110039593" \| "20110159903" \| "20110045837" \| "20110243048" \| "20090279495" \| "20100232382" \| "20110026475" \| "20110243106" \| "20080310395" \| "20100177747" \| "20110235609" \| "20110317777" \| "20100296467" \| "20110134774" \| "20070293224").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/14 17:02 |
| S190 | 182 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) AND (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S191 | 180 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) SAME (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S192 | 0 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) SAME (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100210" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S193 | 243 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:36 |
| S194 | 178 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:36 |
| S195 | 185 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:37 |
| S196 | 204 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) | US-PGPUB; USPAT; | OR | ON | 2016/12/19 11:37 |

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|---|---|---|---|---|---|---|
| | | OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR4 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S197 | 196 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR2 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:38 |
| S198 | 1 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) NEAR5 value SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR2 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:38 |
| S199 | 17 | ("20080002660" \| "20140293853" \| "20140073337" \| "20160100374" \| "20080279131" \| "20130116002").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:39 |
| S200 | 6 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random ADJ access ADJ response) NEAR5 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 12:11 |
| S201 | 10 | ("20100238908" \| "20110243111" \| "20120063425" \| "20120099577").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 12:13 |
| S202 | 120 | random ADJ access NEAR2 (response OR reply) SAME timing NEAR2 advanc$3 AND @ad<"20100210" AND (calculat$4 OR comput$3 OR determin$3 OR estimat$3) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 13:18 |
| S203 | 42 | random ADJ access NEAR2 (response OR reply) SAME timing NEAR2 advanc$3 AND @ad<"20100210" AND (calculat$4 OR comput$3 OR determin$3 OR estimat$3) WITH timing NEAR2 advanc$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 13:19 |
| S204 | 2533 | (H04J3/00).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 15:12 |

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|---|---|---|---|---|---|---|
| S205 | 2 | ("20150271770").PN. | US-PGPUB; USPAT; USOCR; DERWENT | OR | ON | 2016/12/20 09:10 |
| S206 | 56 | delegat$3 NEAR2 (carrier OR CC OR CCs) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 11:59 |
| S207 | 26 | delegat$3 NEAR2 (carrier OR CC OR CCs) AND synchronization | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 12:00 |
| S208 | 6 | ("20080273610" \| "20090186613" \| "20090279495").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 12:09 |
| S209 | 3 | ("20100118720").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/24 12:20 |
| S210 | 148 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic AND ((UL NEAR PCC) OR Pcell OR primary) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 14:16 |
| S211 | 309 | set$4 WITH (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:02 |
| S212 | 8428 | (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:03 |
| S213 | 561 | (TA OR timing ADJ advanced) SAME (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:04 |
| S214 | 10 | (calculat$3 OR comput$4 OR estimat$4) SAME (TA OR timing ADJ advanced) | US-PGPUB; USPAT; | OR | ON | 2016/12/25 00:05 |

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|---|---|---|---|---|---|---|
| | | SAME (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S215 | 2 | ("20100222059").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/26 02:02 |
| S216 | 34 | ("2010/0222059").URPN. | USPAT | OR | ON | 2016/12/26 02:06 |
| S217 | 9 | set$4 WITH (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) AND tim$3 ADJ2 group and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/26 13:11 |
| S218 | 2 | ("20100142485").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/26 15:28 |
| S219 | 0 | WO2009079913 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/26 23:16 |
| S220 | 5 | "2009079913" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/26 23:16 |
| S221 | 64 | ((KIBUM) near2 (KWON)).INV. | US-PGPUB; USPAT | OR | ON | 2017/04/20 09:54 |
| S222 | 21 | ((MYUNGCHEUL) near2 (JUNG)).INV. | US-PGPUB; USPAT | OR | ON | 2017/04/20 09:54 |

**EAST Search History (Interference)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S143 | 3665 | (370/350).CCLS. | US-PGPUB; USPAT | OR | OFF | 2015/01/13 11:08 |
| S144 | 51 | (component NEAR carrier AND (primary NEAR CC)).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:31 |
| S145 | 7 | uplink NEAR timing NEAR group.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:31 |
| S146 | 22 | UL NEAR group.clm. | US- | OR | ON | 2015/01/13 |

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|---|---|---|---|---|---|---|
| | | | PGPUB; USPAT | | | 11:31 |
| S147 | 83 | synchronization NEAR request NEAR message.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:32 |
| S148 | 9 | S143 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:34 |
| S149 | 2 | S146 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:36 |
| S150 | 1 | S144 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:36 |
| S151 | 5348 | uplink AND synchronization.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:37 |
| S152 | 646 | S143 AND S151 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S153 | 1 | S146 AND S152 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S154 | 1 | S147 AND S152 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S155 | 3 | UL NEAR timing NEAR group.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:42 |
| S156 | 15 | (component NEAR carrier AND (primary NEAR CC) AND (second NEAR CC)).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:44 |
| S157 | 3 | delegate ADJ CC.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:32 |
| S158 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:32 |
| S159 | 1 | S147 AND S158 | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:33 |
| S160 | 10 | S144 AND S158 | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:33 |
| S161 | 64 | (primary ADJ CC) AND (radio NEAR resource NEAR control) AND timing.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:34 |
| S163 | 8801 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S164 | 213 | (H04B1/7087).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S165 | 8686 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S166 | 3665 | (370/350).CCLS. | US- | OR | OFF | 2015/01/13 |

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|---|---|---|---|---|---|---|
| | | | PGPUB; USPAT | | | 15:01 |
| S167 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S168 | 7 | S163 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S169 | 86 | S167 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S170 | 56 | S165 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:02 |
| S171 | 5348 | uplink AND synchronization.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |
| S172 | 431 | S163 AND S171 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |
| S173 | 3 | S167 AND S172 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |
| S174 | 8686 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:31 |
| S175 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:32 |
| S176 | 56 | S174 AND S175 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:32 |
| S223 | 15660 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT | OR | ON | 2017/04/20 10:49 |
| S224 | 275 | uplink AND timing NEAR advance NEAR value.clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 10:50 |
| S225 | 12 | uplink AND timing NEAR advance NEAR value AND RAR.clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 10:50 |
| S226 | 5 | uplink NEAR timing AND TA NEAR value AND RAR.clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:02 |
| S227 | 93 | (component NEAR carrier AND (primary NEAR CC)).clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:20 |
| S228 | 236 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:20 |
| S229 | 0 | S223 AND S224 AND S228 | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:20 |
| S230 | 21 | S223 AND S224 | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:21 |
| S231 | 3 | S224 AND S228 | US- | OR | ON | 2017/04/20 |

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|---|---|---|---|---|---|---|
| | | | PGPUB; USPAT | | | 11:21 |

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# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | GP.009 |

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|---|---|---|---|

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 14733068 |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | 2464 |
| | Examiner Name | TRUONG, LAN-HUONG |
| | Attorney Docket Number | GP.009 |

| | | |
|---|---|---|
| | 1 | Office Action issued by JPO on June 13, 2017 for the corresponding JP Application No. 2015-154385 |

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**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 14733068 |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | 2464 |
| | Examiner Name | TRUONG, LAN-HUONG |
| | Attorney Docket Number | GP.009 |

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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 | /Seong Jun PARK/ | Date (YYYY-MM-DD) | 2017-07-06 |
|---|---|---|---|
| Name/Print | Seong Jun PARK | Registration Number | 73,534 |

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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.

Espacenet

## Bibliographic data: JP2010254386 (A) — 2010-11-11

# SAFETY DEVICE FOR ELEVATOR

**Inventor(s):** SUZUKI SHIGEHIKO ± (SUZUKI SHIGEHIKO)

**Applicant(s):** MITSUBISHI ELEC BUILDING TECHN ± (MITSUBISHI ELECTRIC BUILDING TECHNO SERVICE CO LTD)

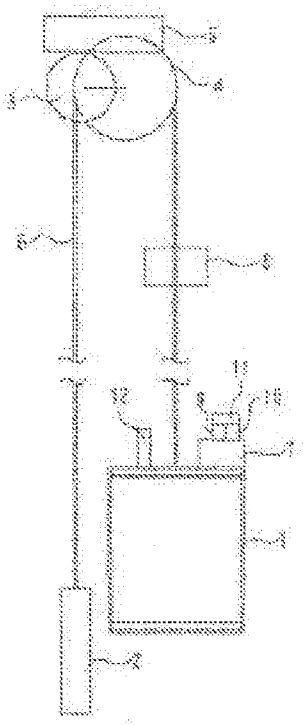
**Classification:** - **international:** ***B66B1/26; B66B5/06; B66B5/12; B66B5/24***
- **cooperative:**

**Application number:** JP20090102997 20090421 Global Dossier

**Priority number (s):** JP20090102997 20090421

## Abstract of JP2010254386 (A)

PROBLEM TO BE SOLVED: To provide a safety device for an elevator, dispensing with an emergency stop device and a mechanical speed regulator, and reducing power consumption and a hoistway space by reducing the weight of a car.
;SOLUTION: The safety device of the elevator includes: a plurality of hoisting ropes; a car speed detecting device for detecting the actual lifting speed of the car; a first brake device for mechanically braking the rotation of a sheave; a second brake device for mechanically braking the lifting and lowering of the hoisting rope; a first safety device for operating the first brake device and stopping the car when an output of the car speed detecting device exceeds a first prescribed value; a second safety device for operating the second brake device and stopping the car when the output of the car speed detecting device exceeds a second prescribed value; and a rope fracture detecting device for detecting the fracture of the individual rope, and operating the first and the second brake devices and stopping the car when a fracture of the individual rope is detected. ;COPYRIGHT: (C)2011,JPO&INPIT



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特開2010-254386
(P2010-254386A)
(43)公開日　平成22年11月11日(2010.11.11)

| (51)Int.Cl. | | F I | | | テーマコード（参考） |
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| B66B 5/12 | (2006.01) | B66B | 5/12 | C | 3F304 |
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審査請求 未請求　請求項の数 6　OL　（全 7 頁）

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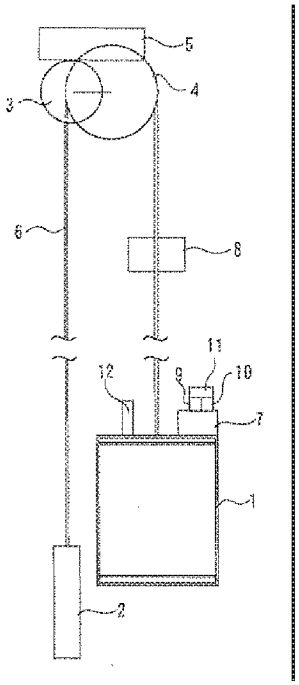
Fターム(参考)　3F002 CA04　EA10
3F304 CA13　DA37　DA42　EA18

(54)【発明の名称】エレベータの安全装置

(57)【要約】
【課題】非常止め装置と機械式調速機が不要でかごの軽量化による消費電力の低減と昇降路スペースの縮減を図ることができるエレベータの安全装置を得る。
【解決手段】複数本からなる巻上ロープと、乗りかごの実昇降速度を検出するかご速度検出装置と、綱車の回転を機械的に制止する第１のブレーキ装置と、巻上ロープの昇降を機械的に制止する第２のブレーキ装置と、かご速度検出装置の出力が第１の所定値を超えた時に第１のブレーキ装置を作動して乗りかごを停止させる第１の安全装置と、かご速度検出装置の出力が第２の所定値を超えた時に第２のブレーキ装置を作動して乗りかごを停止させる第２の安全装置と、巻上ロープの個々のロープ破断を検出し、個々のロープ破断を検出した時、第１のブレーキ装置及び第２のブレーキ装置を動作して乗りかごを停止させるロープ破断検出装置とを備える。
【選択図】図１

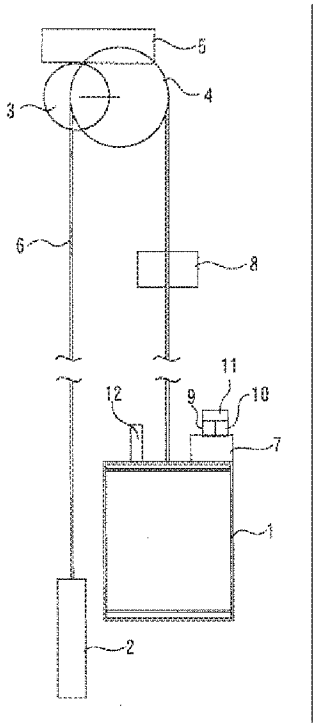


【特許請求の範囲】
【請求項1】
エレベータの乗りかごと、
つり合いおもりと、
巻上電動機及び綱車からなる巻上機と、
前記巻上機の綱車に巻き掛けられ、両端部に前記乗りかご及びつり合いおもりが吊下げられて前記巻上機の綱車の回転により前記乗りかご及びつり合いおもりを互いに逆方向に昇降させる複数本からなる巻上ロープと、
前記乗りかごに設けられ、乗りかごの実昇降速度を検出するかご速度検出装置と、
前記巻上機に設けられ、前記綱車の回転を機械的に制止する第１のブレーキ装置と、
前記複数本からなる巻上ロープの昇降を機械的に制止する第２のブレーキ装置と、
前記かご速度検出装置の出力が第１の所定値を超えた時に前記第１のブレーキ装置を作動して乗りかごを停止させる第１の安全装置と、
前記かご速度検出装置の出力が第２の所定値を超えた時に前記第２のブレーキ装置を作動して乗りかごを停止させる第２の安全装置とを備え、
非常止め装置と機械式調速機とを無くしたことを特徴とするエレベータの安全装置。
【請求項2】
エレベータの乗りかごと、
つり合いおもりと、
巻上電動機及び綱車からなる巻上機と、
前記巻上機の綱車に巻き掛けられ、両端部に前記乗りかご及びつり合いおもりが吊下げられて前記巻上機の綱車の回転により前記乗りかご及びつり合いおもりを互いに逆方向に昇降させる複数本からなる巻上ロープと、
前記乗りかごに設けられ、乗りかごの実昇降速度を検出するかご速度検出装置と、
前記巻上機に設けられ、前記綱車の回転を機械的に制止する第１のブレーキ装置と、
前記複数本からなる巻上ロープの昇降を機械的に制止する第２のブレーキ装置と、
前記かご速度検出装置の出力が第１の所定値を超えた時に前記第１のブレーキ装置を作動して乗りかごを停止させる第１の安全装置と、
前記かご速度検出装置の出力が第２の所定値を超えた時に前記第２のブレーキ装置を作動して乗りかごを停止させる第２の安全装置と、
前記複数本からなる巻上ロープの個々のロープ破断を検出し、個々のロープ破断を検出した時、前記第１のブレーキ装置及び第２のブレーキ装置を動作して乗りかごを停止させるロープ破断検出装置とを備え、
非常止め装置と機械式調速機とを無くしたことを特徴とするエレベータの安全装置。
【請求項3】
エレベータの乗りかごと、
つり合いおもりと、
巻上電動機及び綱車からなる巻上機と、
前記巻上機の綱車に巻き掛けられ、両端部に前記乗りかご及びつり合いおもりが吊下げられて前記巻上機の綱車の回転により前記乗りかご及びつり合いおもりを互いに逆方向に昇降させる複数本からなる巻上ロープと、
前記乗りかごに設けられ、乗りかごの実昇降速度を検出するかご速度検出装置と、
前記巻上機に設けられ、前記綱車の回転を機械的に制止する第１のブレーキ装置と、
前記複数本からなる巻上ロープの昇降を機械的に制止する第２のブレーキ装置と、
前記かご速度検出装置の出力が第１の所定値を超えた時に前記第１のブレーキ装置を作動して乗りかごを停止させる第１の安全装置と、
前記かご速度検出装置の出力が第２の所定値を超えた時に前記第２のブレーキ装置を作動して乗りかごを停止させる第２の安全装置と、
前記複数本からなる巻上ロープの個々のロープ破断を検出し、個々のロープ破断を検出

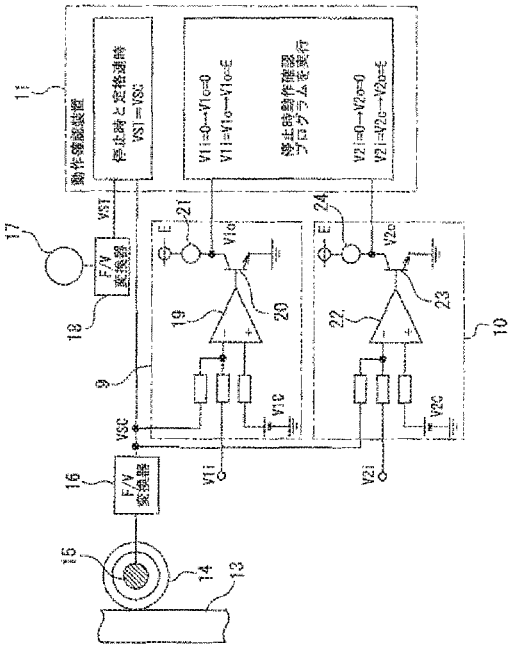
した時、前記第１のブレーキ装置及び第２のブレーキ装置を動作して乗りかごを停止させるロープ破断検出装置と、
　前記第１安全装置及び第２の安全装置の動作状況を確認し、前記第１安全装置及び第２の安全装置の動作異常を確認した時、前記第１のブレーキ装置及び第２のブレーキ装置を動作して乗りかごを停止させる動作確認装置とを備え、
　非常止め装置と機械式調速機とを無くしたことを特徴とするエレベータの安全装置。
【請求項4】
　第１のブレーキ装置及び第２のブレーキ装置を動作して乗りかごを停止させた時、以後再起動不能とすることを特徴とする請求項１～請求項３のいずれかに記載のエレベータの安全装置。
【請求項5】
　ロープ破断検出装置は、個々のロープ間に張り巡らされた一連の電線が断線することで巻上ロープの個々のロープ破断を検出することを特徴とする請求項２又は請求項３記載のエレベータの安全装置。
【請求項6】
　動作確認装置は、巻上電動機に取り付けられたロータリーエンコーダの出力及びガイドレールに接触して回転するローラーに取り付けられたロータリーエンコーダの出力を比較するとともに、第１の安全装置及び第２の安全装置の停止時動作確認プログラムを実行することにより、動作異常を確認することを特徴とする請求項３記載のエレベータの安全装置。
【発明の詳細な説明】
【技術分野】
【0001】
　この発明は、エレベータの安全装置に関するものである。
【背景技術】
【0002】
　従来、エレベータの安全装置においては、ロープの破断等によりかごが落下する場合に備えて、エレベータ法規によりかごを緊急停止させるための非常止め装置と機械式調速機とを備えている。しかしながら、実際にはロープの安全係数が高いため、ロープの破断等によりかごが落下するようなことは無いと言ってもよく、エレベータに備え付けられている非常止め装置と機械式調速機は、一度も使用されることが無いままにその使命を終えていると言うのが実情であった。
【0003】
　また、従来技術として、ばねにより作動されるシューを備え、エレベータの巻上ロープにブレーキ力を加えるエレベータ用の非常ブレーキ装置が提案されている（例えば、特許文献１参照）。
【図面の簡単な説明】
【0015】
【図1】この発明の実施例１におけるエレベータの安全装置を示す全体構成図である。
【図2】この発明の実施例１におけるエレベータの安全装置の要部を示すシステム構成図である。
【図3】この発明の実施例１における巻上ロープの個々のロープ破断を検出するロープ破断検出装置を示す斜視図である。
【図4】ロープ破断検出時の状態を示す図３相当図である。
【符号の説明】
【0019】
　１　エレベータの乗りかご
　１ａ　かご枠
　２　つり合いおもり
　３　巻上電動機
　４　綱車

５　第１のブレーキ装置
６　巻上ロープ
６ａ　個々のロープ
７　かご速度検出装置
８　第２のブレーキ装置
９　第１の安全装置
１０　第２の安全装置
１１　動作確認装置
１２　ロープ破断検出装置
１３　ガイドレール
１４　ローラー
１５、１７　ロータリーエンコーダ
１６、１８　Ｆ／Ｖ変換器
１９、２２　コンパレータ
２０、２３　スイッチング素子
２１、２４　出力リレー
２５　ロープソケット
２６　ばね
２７　電線
２８　破断検出用出力リレー

【図1】



【図2】


動作確認装置
停止時と定格連時
VST=VSC
V1i=0→V1o=0
V1i=V1o→V1o=E
停止時動作確認
プログラムを実行
V2i=0→V2o=0
V2i=V2o→V2o=E
F/V
変換器
VST
VSC
V1i
V1o
V1C
V2i
V2o
V2C
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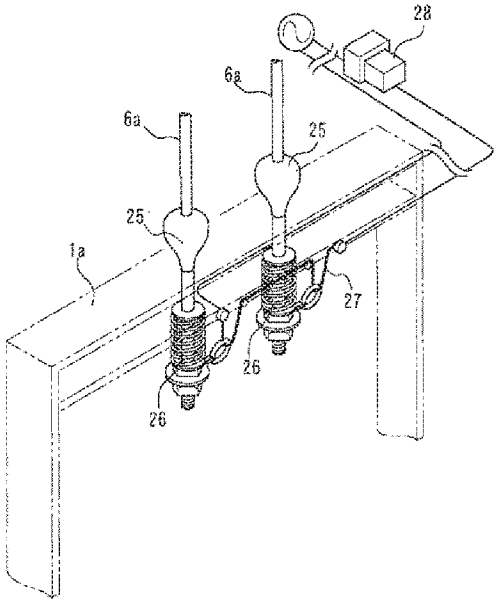
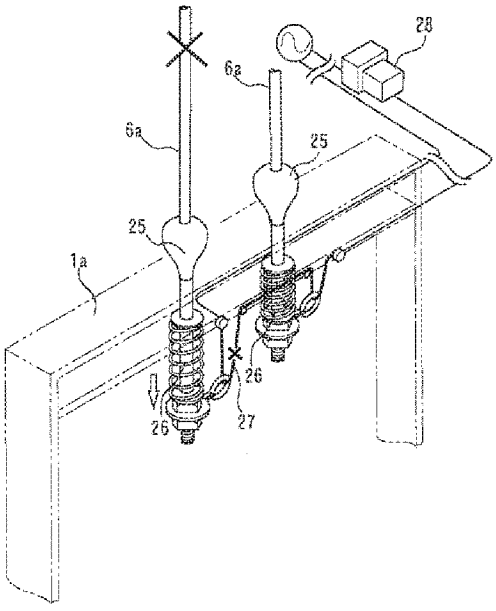
【図3】




【図4】



# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 14733068 |
| **Filing Date:** | 08-Jun-2015 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Filer:** | Seong Jun Park |
| **Attorney Docket Number:** | GP.009 |

Filed as Large Entity

**Filing Fees for Utility under 35 USC 111(a)**

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

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| Submission- Information Disclosure Stmt | 1806 | 1 | 180 | 180 |
| | | **Total in USD ($)** | | **180** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 29708522 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 146410 |
| **Filer:** | Seong Jun Park |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | GP.009 |
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| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 17:32:24 |
| **Application Type:** | Utility under 35 USC 111(a) |

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| Deposit Account | 601655 |
| Authorized User | Seong Jun Park |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | 20170706IDSform14733068.pdf | 612349<br>ac49bdada107ccc979f6fa88e107d81718e416e7 | no | 4 |
| **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. | | | | | |
| 2 | Non Patent Literature | npl.PDF | 78959<br>499f0a7ebaeb4381974f6dc21274811db6af9d79 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Foreign Reference | fref1.pdf | 488834<br>e4f9b1fc8e0dff78a08a9c4745e1adaf09e89c77 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Fee Worksheet (SB06) | fee-info.pdf | 30942<br>619fb199d219f4a5ff7dbffce5bdc7320b69fd2c | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 1211084 | | |

**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.**

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | GP.009 |

**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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| 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 |
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|---|---|---|---|---|---|---|---|---|
| | 1 | 2010-254386 | JP | A | 2010-11-11 | MITSUBISHI ELECTRIC BUILDING TECHNO SERVICE CO LTD | | X |

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| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.T./

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**( Not for submission under 37 CFR 1.99)**

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| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | GP.009 |

| | | | |
|---|---|---|---|
| | 1 | Office Action issued by JPO on June 13, 2017 for the corresponding JP Application No. 2015-154385 | |

If you wish to add additional non-patent literature document citation information please click the Add button [Add]

**EXAMINER SIGNATURE**

| | | | |
|---|---|---|---|
| Examiner Signature | /LAN-HUONG TRUONG/ | Date Considered | 07/09/2017 |

*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.



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| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | GP.009 |

## 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 | /Seong Jun PARK/ | Date (YYYY-MM-DD) | 2017-07-06 |
| Name/Print | Seong Jun PARK | Registration Number | 73,534 |

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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# 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 record s.

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.





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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | GP.009 | 5097 |

146410 7590 07/13/2017

Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

| EXAMINER |
|---|
| TRUONG, LAN-HUONG |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2464 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 07/13/2017 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

fidelis@fidelis-laws.com

| Corrected Notice of Allowability | Application No. 14/733,068 | Applicant(s) KWON ET AL. | |
|---|---|---|---|
| | Examiner LAN-HUONG TRUONG | Art Unit 2464 | AIA (First Inventor to File) Status No |

*-- 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 *07/06/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-3*. 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 _____.

/RICKY NGO/
Supervisory Patent Examiner, Art Unit 2464

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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# REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
## (Submitted Only via EFS-Web)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Application Number | 14733068 | Filing Date | 2015-06-08 | Docket Number (if applicable) | GP.009 | Art Unit | 2464 |
| First Named Inventor | Kibum KWON | | | Examiner Name | TRUONG, LAN-HUONG | | |

**This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.**
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

### SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☐ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

### MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

### FEES

**The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 601655

### SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

X Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

| Signature of Registered U.S. Patent Practitioner | | | |
|---|---|---|---|
| Signature | /Seong Jun PARK/ | Date (YYYY-MM-DD) | 2017-08-09 |
| Name | Seong Jun PARK | Registration Number | 73534 |

This collection of information is required by 37 CFR 1.114. 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.

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

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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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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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| Application Number | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | |

**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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| | 1 | | | | | |

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| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] i | 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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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 14733068 |
| | Filing Date | 2015-06-08 |
| | First Named Inventor | Kibum KWON |
| | Art Unit | 2464 |
| | Examiner Name | TRUONG, LAN-HUONG |
| | Attorney Docket Number | |

| | | |
|---|---|---|
| | 1 | Office Action issued by KIPO on June 13, 2017 for the corresponding KR Application No. 10-2011-0008683. |
| | 2 | Nokia Corporation et al, 3GPP TSG-RAN WG2 Meeting #67bis, R2-095898, " RACH and carrier aggregation", Miyazaki, Japan dated October 12th - 16th, 2009. |

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| Examiner Signature | | Date Considered | |
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[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.

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| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | |

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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 | /Seong Jun PARK/ | Date (YYYY-MM-DD) | 2017-08-09 |
| Name/Print | Seong Jun PARK | Registration Number | 73,534 |

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 record s.

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:** | 14733068 |
| **Filing Date:** | 08-Jun-2015 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Filer:** | Seong Jun Park |
| **Attorney Docket Number:** | GP.009 |

Filed as Large Entity

**Filing Fees for Utility under 35 USC 111(a)**

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

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| RCE- 1st Request | 1801 | 1 | 1200 | 1200 |
| Submission- Information Disclosure Stmt | 1806 | 1 | 180 | 180 |
| | | **Total in USD ($)** | | **1380** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 30035529 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 146410 |
| **Filer:** | Seong Jun Park |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | GP.009 |
| **Receipt Date:** | 09-AUG-2017 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 18:01:29 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $1380 |
| RAM confirmation Number | 081017INTEFSW18021300 |
| Deposit Account | 601655 |
| Authorized User | Seong Jun Park |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Request for Continued Examination (RCE) | sb0030efillRCE.pdf | 697788<br>991802bf6f490176b63f99392a1e4a522d0244da | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Information Disclosure Statement (IDS) Form (SB08) | IDSform.pdf | 612375<br>c5da5abeb54eddbaf6d9b1dbdc1bf3c23efe4ca1 | no | 4 |
| **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 | Non Patent Literature | npl.pdf | 1521468<br>4ed8bd1e2bf2558508b7f4ca88bc34a71e39f5fa | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Fee Worksheet (SB06) | fee-info.pdf | 32517<br>9188837e7994499cd08ccd7bd6bc61a63c9bf03d | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 2864148 | | |

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

**New Applications Under 35 U.S.C. 111**

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

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

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

**New International Application Filed with the USPTO as a Receiving Office**

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

# NOTICE OF ALLOWANCE AND FEE(S) DUE

146410 7590 08/25/2017

Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

| EXAMINER |
|---|
| TRUONG, LAN-HUONG |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2464 | |

DATE MAILED: 08/25/2017

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | GP.009 | 5097 |

TITLE OF INVENTION: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

| APPLN. TYPE | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | UNDISCOUNTED | $960 | $0 | $0 | $960 | 11/27/2017 |

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

**HOW TO REPLY TO THIS NOTICE:**

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

## PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail** **Mail Stop ISSUE FEE**
**Commissioner for Patents**
**P.O. Box 1450**
**Alexandria, Virginia 22313-1450**
**or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

146410 7590 08/25/2017
Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

**Certificate of Mailing or Transmission**
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being 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. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | GP.009 | 5097 |

TITLE OF INVENTION: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

| APPLN. TYPE | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | UNDISCOUNTED | $960 | $0 | $0 | $960 | 11/27/2017 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| TRUONG, LAN-HUONG | 2464 | 370-350000 |

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 03-02 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 patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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.

(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. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue 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 _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee 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. _____



PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

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

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | GP.009 | 5097 |

146410 7590 08/25/2017

Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

| EXAMINER | |
|---|---|
| TRUONG, LAN-HUONG | |
| ART UNIT | PAPER NUMBER |
| 2464 | |

DATE MAILED: 08/25/2017

**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 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, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

## Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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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.

| Applicant-Initiated Interview Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 14/733,068 | KWON ET AL. | |
| | Examiner | Art Unit | |
| | LAN-HUONG TRUONG | 2464 | |

All participants (applicant, applicant's representative, PTO personnel):

(1) *LAN-HUONG TRUONG*. (3)_____.

(2) *Park Seong Jun*. (4)_____.

Date of Interview: *11 August 2017*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *N/A*.

Identification of prior art discussed: *N/A*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

*The applicant's representative and Examiner discussed on the IDS filed on 08/09/2017 to verify the corrected date showed on the NPL (office action issued by KIPI on June 13, 2017 for the corresponding KR application No. 10-2011-0008683) will be corrected as 12/21/2016 instead of June 13, 2017*.

**Applicant recordation instructions:** The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

**Examiner recordation instructions**: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

| /L.H.T/<br>Patent Examiner, Art Unit 2464 | |
|---|---|

# Summary of Record of Interview Requirements

**Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record**
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

**Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews**
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

---

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

**Examiner to Check for Accuracy**

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

| Notice of Allowability | Application No. 14/733,068 | Applicant(s) KWON ET AL. | |
|---|---|---|---|
| | Examiner LAN-HUONG TRUONG | Art Unit 2464 | AIA (First Inventor to File) Status No |

***-- 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 *08/09/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-3*. 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 _____.

| /L.H.T/<br>Patent Examiner, Art Unit 2464 | /RICKY NGO/<br>Supervisory Patent Examiner, Art Unit 2464 |
|---|---|

**DETAILED ACTION**

1. The present application is being examined under the pre-AIA first to invent provisions.

2. This action is in response to the amendment filed on 08/09/2017.

3. The IDS filed on 08/09/2017 is considered.

## Reasons for allowance

4. Claims 1-3 are allowed.

5. Refer to the Reason for Allowance mailed on 05/11/2017.

6. 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 LAN HUONG TRUONG whose telephone number is (571)270-5829. The examiner can normally be reached on Mon-Fri (7:30AM-5:00PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, RICKY NGO can be reached on 571-272-3139. 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.

Patent Examiner /L.T. /
Art Unit: 2464

/RICKY NGO/
Supervisory Patent Examiner, Art Unit 2464

| Applicant-Initiated Interview Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 14/733,068 | KWON ET AL. | |
| | Examiner | Art Unit | |
| | LAN-HUONG TRUONG | 2464 | |

All participants (applicant, applicant's representative, PTO personnel):

(1) *LAN-HUONG TRUONG*. (3)_____.

(2) *Park Seong Jun*. (4)_____.

Date of Interview: *11 August 2017*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *N/A*.

Identification of prior art discussed: *N/A*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

*The applicant's representative and Examiner discussed on the IDS filed on 08/09/2017 to verify the corrected date showed on the NPL (office action issued by KIPI on June 13, 2017 for the corresponding KR application No. 10-2011-0008683) will be corrected as 12/21/2016 instead of June 13, 2017*.

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☐ Attachment

| /L.H.T/<br>Patent Examiner, Art Unit 2464 | |
|---|---|

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- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
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3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
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   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 14733068 |
| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | |

**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[2] i | 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] |
|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | |

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

**NON-PATENT LITERATURE DOCUMENTS** Remove

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|





ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.T/

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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| Filing Date | 2015-06-08 |
| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | |

| | | | |
|---|---|---|---|
| | 1 | Office Action issued by KIPO on ~~June 13, 2017~~ 12/21/2016 for the corresponding KR Application No. 10-2011-0008683. | /L.T/ |
| | 2 | Nokia Corporation et al, 3GPP TSG-RAN WG2 Meeting #67bis, R2-095898, " RACH and carrier aggregation", Miyazaki, Japan dated October 12th - 16th, 2009. | /L.T/ |

If you wish to add additional non-patent literature document citation information please click the Add button [Add]

**EXAMINER SIGNATURE**

| | | | |
|---|---|---|---|
| Examiner Signature | /LAN-HUONG TRUONG/ | Date Considered | 08/16/2017 |

*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.



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.T/

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

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| First Named Inventor | Kibum KWON |
| Art Unit | 2464 |
| Examiner Name | TRUONG, LAN-HUONG |
| Attorney Docket Number | |

## 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 | /Seong Jun PARK/ | Date (YYYY-MM-DD) | 2017-08-09 |
| Name/Print | Seong Jun PARK | Registration Number | 73,534 |

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.**



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.T/

# 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 record s.

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.





ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.T/

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | Examiner | Art Unit |
| | LAN HUONG TRUONG | 2464 |

| CPC- SEARCHED | | |
|---|---|---|
| Symbol | Date | Examiner |
| H04W56/00; H04W74/002; 74/0833; H04W72/04 | 12/19/2016 | LT |
| H04Q7/20 | 12/19/2016 | LT |
| H04J3/00 | 12/19/2016 | LT |

| 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 |
| CPC searching performed | 12/19/2016 | LT |
| East searching performed | 12/19/2016 | LT |
| Double Patenting searching performed | 12/19/2016 | LT |
| Text searching performed | 12/19/2016 | LT |
| CPC and East search updated | 4/19/2017 | LT |
| CPA and East search updated | 08/17/2017 | LT |

| INTERFERENCE SEARCH | | | |
|---|---|---|---|
| US Class/ CPC Symbol | US Subclass / CPC Group | Date | Examiner |
| H04W56/00; H04W74/002; | 74/0833; H04W72/04 | 8/17/2017 | LT |

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| INTERFERENCE SEARCH | | | |
|---|---|---|---|
| **US Class/ CPC Symbol** | **US Subclass / CPC Group** | **Date** | **Examiner** |
| H04Q7/20 | | 8/17/2017 | LT |
| H04J3/00 | | 8/17/2017 | LT |
| US-PGPUB, UPAT | Database Interference Search | 8/17/2017 | LT |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | Examiner | Art Unit |
| | LAN HUONG TRUONG | 2464 |

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|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 12/19/2016 | 08/17/2017 | | | | | | | |
| | 1 | ✓ | = | | | | | | | |
| | 2 | ✓ | = | | | | | | | |
| | 3 | ✓ | = | | | | | | | |

**EAST Search History**

**EAST Search History (Prior Art)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S1 | 37 | ((KIBUM) near2 (KWON)).INV. | US-PGPUB; USPAT | OR | ON | 2014/01/12 00:10 |
| S2 | 12 | ((MYUNGCHEUL) near2 (JUNG)).INV. | US-PGPUB; USPAT | OR | ON | 2014/01/12 00:10 |
| S3 | 6 | ("20080273610" \| "20090186613" \| "20090279495").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:16 |
| S4 | 8 | ("20090274120" \| "20100041399" \| "20100111005").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:24 |
| S5 | 216 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:32 |
| S6 | 43 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (terminal OR UE OR (user adj equipment)) and (CC OR carrier) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:33 |
| S7 | 3922 | (370/350).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:38 |
| S8 | 21823 | (370/329).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:38 |
| S9 | 2840 | (370/330).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; | OR | OFF | 2014/01/12 00:38 |

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|---|---|---|---|---|---|---|
| | | | EPO; JPO; DERWENT; IBM_TDB | | | |
| S10 | 2474 | (370/337).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S11 | 2290 | (370/345).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S12 | 3023 | (370/347).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:39 |
| S13 | 4 | ("20090005058").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:44 |
| S14 | 3 | ("20090116434").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 00:45 |
| S15 | 42 | ("2009/0116434").URPN. | USPAT | OR | ON | 2014/01/12 00:48 |
| S16 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH delegat$3 NEAR3 (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:51 |
| S17 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH delegat$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:52 |
| S18 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) WITH delegat$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:52 |

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|---|---|---|---|---|---|---|
| S19 | 8 | delegat$3 NEAR CC | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:53 |
| S20 | 2 | delegat$3 NEAR (component adj carrier) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:54 |
| S21 | 74 | S5 AND ( (H04W56/00 OR H04W74/002 OR H04W74/0833).CPC. ) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:56 |
| S22 | 1 | S5 AND ( (H04W56/00 OR H04W74/002 OR H04W74/0833).CPC. ) AND delegate | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 00:57 |
| S23 | 13 | set$4 WITH (CC OR (component adj carrier)) NEAR9 aggregation NEAR4 information | US-PGPUB; USPAT | OR | ON | 2014/01/12 09:39 |
| S24 | 2 | ("20120021756" \| "20120057490").PN. | US-PGPUB; USPAT | OR | ON | 2014/01/12 09:42 |
| S27 | 2 | ("20110267957").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 09:49 |
| S28 | 3 | ("20090092091").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 09:50 |
| S30 | 7 | ("2010148532").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 10:06 |
| S31 | 9068 | (UL OR uplink) WITH (sync OR synchronization) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 11:52 |

| | | | | | | |
|---|---|---|---|---|---|---|
| S32 | 61 | (UL OR uplink) WITH (sync OR synchronization) WITH receiv$3 NEAR3 (random near access near preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 11:53 |
| S33 | 2 | ("2010/0331003").URPN. | USPAT | OR | ON | 2014/01/12 11:57 |
| S35 | 2 | ("20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/12 12:13 |
| S37 | 20 | ("20030096631" \| "20100331003" \| "20060166688" \| "20070072600" \| "7054298" \| "20040077357" \| "20090186613").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/12 12:23 |
| S38 | 7 | ("2006/0166688").URPN. | USPAT | OR | ON | 2014/01/12 12:46 |
| S46 | 2 | ("20090239583").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/13 13:58 |
| S47 | 21 | ("20070133611" \| "20120057525" \| "20050099986" \| "20030125073" \| "20120135715" \| "20090239582" \| "20090239583" \| "20120004013").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/13 14:00 |
| S50 | 3 | ("20100080155").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/13 14:19 |
| S51 | 11 | ("2010/0182992").URPN. | USPAT | OR | ON | 2014/01/13 14:25 |
| S52 | 2 | "US 20130034087" | US-PGPUB; USPAT; USOCR; DERWENT | OR | ON | 2014/01/13 14:38 |
| S53 | 304 | (establish$3 OR creat$3) WITH (UL OR uplink) NEAR3 (sync OR synchronization) and (select$3 OR pick$3 OR choos$3) WITH (UE OR mobile near station OR user near equipment) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 11:41 |
| S54 | 3925 | (370/350).CCLS. | US-PGPUB; | OR | OFF | 2014/01/14 |

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|---|---|---|---|---|---|---|
| | | | USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | 11:46 |
| S55 | 20 | S53 and S54 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 11:48 |
| S56 | 5 | S53 and S54 and (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 13:43 |
| S57 | 15 | ("20080060249" \| "20080305822" \| "20070230394" \| "20080119979" \| "20070000967" \| "20070254656").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 13:46 |
| S58 | 2 | "delegate component carrier" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:19 |
| S60 | 5 | "delegate CC" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:20 |
| S61 | 21 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing and (CC OR (component adj carrier)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/14 15:38 |
| S62 | 276 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:34 |
| S63 | 1 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH UL NEAR3 synchronization | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:35 |
| S64 | 4 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH synchronization | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:35 |
| S66 | 31 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic WITH state | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:36 |
| S67 | 256 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd | US-PGPUB; USPAT | OR | ON | 2014/01/15 09:38 |

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|---|---|---|---|---|---|---|
| | | OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | | | | |
| S68 | 1007 | (370/324).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 09:39 |
| S69 | 0 | S62 and S68 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 09:40 |
| S70 | 21847 | (370/329).CCLS. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 09:40 |
| S71 | 10 | S62 and S70 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 09:40 |
| S72 | 3 | ("2011/0292887").URPN. | USPAT | OR | ON | 2014/01/15 09:51 |
| S73 | 3 | ("2011/0292887").URPN. | USPAT | OR | ON | 2014/01/15 09:56 |
| S74 | 2 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" and establish$3 near3 uplink | US-PGPUB; USPAT | OR | ON | 2014/01/15 10:04 |
| S75 | 2 | ("2012/0063425").URPN. | USPAT | OR | ON | 2014/01/15 10:04 |
| S76 | 2 | (13/556165).APP. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/01/15 10:16 |
| S78 | 13343 | retransmission near data | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 10:56 |
| S80 | 357 | retransmission near data WITH receiv$3 NEAR4 terminals | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; | OR | ON | 2014/01/15 11:00 |

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|---|---|---|---|---|---|---|
| | | | DERWENT; IBM_TDB | | | |
| S81 | 21 | retransmission near data WITH receiv$3 NEAR4 terminals WITH threshold | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 11:00 |
| S83 | 4 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (terminal OR UE OR (user adj equipment)) and (CC OR carrier) WITH characteristic | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 19:59 |
| S86 | 2 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH macro | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 21:58 |
| S87 | 11 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (threshold OR predetermin$3 OR predefin$3 OR preset$3) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/15 22:00 |
| S88 | 1308 | form$3 WITH timing near synchronization | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 10:13 |
| S89 | 13 | form$3 WITH timing near4 synchronization NEAR7 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 10:14 |
| S90 | 4 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing NEAR20 (simultaneously OR concurrently) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/01/16 11:03 |
| S91 | 4 | ("2008/0037502").URPN. | USPAT | OR | ON | 2014/01/16 11:12 |
| S94 | 62 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:19 |

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|---|---|---|---|---|---|---|
| | | "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. | | | | |
| S95 | 62 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |
| S96 | 0 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and stimutaneous | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |
| S97 | 22 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:20 |

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|---|---|---|---|---|---|---|
| | | "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and timing | | | | |
| S98 | 4 | ("20110299489" \| "20120113941" \| "20120300743" \| "20120076103" \| "20130078913" \| "20130094466" \| "20110268032" \| "20120113914" \| "20120113962" \| "20130094433" \| "20120113962" \| "20120250520" \| "20120300743" \| "20120224552" \| "20130072246" \| "20070189205" \| "20110261776" \| "20110268032" \| "20120076103" \| "20120008600" \| "20120243498" \| "20120250520" \| "20130010704" \| "20130084913" \| "20070189205" \| "20120008600" \| "20120307811" \| "20120113941" \| "20070293224" \| "20110261776" \| "20120243498" \| "20100227569" \| "20110299489" \| "20120113914" \| "20120077484" \| "20120188897" \| "20100227569" \| "20120307811" \| "8031662").PN. and timing WITH synchron$5 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 17:21 |
| S99 | 44 | ("2007/0293224").URPN. | USPAT | OR | ON | 2014/02/15 17:23 |
| S100 | 17 | ("2012/0250520").URPN. | USPAT | OR | ON | 2014/02/15 21:09 |
| S101 | 17 | ("2012/0250520").URPN. | USPAT | OR | ON | 2014/02/15 21:13 |
| S102 | 13 | ("20100158147" \| "20110038271" \| "20110243016" \| "20100273515" \| "20090163211" \| "20090163211" \| "20090318180").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 21:41 |
| S103 | 435 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:47 |

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|---|---|---|---|---|---|---|---|
| | | "20080285691" \| "20100238903" \| "20040242195" \| "20090264164" \| "20030165122" \| "20040148427" \| "20070155390" \| "20090124259" \| "20100238799" \| "20090005051" \| "20070177569" \| "20060126554" \| "20050041610" \| "20030123485" \| "20070248075" \| "6567409" \| "20050085254" \| "20070291673" \| "20070258591" \| "20050232271" \| "20080076359" \| "20100309877" \| "6795419" \| "20040229605" \| "20050063347" \| "20070293224" \| "20040042507" \| "20070155389" \| "20110207427" \| "7039425" \| "5588009" \| "20030165133" \| "20080181127" \| "20020028690" \| "20010017850" \| "20020057663" \| "20080056198" \| "20070206531" \| "20100165901" \| "8064676" \| "20090207771" \| "20100265896" \| "20010034791" \| "20090239538" \| "20070041382" \| "7525908" \| "20080188223" \| "0776951" \| "7606370" \| "20070291729" \| "20030207696" \| "20070291719" \| "20050009527" \| "20060262811" \| "20100046384" \| "20080280567" \| "20100128669" \| "20070047452" \| "20100227614" \| "20100254340" \| "20080268850" \| "20120002589" \| "20050100048" \| "20030119488" \| "20020059464" \| "20020091860" \| "20050094670" \| "20060126570" \| "20070165635" \| "20100195568" \| "20050053029" \| "20060142019" \| "20040014452" \| "6725267" \| "20030189922" \| "20050141462" \| "20040185837" \| "20080225744" \| "20030050078" \| "20050265294" \| "20090086659" \| "20090181710" \| "20090318170" \| "20100027413" \| "7443813" \| "20060251105" \| "20070291646" \| "20020059464" \| "20080240439" \| "20080316959" \| "20060013165" \| "20110090836" \| "20080186946" \| "20040039830" \| "20050037767" \| "20050160184" \| "20050286470" \| "20080240439" \| "20090022107" \| "6233430" \| "20080167089" \| "20040117860" \| "20050185620" \| "20050238051" \| "20070291673" \| "20070178875" \| "20080273610" \| "20080009289" \| "20080089285" \| "20070291788" \| "20080095185" \| "20080225765" \| "20090086710" \| "20090109912" \| "20100061330" \| "7801527" \| "20030147371" \| "20040042507" \| "20040148427" \| "20050286470" \| "20070165635" \| "20070291695" \| "7865731" \| "20030123485" \| "20100075635" \| "20040147269" \| "20040233870" \| "20070291728" \| "20050176474" \| "20070206531" \| | | | |

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| S104 | 75 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| "20080285691" \| "20100238903" \| "20040242195" \| "20090264164" \| "20030165122" \| "20040148427" \| "20070155390" \| "20090124259" \| "20100238799" \| "20090005051" \| "20070177569" \| "20060126554" \| "20050041610" \| "20030123485" \| "20070248075" \| "6567409" \| "20050085254" \| "20070291673" \| "20070258591" \| "20050232271" \| "20080076359" \| "20100309877" \| "6795419" \| "20040229605" \| "20050063347" \| "20070293224" \| "20040042507" \| "20070155389" \| "20110207427" \| "7039425" \| "5588009" \| "20030165133" \| "20080181127" \| "20020028690" \| "20010017850" \| "20020057663" \| "20080056198" \| "20070206531" \| "20100165901" \| "8064676" \| "20090207771" \| "20100265896" \| "20010034791" \| "20090239538" \| "20070041382" \| "7525908" \| "20080188223" \| "0776951" \| "7606370" \| "20070291729" \| "20030207696" \| "20070291719" \| "20050009527" \| "20060262811" \| "20100046384" \| "20080280567" \| "20100128669" \| "20070047452" \| "20100227614" \| "20100254340" \| "20080268850" \| "20120002589" \| "20050100048" \| "20030119488" \| "20020059464" \| "20020091860" \| "20050094670" \| "20060126570" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:51 |

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| S105 | 11 | ("20080101268" \| "20060067364" \| "20050094670" \| "20060209870" \| "20040014452" \| "20080043619" \| "20050141541" \| "20060203760" \| "20060218271" \| "20080064390" \| "20080310452" \| "20090143074" \| "20090163199" \| "20110039536" \| "20050176430" \| "20080267126" \| "20020091860" \| "20030007490" \| "20080089292" \| "7916697" \| "20080287091" \| "20060187846" \| "20070206531" \| "7912471" \| "20050288022" \| "20060087994" \| "7245707" \| "7551643" \| "20050164719" \| "20060098688" \| "20060251105" \| "7912471" \| "20090092076" \| "20080089285" \| "20100272004" \| "20110116436" \| "7958542" \| "20070155389" \| "20080188223" \| "20080285691" \| "20100238903" \| | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/02/15 22:54 |

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| | | "20040242195" \| "20090264164" \| "20030165122" \| "20040148427" \| "20070155390" \| "20090124259" \| "20100238799" \| "20090005051" \| "20070177569" \| "20060126554" \| "20050041610" \| "20030123485" \| "20070248075" \| "6567409" \| "20050085254" \| "20070291673" \| "20070258591" \| "20050232271" \| "20080076359" \| "20100309877" \| "6795419" \| "20040229605" \| "20050063347" \| "20070293224" \| "20040042507" \| "20070155389" \| "20110207427" \| "7039425" \| "5588009" \| "20030165133" \| "20080181127" \| "20020028690" \| "20010017850" \| "20020057663" \| "20080056198" \| "20070206531" \| "20100165901" \| "8064676" \| "20090207771" \| "20100265896" \| "20010034791" \| "20090239538" \| "20070041382" \| "7525908" \| "20080188223" \| "0776951" \| "7606370" \| "20070291729" \| "20030207696" \| "20070291719" \| "20050009527" \| "20060262811" \| "20100046384" \| "20080280567" \| "20100128669" \| "20070047452" \| "20100227614" \| "20100254340" \| "20080268850" \| "20120002589" \| "20050100048" \| "20030119488" \| "20020059464" \| "20020091860" \| "20050094670" \| "20060126570" \| "20070165635" \| "20100195568" \| "20050053029" \| "20060142019" \| "20040014452" \| "6725267" \| "20030189922" \| "20050141462" \| "20040185837" \| "20080225744" \| "20030050078" \| "20050265294" \| "20090086659" \| "20090181710" \| "20090318170" \| "20100027413" \| "7443813" \| "20060251105" \| "20070291646" \| "20020059464" \| "20080240439" \| "20080316959" \| "20060013165" \| "20110090836" \| "20080186946" \| "20040039830" \| "20050037767" \| "20050160184" \| "20050286470" \| "20080240439" \| "20090022107" \| "6233430" \| "20080167089" \| "20040117860" \| "20050185620" \| "20050238051" \| "20070291673" \| "20070178875" \| "20080273610" \| "20080009289" \| "20080089285" \| "20070291788" \| "20080095185" \| "20080225765" \| "20090086710" \| "20090109912" \| "20100061330" \| "7801527" \| "20030147371" \| "20040042507" \| "20040148427" \| "20050286470" \| "20070165635" \| "20070291695" \| "7865731" \| "20030123485" \| "20100075635" \| "20040147269" \| "20040233870" \| "20070291728" \| "20050176474" \| "20070206531" \| "20040253959" \| "20050041681" \| | | | |

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|---|---|---|---|---|---|---|
| | | "20060165045" \| "20060245417" \| "20080056273" \| "20070047582" \| "20060067324" \| "20040100940" \| "20050032555" \| "20040180675" \| "20080182594" \| "20030165122" \| "20050160184" \| "20070064631" \| "20080004058" \| "20100067495" \| "20040087320" \| "20090040982" \| "20110261743" \| "20070064665" \| "20030139170" \| "20050249188" \| "20060039309").PN. and synchronization WITH uplink | | | | |
| S106 | 44 | ("2007/0293224").URPN. | USPAT | OR | ON | 2014/02/15 23:15 |
| S107 | 15703 | H04W72/04.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:47 |
| S108 | 230 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:47 |
| S109 | 6136 | H04W72/00.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S111 | 1564 | H04B7/216.CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S112 | 7 | S107 and S108 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:48 |
| S114 | 3 | S109 and S108 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/05/19 13:49 |
| S115 | 260 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | US-PGPUB; USPAT | OR | ON | 2014/05/19 13:52 |
| S116 | 2 | ("20120307821").PN. | US-PGPUB; | OR | OFF | 2014/06/27 |

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|---|---|---|---|---|---|---|
| | | | USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | 23:56 |
| S117 | 1 | ("20120307821").PN. | DERWENT | OR | OFF | 2014/06/27 23:56 |
| S118 | 3 | ("20130121264").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/06/28 22:01 |
| S119 | 31095 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:29 |
| S120 | 31048 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:30 |
| S121 | 885 | (H04B1/7087).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S122 | 343 | (establish$3 OR creat$3) WITH (UL OR uplink) NEAR3 (sync OR synchronization) and (select$3 OR pick$3 OR choos$3) WITH (UE OR mobile near station OR user near equipment) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S123 | 53 | S119 and S122 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:31 |
| S124 | 19 | S120 and S122 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 00:32 |
| S125 | 2 | S121 and S122 | US-PGPUB; USPAT; USOCR; FPRS; | OR | ON | 2014/06/29 00:32 |

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|---|---|---|---|---|---|---|
| | | | EPO; JPO; DERWENT; IBM_TDB | | | |
| S126 | 2 | ("20090186613").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2014/06/29 01:17 |
| S127 | 14 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing and (CC OR (component adj carrier)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 09:56 |
| S128 | 9 | ("20030076812" \| "20090161599" \| "20090290555" \| "20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 10:03 |
| S129 | 31136 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:22 |
| S130 | 12 | (UL OR uplink) NEAR4 timing WITH distinguished and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:28 |
| S131 | 165 | (UL OR uplink) NEAR4 timing WITH error and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:32 |
| S132 | 15 | S129 and S131 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/06/29 12:33 |
| S133 | 26 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH (RACH OR random NEAR access NEAR channel) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/07 22:46 |
| S134 | 0 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR | US-PGPUB; USPAT; | OR | ON | 2014/12/07 23:05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | message OR data) WITH (UL OR uplink) NEAR4 timing WITH (RACH OR random NEAR access NEAR channel) WITH response | USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S135 | 46 | ("20100260156" \| "8077671" \| "20070015511" \| "8274947" \| "20110103347" \| "7450944" \| "20100142485" \| "20090046665" \| "20100056160" \| "20100003981" \| "20120177006" \| "5440561" \| "20090070469" \| "20020160779" \| "7469142" \| "20030053431" \| "20030147370" \| "20100278150").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/07 23:09 |
| S136 | 19 | ("2010/0142485").URPN. | USPAT | OR | ON | 2014/12/07 23:15 |
| S137 | 13 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) NEAR4 timing WITH contention | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/16 11:47 |
| S138 | 75 | (transmit$3 OR send$3) WITH (SYNC OR synchroniz$5) NEAR7 (information OR message OR data) WITH (UL OR uplink) WITH contention | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2014/12/16 11:49 |
| S139 | 51 | (component NEAR carrier AND (primary NEAR CC)).clm. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2015/01/13 11:31 |
| S140 | 47 | ((KIBUM) near2 (KWON)).INV. | US-PGPUB; USPAT | OR | ON | 2015/01/13 12:46 |
| S141 | 1 | ("2012/0108254").URPN. | USPAT | OR | ON | 2015/01/13 13:26 |
| S142 | 14 | ((MYUNGCHEUL) near2 (JUNG)).INV. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:28 |
| S162 | 41 | ("20090116434" \| "20090274120" \| "8606336" \| "20110170495" \| "20090318175" \| "20100086065" \| "20100238857" \| "20100323744" \| "20100041399" \| "20090270094" \| "20090316642" \| "20100111005" \| "20100118720").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2015/01/13 13:51 |
| S177 | 2316 | (TA OR (timing NEAR2 advanced)) AND (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 11:59 |
| S178 | 421 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR2 advanced)) AND (random NEAR2 access NEAR3 | US-PGPUB; USPAT; USOCR; | OR | ON | 2016/12/12 12:04 |

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|---|---|---|---|---|---|---|
| | | preamble) | FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S179 | 421 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) AND (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:05 |
| S180 | 230 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:05 |
| S181 | 185 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:06 |
| S182 | 169 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:07 |
| S183 | 3 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100210" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:08 |
| S184 | 9 | ("20030076812" \| "20090161599" \| "20090290555" \| "20090316642").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 12:17 |
| S185 | 2 | tim$4 NEAR3 group SAME (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/12 15:08 |
| S186 | 50 | ("2012/0307811").URPN. | USPAT | OR | ON | 2016/12/12 15:18 |
| S187 | 17 | ("20070189205" \| "20100227569" \| "20110261776" \| "20110268032" \| "20110299489" \| "20120113941" \| "20120300743" \| "20120307811").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; | OR | ON | 2016/12/14 16:27 |

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|---|---|---|---|---|---|---|
| | | | DERWENT; IBM_TDB | | | |
| S188 | 3 | ("8982805").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/14 16:47 |
| S189 | 34 | ("20110039593" \| "20110159903" \| "20110045837" \| "20110243048" \| "20090279495" \| "20100232382" \| "20110026475" \| "20110243106" \| "20080310395" \| "20100177747" \| "20110235609" \| "20110317777" \| "20100296467" \| "20110134774" \| "20070293224").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/14 17:02 |
| S190 | 182 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) AND (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S191 | 180 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) SAME (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S192 | 0 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced)) SAME (random NEAR2 access NEAR2 preamble) AND synchroniz$4 NEAR2 (UL OR uplink) SAME (carrier OR CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100210" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/16 11:58 |
| S193 | 243 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:36 |
| S194 | 178 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR3 preamble) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:36 |
| S195 | 185 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR4 (UL OR uplink) AND (CC OR (commponent ADJ carrier) OR (carrier ADJ frequency)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:37 |
| S196 | 204 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) | US-PGPUB; USPAT; | OR | ON | 2016/12/19 11:37 |

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|---|---|---|---|---|---|---|
| | | OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR4 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S197 | 196 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR2 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:38 |
| S198 | 1 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) NEAR5 value SAME (random NEAR2 access NEAR2 (preamble OR response)) AND synchroniz$4 NEAR2 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:38 |
| S199 | 17 | ("20080002660" \| "20140293853" \| "20140073337" \| "20160100374" \| "20080279131" \| "20130116002").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 11:39 |
| S200 | 6 | (calculat$3 OR estimat$3 OR comput$4) WITH (TA OR (timing NEAR advanced) OR timing NEAR2 group) SAME (random ADJ access ADJ response) NEAR5 (UL OR uplink) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 12:11 |
| S201 | 10 | ("20100238908" \| "20110243111" \| "20120063425" \| "20120099577").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 12:13 |
| S202 | 120 | random ADJ access NEAR2 (response OR reply) SAME timing NEAR2 advanc$3 AND @ad<"20100210" AND (calculat$4 OR comput$3 OR determin$3 OR estimat$3) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 13:18 |
| S203 | 42 | random ADJ access NEAR2 (response OR reply) SAME timing NEAR2 advanc$3 AND @ad<"20100210" AND (calculat$4 OR comput$3 OR determin$3 OR estimat$3) WITH timing NEAR2 advanc$3 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 13:19 |
| S204 | 2533 | (H04J3/00).CPC. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/19 15:12 |

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|---|---|---|---|---|---|---|
| S205 | 2 | ("20150271770").PN. | US-PGPUB; USPAT; USOCR; DERWENT | OR | ON | 2016/12/20 09:10 |
| S206 | 56 | delegat$3 NEAR2 (carrier OR CC OR CCs) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 11:59 |
| S207 | 26 | delegat$3 NEAR2 (carrier OR CC OR CCs) AND synchronization | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 12:00 |
| S208 | 6 | ("20080273610" \| "20090186613" \| "20090279495").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 12:09 |
| S209 | 3 | ("20100118720").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/24 12:20 |
| S210 | 148 | set$4 WITH (CC OR (component adj carrier)) WITH characteristic AND ((UL NEAR PCC) OR Pcell OR primary) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/24 14:16 |
| S211 | 309 | set$4 WITH (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:02 |
| S212 | 8428 | (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:03 |
| S213 | 561 | (TA OR timing ADJ advanced) SAME (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/25 00:04 |
| S214 | 10 | (calculat$3 OR comput$4 OR estimat$4) SAME (TA OR timing ADJ advanced) | US-PGPUB; USPAT; | OR | ON | 2016/12/25 00:05 |

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|---|---|---|---|---|---|---|
| | | SAME (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) and (@pd OR @ptad OR @prad OR @ad OR @rlad) <"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | | | |
| S215 | 2 | ("20100222059").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/26 02:02 |
| S216 | 34 | ("2010/0222059").URPN. | USPAT | OR | ON | 2016/12/26 02:06 |
| S217 | 9 | set$4 WITH (CC OR (component adj carrier)) AND ((UL NEAR PCC) OR Pcell OR primary NEAR cell) AND tim$3 ADJ2 group and (@pd OR @ptad OR @prad OR @ad OR @rlad)<"20100212" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/26 13:11 |
| S218 | 2 | ("20100142485").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT | OR | OFF | 2016/12/26 15:28 |
| S219 | 0 | WO2009079913 | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/26 23:16 |
| S220 | 5 | "2009079913" | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2016/12/26 23:16 |
| S221 | 64 | ((KIBUM) near2 (KWON)).INV. | US-PGPUB; USPAT | OR | ON | 2017/04/20 09:54 |
| S222 | 21 | ((MYUNGCHEUL) near2 (JUNG)).INV. | US-PGPUB; USPAT | OR | ON | 2017/04/20 09:54 |
| S232 | 61 | ("20090116434" \| "20090274120" \| "20100177747" \| "20090270094" \| "20100041399" \| "20100118720" \| "20080002660" \| "20080188219" \| "20100142485" \| "20090316642" \| "20090318175" \| "20100238857" \| "8606336" \| "20100111005" \| "20100323744" \| "20100238872" \| "20120008600" \| "20090279495" \| "20100086065" \| "20110170495" \| "20080268850").PN. | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2017/08/18 16:08 |

**EAST Search History (Interference)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
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|---|---|---|---|---|---|---|
| S143 | 3665 | (370/350).CCLS. | US-PGPUB; USPAT | OR | OFF | 2015/01/13 11:08 |
| S144 | 51 | (component NEAR carrier AND (primary NEAR CC)).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:31 |
| S145 | 7 | uplink NEAR timing NEAR group.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:31 |
| S146 | 22 | UL NEAR group.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:31 |
| S147 | 83 | synchronization NEAR request NEAR message.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:32 |
| S148 | 9 | S143 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:34 |
| S149 | 2 | S146 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:36 |
| S150 | 1 | S144 AND S147 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:36 |
| S151 | 5348 | uplink AND synchronization.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:37 |
| S152 | 646 | S143 AND S151 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S153 | 1 | S146 AND S152 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S154 | 1 | S147 AND S152 | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:40 |
| S155 | 3 | UL NEAR timing NEAR group.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:42 |
| S156 | 15 | (component NEAR carrier AND (primary NEAR CC) AND (second NEAR CC)).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 11:44 |
| S157 | 3 | delegate ADJ CC.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:32 |
| S158 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:32 |
| S159 | 1 | S147 AND S158 | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:33 |
| S160 | 10 | S144 AND S158 | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:33 |
| S161 | 64 | (primary ADJ CC) AND (radio NEAR resource NEAR control) AND timing.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 13:34 |

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|---|---|---|---|---|---|---|
| S163 | 8801 | (H04W56/0045 OR H04W92/10 OR H04W88/08).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S164 | 213 | (H04B1/7087).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S165 | 8686 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:00 |
| S166 | 3665 | (370/350).CCLS. | US-PGPUB; USPAT | OR | OFF | 2015/01/13 15:01 |
| S167 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S168 | 7 | S163 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S169 | 86 | S167 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:01 |
| S170 | 56 | S165 AND S167 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:02 |
| S171 | 5348 | uplink AND synchronization.clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |
| S172 | 431 | S163 AND S171 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |
| S173 | 3 | S167 AND S172 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:04 |
| S174 | 8686 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:31 |
| S175 | 86 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:32 |
| S176 | 56 | S174 AND S175 | US-PGPUB; USPAT | OR | ON | 2015/01/13 15:32 |
| S223 | 15660 | (H04L5/001 OR H04L5/0007).CPC. | US-PGPUB; USPAT | OR | ON | 2017/04/20 10:49 |
| S224 | 275 | uplink AND timing NEAR advance NEAR value.clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 10:50 |
| S225 | 12 | uplink AND timing NEAR advance NEAR value AND RAR.clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 10:50 |
| S226 | 5 | uplink NEAR timing AND TA NEAR value AND RAR.clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:02 |
| S227 | 93 | (component NEAR carrier AND (primary NEAR CC)).clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:20 |

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| S228 | 236 | (primary ADJ CC) AND (radio NEAR resource NEAR control).clm. | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:20 |
| S229 | 0 | S223 AND S224 AND S228 | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:20 |
| S230 | 21 | S223 AND S224 | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:21 |
| S231 | 3 | S224 AND S228 | US-PGPUB; USPAT | OR | ON | 2017/04/20 11:21 |

**8/ 18/ 2017 5:04:38 PM**
**C:\ Users\ ltruong1\ Documents\ EAST\ Workspaces\ 14-733068_CON_578531.wsp**

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 14733068 | KWON ET AL. |
| | **Examiner** | **Art Unit** |
| | LAN HUONG TRUONG | 2464 |

| CPC | | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | | | | | **Type** | **Version** |
| H04W | | 56 | / | 0005 | F | 2013-01-01 |
| H04L | | 5 | / | 0007 | A | 2013-01-01 |
| H04L | | 5 | / | 001 | I | 2013-01-01 |
| H04W | | 88 | / | 08 | A | 2013-01-01 |
| H04W | | 92 | / | 10 | A | 2013-01-01 |
| H04B | | 1 | / | 7087 | A | 2013-01-01 |
| H04W | | 56 | / | 0045 | I | 2013-01-01 |
| H04W | | 74 | / | 004 | I | 2013-01-01 |
| H04W | | 76 | / | 046 | I | 2013-01-01 |
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| /LAN HUONG TRUONG/<br>Examiner.Art Unit 2464 | 08/17/2017 | **Total Claims Allowed:** | |
| (Assistant Examiner) | (Date) | 3 | |
| /RICKY NGO/<br>Supervisory Patent Examiner.Art Unit 2464 | 08/20/2017 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 1 | Figure 9 |

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
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| | 14733068 | KWON ET AL. |
| | **Examiner** | **Art Unit** |
| | LAN HUONG TRUONG | 2464 |

| US ORIGINAL CLASSIFICATION | | INTERNATIONAL CLASSIFICATION | | | | | | | | | | |
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| CLASS | SUBCLASS | CLAIMED | | | | | NON-CLAIMED | | | | | |
| | | H | 0 | 4 | J | 3 / 06 (2006.01.01) | | | | | | |
| CROSS REFERENCE(S) | | | | | | | | | | | | |
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| /LAN HUONG TRUONG/<br>Examiner.Art Unit 2464 | 08/17/2017 | **Total Claims Allowed:** | |
| (Assistant Examiner) | (Date) | 3 | |
| /RICKY NGO/<br>Supervisory Patent Examiner.Art Unit 2464 | 08/20/2017 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 1 | Figure 9 |

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
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| | 14733068 | KWON ET AL. |
| | **Examiner** | **Art Unit** |
| | LAN HUONG TRUONG | 2464 |

☒ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

| Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original |
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| /LAN HUONG TRUONG/<br>Examiner.Art Unit 2464 | 08/17/2017 | **Total Claims Allowed:** | |
| (Assistant Examiner) | (Date) | 3 | |
| /RICKY NGO/<br>Supervisory Patent Examiner.Art Unit 2464 | 08/20/2017 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 1 | Figure 9 |

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Falls Church, VA 22046

**Courtesy Reminder for**
**Application Serial No: 14/733,068**

Attorney Docket No: GP.009
Customer Number: 146410
Date of Electronic Notification: 08/25/2017

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# STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: GOLDPEAK INNOVATIONS INC

Application No./Patent No.: 14/733,068 Filed/Issue Date: 06/08/2015

Titled: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

GOLDPEAK INNOVATIONS INC, 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:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: PANTECH CO., LTD. To: PANTECH INC.

   The document was recorded in the United States Patent and Trademark Office at
   Reel 039428, Frame 0268, or for which a copy thereof is attached.

2. From: PANTECH INC To: GOLDPEAK INNOVATIONS INC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 042098, Frame 0653, or for which a copy thereof is attached.



This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

## STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ 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.

| | |
|---|---|
| /jwkim/ | 2017-10-18 |
| Signature | Date |
| Jongwon Kim | 66993 |
| 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.

PTO/AIA/80 (07-17)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no person is required to respond to a collection of information unless it displays a valid OMB control number.

# POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

[x] Practitioners associated with Customer Number: 66390

**OR**

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

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

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

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

[x] The address associated with Customer Number: 66390

**OR**

[ ]

| | | |
|---|---|---|
| Firm or individual name | | |
| Address | | |
| City | State | Zip |
| Country | | |
| Telephone | Email | |

Assignee name and address: GOLDPEAK INNOVATIONS INC.
Suite # 808, Digital-ro 34-gil, 55,Guro-gu, Seoul, 08378, South Korea(Republic of Korea)

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

**SIGNATURE of Assignee of Record**

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

| | |
|---|---|
| Signature | Date 17 / 10 / 2017 |
| Name Youngjoon Rhee | Telephone +82-10-8929-1905 |
| Title CEO at GOLDPEAK INNOVATIONS INC | |

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

# Privacy Act Statement

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

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

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

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 30687141 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 146410 |
| **Filer:** | Jongwon Kim |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | GP.009 |
| **Receipt Date:** | 18-OCT-2017 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 10:33:49 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Power of Attorney | aia0096.pdf | 1917612<br>d6185058622031bee8a23e7fa6a2d4aaa9de18bf | no | 3 |
| **Warnings:** | | | | | |

| Information: | | | | | |
|---|---|---|---|---|---|
| 2 | Power of Attorney | GPOA_GoldPeak_sb80.pdf | 684881<br>66f5127db48c2b8b41fad91bdf748c3f97e394eb | no | 2 |
| Warnings: | | | | | |
| Information: | | | | | |
| | | | Total Files Size (in bytes): | 2602493 | |

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

**New Applications Under 35 U.S.C. 111**

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

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

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

**New International Application Filed with the USPTO as a Receiving Office**

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | GP.009 |

**CONFIRMATION NO. 5097**

66390
LEX IP MEISTER, PLLC
5180 PARKSTONE DRIVE, SUITE 175
CHANTILLY, VA 20151

**POA ACCEPTANCE LETTER**

*OC000000094886457*

Date Mailed: 10/19/2017

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/18/2017.

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**.

/bcrittenden/

UNITED STATES PATENT AND TRADEMARK OFFICE

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

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | GP.009 |

**CONFIRMATION NO. 5097**

**POWER OF ATTORNEY NOTICE**

146410
Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

*OC000000094886410*

Date Mailed: 10/19/2017

## NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/18/2017.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

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

/bcrittenden/

## PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail** **Mail Stop ISSUE FEE**
**Commissioner for Patents**
**P.O. Box 1450**
**Alexandria, Virginia 22313-1450**
**or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

146410 7590 08/25/2017
Fidelis Law Group , PLLC
444 W Broad ST UNIT 426
Falls Church, VA 22046

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

**Certificate of Mailing or Transmission**
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

| | |
|---|---|
| Jongwon Kim | (Depositor's name) |
| /jwkim/ | (Signature) |
| November 22, 2017 | (Date) |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 14/733,068 | 06/08/2015 | Kibum KWON | GP.009 | 5097 |

TITLE OF INVENTION: APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM

| APPLN. TYPE | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | UNDISCOUNTED | $960 | $0 | $0 | $960 | 11/27/2017 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| TRUONG, LAN-HUONG | 2464 | 370-350000 |

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 03-02 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 patent attorneys or agents. If no name is listed, no name will be printed.
1 LEX IP MEISTER, PLLC
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.

(A) NAME OF ASSIGNEE: GOLDPEAK INNOVATIONS INC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): SEOUL, KOREA, REPUBLIC OF

Please check the appropriate assignee category or 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 Fee(s): **(Please first reapply any previously paid issue 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 504054 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee 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 /jwkim/ Date November 22, 2017
Typed or printed name Jongwon Kim Registration No. 66993



PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 14733068 |
| **Filing Date:** | 08-Jun-2015 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Filer:** | Jongwon Kim |
| **Attorney Docket Number:** | BPP20170030US |

Filed as Large Entity

**Filing Fees for Utility under 35 USC 111(a)**

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| UTILITY APPL ISSUE FEE | 1501 | 1 | 960 | 960 |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **960** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 31028442 |
| **Application Number:** | 14733068 |
| **International Application Number:** | |
| **Confirmation Number:** | 5097 |
| **Title of Invention:** | APPARATUS AND METHOD FOR ESTABLISHING UPLINK SYNCHRONIZATION IN A WIRELESS COMMUNICATION SYSTEM |
| **First Named Inventor/Applicant Name:** | Kibum KWON |
| **Customer Number:** | 66390 |
| **Filer:** | Jongwon Kim |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | BPP20170030US |
| **Receipt Date:** | 22-NOV-2017 |
| **Filing Date:** | 08-JUN-2015 |
| **Time Stamp:** | 13:01:38 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $960 |
| RAM confirmation Number | 112417INTEFSW13015600 |
| 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) | transmittal_issue_fee.pdf | 271806<br>4e372384837cce963843bf72489c4debdf8a604e | no | 1 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Fee Worksheet (SB06) | fee-info.pdf | 30927<br>d037a71d5a2d68091cbbca38f9871084523dc028 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 302733 | | |

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

**New Applications Under 35 U.S.C. 111**

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

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

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

**New International Application Filed with the USPTO as a Receiving Office**

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

| APPLICATION NO. | ISSUE DATE | PATENT NO. | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 14/733,068 | 12/26/2017 | 9854545 | BPP20170030US | 5097 |

66390 7590 12/06/2017

LEX IP MEISTER, PLLC
5180 PARKSTONE DRIVE, SUITE 175
CHANTILLY, VA 20151

# 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 54 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):

Kibum KWON, Seoul, KOREA, REPUBLIC OF;
GOLDPEAK INNOVATIONS INC, Seoul, KOREA, REPUBLIC OF;
Myungcheul JUNG, Seoul, KOREA, REPUBLIC OF;

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# PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT6105570

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| **SUBMISSION TYPE:** | NEW ASSIGNMENT |
| **NATURE OF CONVEYANCE:** | ASSIGNMENT |

**CONVEYING PARTY DATA**

| Name | Execution Date |
|---|---|
| GOLDPEAK INNOVATIONS INC | 05/07/2020 |

**RECEIVING PARTY DATA**

| | |
|---|---|
| **Name:** | PANTECH CORPORATION |
| **Street Address:** | 8 YANGJAECHEONRO-21GIL, SUITE 402, SEOCHO-GU, |
| **City:** | SEOUL |
| **State/Country:** | KOREA, REPUBLIC OF |
| **Postal Code:** | 06748 |

**PROPERTY NUMBERS Total: 234**

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| **Application Number:** | 16288278 |

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| **Application Number:** | 16823170 |
| **Application Number:** | 16806830 |
| **Application Number:** | 16730711 |
| **Application Number:** | 16711269 |
| **Application Number:** | 16806665 |
| **Application Number:** | 16826054 |
| **Application Number:** | 16037067 |
| **Application Number:** | 16184560 |
| **Application Number:** | 16694830 |

**CORRESPONDENCE DATA**

**Fax Number:** (703)643-9789

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

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**Email:** yoon@capitoliplaw.com
**Correspondent Name:** YEASUN YOON
**Address Line 1:** 20319 KIAWAH ISLAND DR
**Address Line 4:** ASHBURN, VIRGINIA 20147

| | |
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| **NAME OF SUBMITTER:** | YEASUN YOON |
| **SIGNATURE:** | /yoon/ |
| **DATE SIGNED:** | 05/13/2020 |
| | This document serves as an Oath/Declaration (37 CFR 1.63). |

**Total Attachments: 17**
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# CONFIRMATORY ASSIGNMENT OF PATENT RIGHTS

This CONFIRMATORY ASSIGNMENT OF PATENT RIGHTS (this "**Assignment**") is made this ____ day of April 2020, by **GoldPeak Innovations Inc,** a Korean company ("**Assignor**"), in favor of **Pantech Corporation.**, a Korean company ("**Assignee**").

WHEREAS, Assignor and Assignee are party to that certain Patent Sale and Purchase Agreement of even date herewith (as in effect from time to time, the "**Patent Sale and Purchase Agreement**"); capitalized terms used but not otherwise defined in this Assignment shall have the respective meaning assigned thereto in the Patent Sale and Purchase Agreement; and

WHEREAS, pursuant to the Patent Sale and Purchase Agreement, Assignor has agreed to sell, convey, transfer, assign and deliver to Assignee all right, title and interest, including, without limitation, Patent Rights, in and to the patents, provisional patent applications, and patent applications listed on listed on Schedule A hereto (collectively, the "**Patents**").

NOW, THEREFORE, for good and valuable consideration, receipt of which is hereby acknowledged by Assignor, Assignor hereby sells, conveys, transfers, and assigns to Assignee, its successors, legal representatives and assigns all right, title and interest in the United States and throughout the world in and to:

The Patents and any and all letters patent that are or may be granted thereon, and any legal equivalent and counterpart thereof that may be granted in any country or countries foreign to the United States, in each case including without limitation any extensions, substitutes, continuations, continuations-in-part, divisions, reissues, reexaminations, and renewals thereof, or other equivalents thereof, and further, all rights and privileges pertaining to the Patents and any and all letters patent that are or may be granted thereon, and any legal equivalent thereof that may be granted in any country or countries foreign to the United States as well as all inventions, invention disclosures, and discoveries described in any of the foregoing and including, without limitation, the right, if any, to petition, sue or otherwise seek and recover damages, profits and any other remedy (monetary, injunctive, declaratory or other relief or remedy of any kind) in the United States and anywhere throughout the world for any past, present and future infringement thereof, conversion or misappropriation of, or other injury, offense, violation, breach of duty or wrong relating to, any of the Patents, or any license, agreement, contract or other matter relating thereto.

Assignor hereby authorizes and requests the Commissioner of Patents and Trademarks of the United States of America and the appropriate officers of all other jurisdictions in which the Patents are or may be registered or in which applications included among the Patents are pending, to record the title of Assignee, its successors, legal representatives and assigns, as owner of all right, title and interest in and to the Patents, and to issue to Assignee, its successors, legal representatives and assigns, all letters patent and any legal equivalent thereof that may be granted in any country or countries foreign to the United States and recordations of patent rights resulting from any application included among the Patents, according to this instrument.

Except to the extent that federal law preempts state law with respect to the matters covered hereby, this Assignment shall be governed by and construed in accordance with the laws of the State of Delaware, without giving effect to any of the principles of conflicts of laws thereof that would result in the application of the laws of another jurisdiction to this Assignment.

This Assignment will inure to the benefit of Assignee, its successors, assigns, and other legal representatives and will be binding upon Assignor, its successors, assigns, and other legal representatives.

Assignor has the full power and authority, and has obtained all Third Party consents, approvals and/or other authorizations required to enter into this Assignment and to carry out its obligations hereunder.

If Assignee is unable for any reason to secure Assignor's or its affiliates or their respective successors' or assigns' signature to any document it is entitled to under this Assignment, Assignor and its affiliates hereby irrevocably designate and appoint Assignee, and Assignee's duly authorized officers, agents and representatives, as its agents and attorneys-in-fact, coupled with an interest, with full power of substitution to act for and on the behalf and instead of Assignor, to execute and file any such document or documents and to do all other lawfully permitted acts to further the purposes of this Assignment with the same legal force and effect as if executed by Assignor.

IN WITNESS WHEREOF, Assignor has caused this Assignment to be executed by its duly authorized officer, as of the date first written above.

**ASSIGNOR:**

**GoldPeak Innovations Inc.**

By: Saekyung Park

Name: Saekyung Park

Title: CEO

Schedule A

| Family | Country | Application # | Application Date | Issued # | Issued Date |
|---|---|---|---|---|---|
| 1 | U.S.A. | 2017-406403 | 1/13/2017 | 10014988 | 7/3/2018 |
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| | GERMANY | 15166204.6 | 11/13/2017 | 2922233 | 11/22/2017 |
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| | ISRAEL | 180227 | 12/21/2006 | 180227 | 12/28/2011 |
| | ICELAND | 05756764.6 | 6/25/2005 | 1767036 | 10/31/2012 |
| | IRELAND | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | HUNGARY | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | GREECE | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |

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| | U.K. | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | SLOVAKIA | 05756764.6 | 6/25/2005 | 1767036 | 10/31/2012 |
| | FRANCE | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | SWITZERLAND | 5756764.6 | 6/25/2005 | 1767036 | 10/31/2012 |
| | FINLAND | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | SPAIN | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | E.P.O | 12189742 | 10/24/2012 | 2552164 | 9/5/2018 |
| | GERMANY | 12189742.5 | 8/28/2018 | 2552164 | 9/5/2018 |
| | FRANCE | 12189742.5 | 8/28/2018 | 2552164 | 9/5/2018 |
| | U.K. | 12189742.5 | 8/28/2018 | 2552164 | 9/5/2018 |
| | E.P.O | 05756764.6 | 6/25/2005 | 1767036 | 10/31/2012 |
| | ESTONIA | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | DENMARK | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | GERMANY | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | CZ | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | CYPRUS | 05756764.6 | 1/12/2007 | CY20131100062 - EP1767036 | 10/31/2012 |
| | CHINA | 200910224551.5 | 11/17/2009 | ZL200910224551.5 | 12/7/2016 |
| | CHINA | 200580020940.6 | 12/25/2006 | ZL 2005 8 0020940.6 | 3/24/2010 |
| | CANADA | 2569425 | 12/1/2006 | 2569425 | 6/3/2014 |
| | BULGARIA | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | Belgium | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | AUSTRALIA | 2005257642 | 11/24/2006 | 2005257642 | 11/12/2009 |
| | AUSTRIA | 05756764.6 | 1/12/2007 | 1767036 | 10/31/2012 |
| | KR | 1020050019211 | 3/8/2005 | 875419 | 12/16/2008 |
| | KR | 1020090013393 | 2/18/2009 | 935294 | 12/24/2009 |
| | KR | 1020040077649 | 9/25/2004 | 908260 | 7/10/2009 |
| 4 | U.S.A. | 12/684847 | 1/8/2010 | 7853852 | 12/14/2010 |
| | U.S.A. | 11/320374 | 12/27/2005 | 7725796 | 5/25/2010 |
| | TAIWAN | 94146828 | 12/27/2005 | I416897 | 11/21/2013 |
| | MEXICO | MX/a/2007/007796 | 6/25/2007 | 270303 | 9/23/2009 |
| | JAPAN | 2013-236045 | 11/14/2013 | 5619262 | 9/26/2014 |
| | JAPAN | 2012-142491 | 6/25/2012 | 5554375 | 6/6/2014 |
| | JAPAN | 2007-548094 | 6/26/2007 | 5055132 | 8/3/2012 |
| | ISRAEL | 183915 | 6/14/2007 | 183915 | 9/1/2011 |
| | E.P.O | 05 818 969.7 | 7/2/2007 | 1832024 | 6/6/2018 |
| | U.K. | 05 818 969.7 | 3/22/2018 | 1832024 | 6/6/2018 |
| | GERMANY | 05 818 969.7 | 3/22/2018 | 1832024 | 6/6/2018 |
| | FRANCE | 05 818 969.7 | 3/22/2018 | 1832024 | 6/6/2018 |
| | CHINA | 200580044699.0 | 6/25/2007 | ZL200580044699.0 | 10/9/2012 |

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| | AUSTRALIA | 2005326877 | 6/13/2007 | 2005326877 | 2/4/2010 |
| | KR | 1020040112929 | 12/27/2004 | 1079095 | 10/27/2011 |
| | KR | 1020040112926 | 12/27/2004 | 1080964 | 11/1/2011 |
| 5 | U.S.A. | 2016-014792 | 2/3/2016 | 9838194 | 12/5/2017 |
| | U.S.A. | 16/394,702 | 4/25/2019 | Pending | |
| | U.S.A. | 2014-513449 | 10/14/2014 | 9270365 | 2/23/2016 |
| | U.S.A. | 2012-715278 | 12/14/2012 | 8873519 | 10/28/2014 |
| | JAPAN | 2014-547111 | 6/12/2015 | 6212048 | 9/22/2017 |
| | E.P.O | 12857526.3 | 7/15/2014 | 2792093 | 7/11/2018 |
| | GERMANY | 12857526.3 | 5/30/2018 | 2792093 | 7/11/2018 |
| | FRANCE | 12857526.3 | 5/30/2018 | 2792093 | 7/11/2018 |
| | U.K. | 12857526.3 | 5/30/2018 | 2792093 | 7/11/2018 |
| | CHINA | 2012-80067029 | 12/14/2012 | ZL201280067029.0 | 9/1/2017 |
| | KR | 1020200034567 | | Pending | |
| 6 | U.S.A. | 2016-077466 | 3/22/2016 | 9713095 | 7/18/2017 |
| | U.S.A. | 15/653,355 | 7/18/2017 | 10045304 | 08/07/2018 |
| | U.S.A. | 2014-357557 | 5/9/2014 | 9313743 | 4/12/2016 |
| | U.S.A. | 16/293,321 | 5/5/2019 | 10609650 | 3/31/2020 |
| | JAPAN | 2014-540937 | 6/19/2014 | 5763845 | 6/19/2015 |
| | E.P.O | 12850075 | 6/4/2014 | 2782405 | 8/22/2018 |
| | GERMANY | 12850075 | 6/4/2014 | 2782405 | 8/22/2018 |
| | FRANCE | 12850075 | 6/4/2014 | 2782405 | 8/22/2018 |
| | U.K. | 12850075 | 6/4/2014 | 2782405 | 8/22/2018 |
| | CHINA | 201280056210.1 | 5/15/2014 | ZL201280056210.1 | 5/15/2018 |
| | KR | 1020110119154 | 11/15/2011 | 10-1867314 | 6/7/2018 |
| 8 | U.S.A. | 2016-222068 | 7/28/2016 | 9680590 | 6/13/2017 |
| | U.S.A. | 2014-147295 | 1/3/2014 | 9419739 | 8/16/2016 |
| | U.S.A. | 2011-332089 | 12/20/2011 | 8649346 | 2/11/2014 |
| | JAPAN | 2014-134625 | 6/30/2014 | 6025783 | 10/21/2016 |
| | JAPAN | 2013-546010 | 6/14/2013 | 5575993 | 7/11/2014 |
| | E.P.O | 11850274.9 | 7/1/2013 | Pending | |
| | CHINA | 201180062059 | 6/21/2013 | 103270710 | 3/9/2016 |
| | KR | 1020100131864 | 12/21/2010 | 10-1867311 | 6/7/2018 |
| 9 | U.S.A. | 2016-335679 | 10/27/2016 | 9860046 | 1/2/2018 |
| | U.S.A. | 16/392,323 | 4/23/2019 | Pending | |
| | U.S.A. | 2016-992186 | 1/11/2016 | 9485072 | 11/1/2016 |
| | U.S.A. | 13/877,827 | 4/4/2013 | 9237566 | 1/12/2016 |
| | JAPAN | 2013-533775 | 5/31/2013 | 5766294 | 6/26/2015 |
| | E.P.O | 11832776.6 | 4/4/2013 | Pending | |
| | CHINA | 201610452850.4 | 6/21/2016 | 106059719 | 6/14/2019 |

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| | CHINA | 201180049399 | 4/12/2013 | 103181109 | 8/3/2016 |
| | KR | 1020100100988 | 10/15/2010 | 10-1771550 | 8/21/2017 |
| 10 | U.S.A. | 14/056,474 | 10/17/2013 | 9008046 | 4/14/2015 |
| | U.S.A. | 2011-181456 | 7/12/2011 | 8588185 | 7/19/2013 |
| | E.P.O | 11807024.2 | 12/11/2012 | Pending | |
| | KR | 1020100068157 | 7/14/2010 | 10-1699023 | 1/17/2017 |
| 11 | U.S.A. | 2011-098056 | 4/29/2011 | 8780840 | 7/15/2014 |
| 12 | U.S.A. | 2015-733068 | 6/8/2015 | 9854545 | 12/26/2017 |
| | U.S.A. | 15/820,980 | 11/22/2017 | Pending | |
| | U.S.A. | 2012-578531 | 8/10/2012 | 9054835 | 6/9/2015 |
| | JAPAN | 2015-154385 | 8/4/2015 | 6175466 | 7/14/2017 |
| | E.P.O | 11742487.9 | 9/5/2012 | 2536227 | 5/8/2019 |
| | GERMANY | 11742487.9 | 9/5/2012 | 2536227 | 5/8/2019 |
| | U.K. | 11742487.9 | 9/5/2012 | 2536227 | 5/8/2019 |
| | FRANCE | 11742487.9 | 9/5/2012 | 2536227 | 5/8/2019 |
| | SWITZERLAND | 11742487.9 | 9/5/2012 | 2536227 | 5/8/2019 |
| | IRELAND | 11742487.9 | 9/5/2012 | 2536227 | 5/8/2019 |
| | Luxembourg | 11742487.9 | 9/5/2012 | 2536227 | 5/8/2019 |
| | Monaco | 11742487.9 | 9/5/2012 | 2536227 | 5/8/2019 |
| | CHINA | 201610908740.4 | 10/18/2016 | Pending | |
| | CHINA | 201180014458.7 | 9/18/2012 | ZL201180014458.7 | 11/16/2016 |
| | KR | 10201100086&3 | 1/28/2011 | 10-1803015 | 11/23/2017 |
| 14 | U.S.A. | 15/206,508 | 7/11/2016 | 10299251 | 5/21/2019 |
| | U.S.A. | 16/418,708 | 5/28/2019 | Pending | |
| | U.S.A. | 13/875,808 | 5/2/2013 | 9392582 | 7/12/2016 |
| | U.S.A. | 13/875,869 | 5/2/2013 | 9131482 | 9/8/2015 |
| | U.S.A. | 2013-965837 | 8/13/2013 | 9265034 | 2/16/2016 |
| | U.S.A. | 2010-916203 | 10/29/2010 | 8538411 | 9/17/2013 |
| | JAPAN | 2014-080506 | 4/9/2014 | 5788051 | 8/7/2015 |
| | JAPAN | 2012-536694 | 4/23/2012 | 5525055 | 4/18/2014 |
| | E.P.O | 10827139.6 | 5/23/2012 | Pending | |
| | KR | 1020170127789 | 9/29/2017 | 10-1828917 | 2/7/2018 |
| | KR | 1020100088151 | 9/8/2010 | 10-1785997 | 10/10/2017 |
| 15 | U.S.A. | 2015-703360 | 5/4/2015 | 9787514 | 10/10/2017 |
| | U.S.A. | 16/272,473 | 2/11/2019 | Pending | |
| | U.S.A. | 15/729,604 | 10/10/2017 | 10237104 | 3/19/2019 |
| | U.S.A. | 2013-891522 | 5/10/2013 | 9025485 | 5/5/2015 |
| | JAPAN | 2015-511380 | 11/10/2014 | 6200944 | 9/1/2017 |
| | E.P.O | 13787400.4 | 12/3/2014 | 2850757 | 10/17/2017 |
| | GERMANY | 13787400.4 | 12/3/2014 | 2850757 | 10/17/2017 |

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| | FRANCE | 13787400.4 | 12/3/2014 | 2850757 | 10/17/2017 |
| | U.K. | 13787400.4 | 12/3/2014 | 2850757 | 10/17/2017 |
| | CHINA | 201380036116.4 | 1/6/2015 | ZL201380036116.4 | 11/3/2017 |
| | KR | 1020120050406 | 5/11/2012 | Pending | |
| 16 | U.S.A. | 2016-180153 | 6/13/2016 | 9742542 | 8/22/2017 |
| | U.S.A. | 2015-801116 | 7/16/2015 | 9369251 | 6/14/2016 |
| | U.S.A. | 16/387,174 | 4/17/2019 | Pending | |
| | U.S.A. | 2014-547112 | 11/18/2014 | 9088396 | 7/21/2015 |
| | U.S.A. | 2011-816182 | 2/8/2013 | 8897182 | 11/25/2014 |
| | JAPAN | 2016-115490 | 6/9/2016 | 6185116 | 8/4/2017 |
| | JAPAN | 2015-053011 | 3/17/2015 | 5952449 | 6/17/2016 |
| | JAPAN | 2013-524046 | 2/8/2013 | 5718464 | 3/27/2015 |
| | GERMANY | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | FRANCE | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | SWITZERLAND | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | Luxembourg | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | MONACO | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | IRELAND | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | Belgium | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | U.K. | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | E.P.O | 11816634.7 | 3/11/2013 | 2605433 | 2/27/2019 |
| | CHINA | 201610412657.8 | 8/11/2011 | ZL201610412657.8 | 9/24/2019 |
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| | KR | 1020100098006 | 10/7/2010 | 1719542 | 3/20/2017 |
| | KR | 1020170033713 | 3/17/2017 | 1810962 | 12/24/2017 |
| | KR | 1020100098005 | 10/7/2010 | 1790502 | |
| 17 | U.S.A. | 2012-807706 | 12/28/2012 | 9136924 | 9/15/2015 |
| | JAPAN | 2013-518260 | 1/4/2013 | 6293482 | 2/23/2018 |
| | E.P.O | 11803762 | 2/1/2013 | 2592763 | 5/23/2018 |
| | GERMANY | 11803762 | 2/1/2013 | 2592763 | 5/23/2018 |
| | FRANCE | 11803762 | 2/1/2013 | 2592763 | 5/23/2018 |
| | U.K. | 11803762 | 2/1/2013 | 2592763 | 5/23/2018 |
| | CHINA | 201180037814.7 | 1/31/2013 | ZL201180037814.7 | 11/17/2017 |
| | KR | 1020160171540 | 12/15/2016 | 10-1771549 | 8/21/2017 |
| 18 | U.S.A. | 2016-151296 | 5/10/2016 | 9948440 | 4/17/2018 |
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| | JAPAN | 2013-513109 | 11/27/2012 | 5931056 | 5/13/2016 |
| | E.P.O | 11790009 | 12/5/2012 | Pending | |

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| | CHINA | 201610951696.5 | 11/2/2016 | Pending | |
| | CHINA | 201180037855.6 | 1/31/2013 | ZL201180037855.6 | 11/30/2016 |
| | KR | 1020100055073 | 6/10/2010 | 10-1790505 | 10/20/2017 |
| 19 | U.S.A. | 2016-192233 | 6/24/2016 | 9893866 | 2/13/2018 |
| | U.S.A. | 2014-464041 | 8/20/2014 | 9380581 | 6/28/2016 |
| | U.S.A. | 2013-043005 | 10/1/2013 | 8837452 | 9/16/2014 |
| | U.S.A. | 2011-008685 | 1/18/2011 | 8576822 | 11/5/2013 |
| | JAPAN | 2012-548900 | 7/11/2012 | 5855016 | 12/18/2015 |
| | E.P.O | 11733132 | 8/17/2012 | Pending | |
| | U.S.A. | 16/285,957 | 2/26/2019 | 10567140 | 2/18/2020 |
| | U.S.A. | 15/858,921 | 12/29/2017 | 10218485 | 2/26/2019 |
| | CHINA | 201180014290.X | 9/17/2012 | 102804625 | 11/13/2018 |
| | KR | 1020100004219 | 1/18/2010 | 1740221 | |
| 20 | U.S.A. | 2009-505707 | 5/2/2012 | 8811518 | 8/19/2014 |
| | KR | 1020127011219 | 4/30/2012 | 1627393 | 5/30/2016 |
| 21 | U.S.A. | 2016-131725 | 4/18/2016 | 9825686 | 11/21/2017 |
| | U.S.A. | 2009-500288 | 4/4/2012 | 9319252 | 4/19/2016 |
| | U.S.A. | 16/203,319 | 11/28/2018 | Pending | |
| | U.S.A. | 15/814,605 | 11/16/2017 | 10153821 | 12/11/2018 |
| | KR | 1020127008173 | 3/29/2012 | 1621376 | 5/10/2016 |
| 22 | U.S.A. | 2015-279139 | 9/28/2016 | 10057940 | 8/21/2018 |
| | U.S.A. | 2015-801280 | 7/16/2015 | 9474025 | 10/18/2016 |
| | U.S.A. | 2013-847319 | 3/19/2013 | 9088992 | 7/21/2015 |
| | KR | 1020120027938 | 3/19/2012 | 10-1868865 | 6/12/2018 |
| 23 | U.S.A. | 2016-183158 | 6/15/2016 | 9730265 | 8/8/2017 |
| | U.S.A. | 16/275,039 | 2/13/2019 | Pending | |
| | U.S.A. | 2014-560838 | 12/4/2014 | 9374213 | 6/21/2016 |
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| | KR | 1020110110798 | 10/27/2011 | 10-1841693 | 3/19/2018 |
| 24 | U.S.A. | 2016-341296 | 11/2/2016 | 9955376 | 4/24/2018 |
| | U.S.A. | 16/288,278 | 2/28/2019 | Pending | |
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| | U.S.A. | 2013-984476 | 8/8/2013 | 9191833 | 11/17/2015 |
| | E.P.O | 12744486.3 | 8/9/2013 | Notice of Allowance at 1/7/2020 (Issue fee due 5/7/2020) | |
| | CHINA | 201610397886.7 | 6/7/2016 | 106060866B | 1/7/2020 |
| | CHINA | 201280014327 | 9/22/2013 | 103444100 | 6/29/2016 |
| | KR | 1020170130604 | 10/11/2017 | 1860863 | 5/17/2018 |
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| | E.P.O | 06019434.7 | 12/5/2003 | 1727386 | 3/4/2009 |
| | U.K. | 06019434.7 | 9/18/2006 | 1727386 | 3/4/2009 |
| | U.K. | 03257661.3 | 12/5/2003 | 1427242 | 11/15/2006 |
| | FRANCE | 06019434.7 | 9/18/2006 | 1727386 | 3/4/2009 |
| | E.P.O | 03257661.3 | 12/5/2003 | 1427242 | 11/15/2006 |
| | FRANCE | 03257661.3 | 12/5/2003 | 1427242 | 11/15/2006 |
| | GERMANY | 06019434.7 | 9/18/2006 | 1727386 | 3/4/2009 |
| | GERMANY | 03257661.3 | 12/5/2003 | 1427242 | 11/15/2006 |
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| | KR | 1020040025922 | 4/14/2004 | 598062 | 6/30/2006 |
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| | KR | 1020080046505 | 5/20/2008 | 985617 | 9/29/2010 |
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| | U.S.A. | 2009-625191 | 11/24/2009 | 8374572 | 2/12/2013 |
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AO 120 (Rev. 08/10)

| TO: | REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK |
|---|---|
| **Mail Stop 8**<br>**Director of the U.S. Patent and Trademark Office**<br>**P.O. Box 1450**<br>**Alexandria, VA 22313-1450** | |

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, Texarkana Division on the following

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

| DOCKET NO. | DATE FILED | U.S. DISTRICT COURT |
|---|---|---|
| 5:22-CV-00113 | 9/2/2022 | for the Eastern District of Texas, Texarkana Division |

| PLAINTIFF | DEFENDANT |
|---|---|
| PANTECH CORPORATION and PANTECH WIRELESS, LLC | LG ELECTRONICS INC., and LG ELECTRONICS U.S.A., INC. |

| | PATENT OR TRADEMARK NO. | DATE OF PATENT OR TRADEMARK | HOLDER OF PATENT OR TRADEMARK |
|---|---|---|---|
| 1 | 9,136,924 | 9/15/2015 | Pantech Corporation |
| 2 | 9,854,545 | 12/26/2017 | Pantech Corporation |
| 3 | 10,869,247 | 12/15/2020 | Pantech Wireless |
| 4 | 9,313,809 | 4/12/2016 | Pantech Wireless |
| 5 | 9,065,486 | 6/23/2015 | Pantech Wireless |

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**<br>**Director of the U.S. Patent and Trademark Office**<br>**P.O. Box 1450**<br>**Alexandria, VA 22313-1450** | **REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK** |
|---|---|---|

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| | PATENT OR TRADEMARK NO. | DATE OF PATENT OR TRADEMARK | HOLDER OF PATENT OR TRADEMARK |
|---|---|---|---|
| 1 | 7,283,839 | 10/16/2007 | Pantech Corporation |
| 2 | 9,575,631 | 2/21/2017 | Pantech Corporation |
| 3 | | | |
| 4 | | | |
| 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 |
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| DECISION/JUDGEMENT |
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| 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**