TRANSPERFECT

City of New York, State of New York, County of New York

I, Dan McCourt, hereby certify that the document "**KR20100077880**" is, to the best of my knowledge and belief, a true and accurate translation from Korean into English.

Dan McCourt

Sworn to before me this
July 19, 2023

Signature, Notary Public

WENDY POON
STATE
OF NEW YORK
NOTARY PUBLIC
Qualified in
Queens County
01PO6356754
MY COMMISSION EXPIRES 04-03-2025

Stamp, Notary Public

[logo:] Korean Intellectual Property Office

KOREAN INTELLECTUAL PROPERTY OFFICE

This is to certify that the attached copy is the same as the original of the application below.

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

Application No.:	10-2010-0077880
Application Number	
Date of Application:	August 12, 2010
Filing Date	AUG. 12, 2010
Applicant:	Electronics and Telecommunications Research Institute
Applicant(s)	Electronics and Telecommunications Research Institute

September 15, 2015

[stamp:] [illegible]

Commissioner of the Korean Intellectual Property Office

COMMISSIONER

Date of Submission: August 12, 2010

【Bibliography】

【Name of Document】	Patent Application
【Applicantion Classification】	Patent Application
【Applicant】	
【Name】	Electronics and Telecommunications Research Institute
【Applicant Code】	3-1998-007763-8
【Agent】	
【Name】	Shinsung Patent Firm, LLC
【Agent Code】	9-2000-100004-8
【Designated Patent Agent】	Chan-du Moon, Jong-sik Choi, Jeong-hu Park, Jung-hee Shim, Hyung-yong Jang
【Comprehensive Delegation Registration Number】	2000-051975-8
【Title of the Invention in Korean】	이동통신 시스템에서 멀티 캐리어 구조를 위한 채널 관리 방법
【Title of the Invention in English】	A METHOD FOR CHANNEL MANAGEMENT ON MULTIPLE COMPONENT CARRIER SYSTEMS
【Inventor】	
【Name in Korean】	이경석
【Name in English】	Kyoung-seok LEE
【Resident Registration Number】	681001-1XXXXXX
【Zip Code】	302-120
【Address】	214-1704, Dunsan-dong, Seo-gu, Daejeon, Republic of Korea (Saemmeori Apt.)
【National】	KR

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00003

Date of Submission: August 12, 2010

【Inventor】

【Name in Korean】 김 재흥

【Name in English】 Jae-heung KIM

【Resident Registration Number】 660220-1XXXXXX

【Zip Code】 305-728

【Address】 108-302, Jeonmin-dong, Yuseong-gu, Daejeon, Republic of Korea (Sejong Apt.)

【National】 KR

【Inventor】

【Name in Korean】 이국진

【Name in English】 Kook-jin LEE

【Resident Registration Number】 830404-1XXXXXX

【Zip Code】 302-120

【Address】 1517-ho, B-dong, Dunsan-dong, Seo-gu, Daejeon, Republic of Korea (Nexus Valley)

【National】 KR

【Desire for Technology Transfer】

【Technology Transfer】 Desire it

【License Grant】 Desire it

【Technology Guidance】 Desire it

【Purpose】 We hereby submit the application to the Commissioner of the Korean Intellectual Property Office as above.

Agent Shinsung Patent Firm, LLC (signature or seal)

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00004

Date of Submission: August 12, 2010

【Fees】

【Application Fee】	0 Page	38,000 won
【Additional Application Fee】	18 Pages	0 won
【Priority Claim Fee】	0 case	0 won
【Examination Request Fee】	0 claim	0 won
【Total】	38,000 won	
【Reason for Reduction】	Government-funded research institute	
【Fee after Reduction】	19,000 won	

【Specifications】

【TITLE OF THE INVENTION】

A METHOD FOR CHANNEL MANAGEMENT ON MULTIPLE COMPONENT CARRIER SYSTEM

【Field of the Invention】

<1> The present invention relates to a method for managing a channel of a terminal according to a wireless channel state in a structure where an LTE-Advanced system being standardized by the 3GPP uses a plurality of carriers to perform communications between a base station and a terminal. To prevent the problem that data re-transmission errors increase rapidly due to an unstable wireless channel state of multi-carriers used by base stations and terminals for high-capacity data communications, the present invention presents a method by which a base station transmits a control message to a good carrier to stop re-transmissions occurring on a bad carrier.

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00005

【Description of the Related Art】

<2> 3GPP, a mobile communications standardization organization, has developed a Long Term Evolution (LTE) system standard for next-generation mobile communications standards. In addition, an LTE-Advanced system standard having expanded the LTE standard to meet the IMT-Advanced requirements proposed by ITU-R is being developed.

<3> The LTE standard supports a maximum wireless bandwidth for mobile communications up to 20 MHz, and the LTE-Advanced standard uses carrier aggregation technology to support up to 100 MHz of bandwidth. Accordingly, the 100 MHz bandwidth is divided into component carriers (CCs) with a maximum range of 20 MHz, and the base station and the terminal may communicate using a plurality of carriers simultaneously.

<4> A terminal that supports multi-carrier communications uses a plurality of wireless channels in broadband, and the wider the frequency bandwidth used for communications, the higher the power consumption. Therefore, the terminal in the LTE-Advanced system activates and uses a multi-carrier for communications only when the volume of communications is high, and it performs communicating operations using only a single carrier when the volume of communications is small.

<5> FIG. 1 is a diagram illustrating a typical procedure for a base station to activate a terminal's carrier in a multi-carrier environment.

<6> The LTE-Advanced system controls the multi-carrier management phase by dividing it into two

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00006

phases: configuration and activation.

<7> When the terminal connects to a base station that provides multi-carrier communications, it uses the configuration procedure to establish a multi-carrier communications environment. The base station transmits a configuration message so that the terminal stores configuration information for multi-carrier communications and prepares communications for that carrier.

<8> When the terminal has a small volume of communications, it communicates with the base station using only a single carrier (using DL CC #1 and UL CC #1 in FIG . 1). The carrier used in the state of using a single carrier is referred to as a primary carrier or a primary cell, and the wireless channel state of the primary carrier is measured at frequent intervals and managed in a stable communicable state.

<9> The base station uses the activation procedure to ensure that the terminal actually uses a plurality of carriers when the terminal's volume of communications increases. The carrier activated for a multi-carrier environment is referred to as a secondary carrier or secondary cell and manages a wireless channel state at a lower level than that of the primary carrier.

<10> To activate a secondary carrier, the base station transmits an activation message to the terminal, and the terminal activates that secondary carrier upon receiving the message and uses it for communications. Thus, a multi-carrier transmits and receives large amounts of data, increasing the data transmission rate. When the volume of communications with the terminal decreases, the base

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00007

station transmits a deactivation message to make the terminal use only a single carrier. The secondary carrier (CC) for a downlink (DL) and an uplink (UL) may be independently configured/released and activated/deactivated.

<11> When performing multi-carrier communications, data is mapped and transmitted for each carrier. The scheduler of the base station divides the data that will be transmitted in units of carriers, and allocates and transmits the divided data for each carrier. In addition, for the re-transmission of the transmitted data, the data is transmitted with the use of the same carrier.

<12> Assuming FIG. 1, a block of data is allocated to DL CC #1 for initial transmission, and if a reception error occurs in such data, re-transmission (or HARQ) is to be performed to DL CC #1. When transmitting downlink data, the data is allocated to a data channel (or PDSCH), and demodulation information of the data channel is indicated on and transmitted to the control channel (or PDCCH).

<13> The control channel may transmit with the same carrier as the data channel or with a different carrier, and if the locations of carriers are different, a carrier identifier (or CIF: Carrier Indicator Field) is used within the control channel to indicate the location of the data channel.

<14> When the volume of communications between the base station and the terminal increases and the wireless channel state of some carriers deteriorates in the course of use of a multi-carrier, the number of re-transmissions increases due to increased data reception errors at the receiver. In particular, in a structure in which re-transmission is performed only with a carrier used for initial data

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00008

transmission, such as in the LTE-Advanced system, there is a problem that the reception errors increase rapidly when the wireless channel state of that carrier is poor. In addition, there is a problem that the data that has been transmitted is re-transmitted until the reception is successful for the maximum number of re-transmissions regardless of the wireless channel state. This procedure results in unnecessary re-transmission operation and power consumption in the terminal. In addition, there is a problem that unnecessary re-transmission causes the waste of wireless resources which other terminals are in turn unable to use and the degradation of base station performance.

【Summary of the Invention】

【Problems to Be Solved】

<15> The present invention is an invention to address the above-mentioned problems of the related art, and a method for a base station to communicate with a terminal to stop the use of a carrier with a poor wireless channel state is required.

<16> Other objectives and advantages of the present invention will be understood from the following description, and will become more apparent with reference to exemplary embodiments of the present invention. It will also be readily apparent that the objectives and advantages of the present invention may be realized by the means and combinations thereof set forth in WHAT IS CLAIMED IS.

【Means for Solving the Problems】

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00009

<17> To achieve the above objectives, the present invention provides a method for managing a channel, including the steps of: determining a downlink carrier having an unstable wireless channel state among multi-carriers; and stopping data transmission to that carrier based on the determination result.

【Effects of the Invention】

<18> According to the present invention, the number of re-transmissions may be reduced in a mobile communications system using a multi-carrier structure. This effect reduces unnecessary re-transmission operation and power consumption in a terminal. Furthermore, the present invention may prevent waste of wireless resources and degradation of base station performance due to unnecessary re-transmissions.

【BRIEF DESCRIPTION OF THE DRAWINGS】

<19> FIG. 1 is a diagram illustrating a typical procedure for a base station to activate a terminal's carrier in a multi-carrier environment.

FIG. 2 is a diagram illustrating a procedure for stopping a base station's re-transmission of downlink data in a multi-carrier environment, according to one exemplary embodiment of the present invention.

FIG. 3 is a diagram illustrating a procedure for stopping a base station's re-transmission of

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00010

uplink data in a multi-carrier environment, according to one exemplary embodiment of the present invention.

【DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS】

<20> Hereinafter, in order to describe the present invention in detail so that a person having ordinary skill in the art to which it belongs can easily implement the technical ideas of the present invention, the most preferred exemplary embodiments of the present invention will be described with reference to the accompanying drawings. The above-described objectives, features, and advantages will become clearer through the following detailed description related to the accompanying drawings, and in describing the present invention, detailed description of the related art in connection with the present invention is hereby omitted where it is deemed that such detailed description would unnecessarily obscure the essence of the invention.

<21> <Description of a Downlink Method>

<22> In an FDD-based mobile communications system, the wireless channel state of a downlink is measured at a terminal, and information on the measured channel state is transmitted to a base station. The base station analyzes the received downlink channel state information to manage the wireless channel state of a carrier and use such information as scheduling information. Since the TDD-based mobile communications system uses the same frequency band for an uplink and a downlink, the downlink wireless channel state is managed by analyzing the uplink channel state at the base station.

<23> The base station of the present invention determines a downlink carrier having an unstable

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00011

wireless channel state among multi-carriers and stops transmitting data to that carrier. The determination of the wireless channel state is made using the wireless channel state information measured and transmitted by the terminal or directly measured by the base station, and this state is determined based on the fact that an error has been lowered below the reference value for a certain amount of time. In addition, the base station stops allocating data to the carrier whose reception error of the transmitted data increases, and such stopping is determined based on the increase in the number of errors over the reference value for a certain amount of time. In a conventional method, even if data whose initial transmission to one carrier is performed obtains information about the unstable wireless channel state, the data is to be re-transmitted to that carrier up to the set maximum number re-transmissions (e.g., 8 times).

<24> Even if the base station of the present invention does not receive data reception success information (or ACK) from the terminal a certain number of times or more, it stops re-transmitting to that carrier if it determines that the wireless channel state of that carrier is unstable. When the base station does not receive the data reception success information, it means that the terminal transmits reception failure information (or NACK) or that the base station fails to receive the transmitted information.

<25> In the present invention, the base station sends a message instructing that the re-transmission of that data should be stopped to the terminal via another carrier. The carrier used to send the message is a primary carrier or a secondary carrier with a good wireless channel state, and the location of the carrier used to send the message may be indicated with the use of a carrier identifier (CIF).

<26> FIG. 2 is a diagram illustrating a procedure for stopping a base station's re-transmission of

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00012

downlink data in a multi-carrier environment, according to one exemplary embodiment of the present invention.

<27> In a typical procedure, the data transmission procedure between a base station and a terminal is executed repeatedly as follows: an initial data transmission, a reception error report by the terminal, and a data re-transmission by the base station in sequence. In an example of the present invention, when a base station receives a wireless channel state report of a multi-carrier from a terminal, if the wireless channel state of some downlink carriers is bad, the base station instructs those carriers to stop the transmission. Accordingly, the base station stops re-transmitting to those carriers, and the terminal stops the procedure for reporting a reception error or re-transmitting data upon receiving the instruction to stop transmission.

<28> There are two methods for the base station to transmit re-transmission stop information to the terminal: a method for displaying the information with a control channel and a method for displaying the information with a data channel.

<29> *A method for displaying re-transmission stop information with a control channel (or PDCCH)

<30> - Display the carrier's re-transmission stop on the control channel and transmit it to the terminal.

<31> - The display method is shown in some fields of the control channel (e.g., TB: Transport Block field).

<32> - Use the carrier identifier (or CIF) to indicate information on the carrier to stop re-transmitting on the control channel.

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00013

<33> - Indicate the information on data whose re-transmission to the re-transmission-related fields (e.g., NDI: New Data Indicator, RV: Redundancy Version) will be stopped, or mark the information with a distinguishable value to indicate that all data transmissions to that carrier will be stopped.

<34> - After receiving the control channel, the terminal may notify the base station that it has successfully received the stop message.

<35> *A method for displaying re-transmission stop information with the data channel (or PDSCH)

<36> - Display the carrier's re-transmission stop on the data channel and transmit it to the terminal.

<37> - The method for displaying information is the same as the method for displaying it with the control channel.

<38> - Such control information may be configured with a new control message (or MAC Control Element).

<39> In addition, a method for using the existing method to stop re-transmission is as follows.

<40> - Avoid resource consumption by indicating a new data transfer rather than a re-transmission of old data on the control channel (e.g., indicating a new data transmission by changing (or toggling) the NDI field of the PDCCH) and minimizing and allocating the size (or TB field) of the data channel to be allocated.

<41> - In this case, meaningless data (or padding) may be transmitted to the data channel to avoid a delay in data transmission having used unstable channels. Alternatively, the re-transmission stop

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00014

control information described above may be transmitted.

<42> In addition, the use of the existing carrier deactivation message allows a terminal to perform the deactivation procedure for that carrier and concurrently stop all transmissions (initial transmission and re-transmission) to that carrier when the terminal receives a carrier deactivation message from a base station.

<43> In the present invention, when a terminal receives re-transmission stop information through a control channel or data channel, it stops a data re-transmission procedure by terminating the control channel reception operation for receiving data to be re-transmitted to a designated carrier. In addition, the received buffer of that carrier or that re-transmission block is reset to prevent a demodulation operation error of the re-transmission.

<44> In addition, stopping the re-transmission procedure for a given carrier may trigger an operation to reduce power consumption (or DRX: Discontinuous Reception) or a carrier deactivation procedure. More particularly, a terminal is prevented from performing DRX operations by demodulating the control channel for a period of time in order to receive the data that has experienced a reception error, and the use of the procedure under the present invention allows the terminal to immediately stop the control channel demodulation operation and proceed with the DRX operations.

<45> <Description of an Uplink Method>

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00015

<46> The wireless channel state of an uplink is measured by a base station, which manages the wireless channel state of received carriers and uses it as uplink scheduling information. The uplink scheduling is performed at the base station, and information (e.g., uplink carrier information and transmission data size) to be used by a terminal determined by the scheduling is transmitted by the base station to the terminal via a control channel (or PDCCH).

<47> The base station of the present invention determines an uplink carrier having an unstable wireless channel state among multi-carriers to instruct the terminal to stop transmitting data to that carrier. The determination of the wireless channel state uses wireless channel state information collected by the base station, and this state is determined based on the fact that an error has been lowered below the reference value for a certain amount of time. In addition, the base station instructs the terminal to stop allocating data to the carrier whose reception error of the received uplink data increases, and such stopping is determined based on the increase in the number of errors over the reference value for a certain amount of time. In a conventional method, even if data whose initial transmission to one carrier is performed obtains information about the unstable wireless channel state, the data is to be continuously re-transmitted to that carrier up to the set maximum number re-transmissions (e.g., 8 times).

<48> In particular, in a conventional method, an uplink has a problem that a terminal continues to re-transmit data even if the base station does not authorize the re-transmission. More particularly, even if the terminal does not receive a data re-transmission instruction through the control channel from the base station after transmitting data, the terminal determines that a reception error has occurred and re-

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00016

transmits the data to the corresponding carrier if a certain amount of time elapses.

<49> FIG. 3 is a diagram illustrating a procedure for stopping a base station's re-transmission of uplink data in a multi-carrier environment, according to one exemplary embodiment of the present invention.

<50> In a typical procedure, the data transmission procedure between a base station and a terminal is executed repeatedly as follows: the base station's initial transmission authorization, the terminal's initial data transmission, the base station's data re-transmission authorization, and the terminal's re-transmission operation in sequence. In an example of the present invention, when the wireless channel state of an uplink carrier received by the base station from the terminal is bad, the base station instructs the terminal to stop transmitting data to that carrier. Accordingly, the base station stops giving authorization for re-transmission to that carrier, and the terminal stops the re-transmission procedure upon receiving the instruction to stop transmission.

<51> There are two methods for the base station to transmit re-transmission stop information to the terminal: a method for displaying the information with a control channel and a method for displaying the information with a data channel.

<52> *A method for displaying re-transmission stop information with the control channel (or PDCCH)

<53> - Display the re-transmission having been stopped on the control channel and transmit it to the

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00017

terminal.

<54> - The display method is shown in some fields of the control channel (e.g., TB: Transport Block field).

<55> - Use the carrier identifier (or CIF) to indicate a carrier whose re-transmission has been stopped on the control channel.

<56> - Indicate the information on data whose re-transmission to the re-transmission-related fields (e.g., NDI: New Data Indicator, RV: Redundancy Version) has been stopped, or mark the information with a distinguishable value to indicate that all data transmissions to that carrier will be stopped.

<57> - After receiving the control channel, the terminal may notify the base station that it has successfully received the stop message, and the carrier used for notification is an uplink carrier with a good wireless channel state.

<58> *A method for displaying re-transmission stop information with the data channel (or PDSCH)

<59> - Display the carrier's re-transmission stop on the data channel and transmit it to the terminal.

<60> - The method for displaying information is the same as the method for displaying it with the control channel.

<61> - Such control information may be configured with a new control message (or MAC Control Element).

<62> In addition, a method for using the existing method to stop re-transmission is as follows.

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00018

<63> - Avoid resource consumption when a terminal transmits uplink data by indicating a new data transfer rather than a re=transmission of old data on the control channel (e.g., indicating a new data transmission by changing (or toggling) the NDI field of the PDCCH) and minimizing and designating the size (or TB field) of the data channel to be allocated.

<64> - In this case, the terminal may transmit meaningless data (or padding) to the allocated data channel to avoid a delay in data transmission having used unstable channels.

<65> In addition, a base station may use a carrier deactivation message to transmit data to a terminal, and perform the deactivation procedure for that carrier and concurrently stop all transmissions (initial transmission and re-transmission) to that carrier when the terminal receives the carrier deactivation message from the base station.

<66> In the present invention, when a terminal receives re-transmission stop information with a control channel or data channel, it stops data re-transmission to the designated carrier and ends the reception procedure of that carrier. In addition, the transmitted buffer of that carrier or that re-transmission is reset to prevent a demodulation operation error of the re-transmission. In addition, stopping the re-transmission of that carrier may result in an operation (or DRX: Discontinuous Reception) or carrier deactivation procedure to reduce power consumption.

<67> Meanwhile, although the present invention has been illustrated by limited exemplary

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00019

embodiments and drawings, the present invention is not limited thereto and various modifications and variations may be made by a person having ordinary skill in the art to which the present invention belongs within the equitable scope of the technical ideas and patent claims.

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00020

Date of Submission: August 12, 2010

Date of Submission: August 12, 2010

【WHAT IS CLAIMED IS】

【Claim 1】

A method for managing a channel, comprising the steps of: determining a downlink carrier with an unstable wireless channel state among multi-carriers; and stopping transmitting data to that carrier, based on the result of the determination.

IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00022

Date of Submission: August 12, 2010

【ABSTRACT】

【Abstract】

The present invention discloses a technique regarding a method for managing a channel of a terminal according to a wireless channel state in a structure where an LTE-Advanced system being standardized by the 3GPP uses a plurality of carriers to perform communications between a base station and a terminal. According to this technique, a method for managing a channel, including the following steps, is provided: determining a downlink carrier with an unstable wireless channel state among multi-carriers; and, based on the determination result, stopping transmitting data to that carrier.

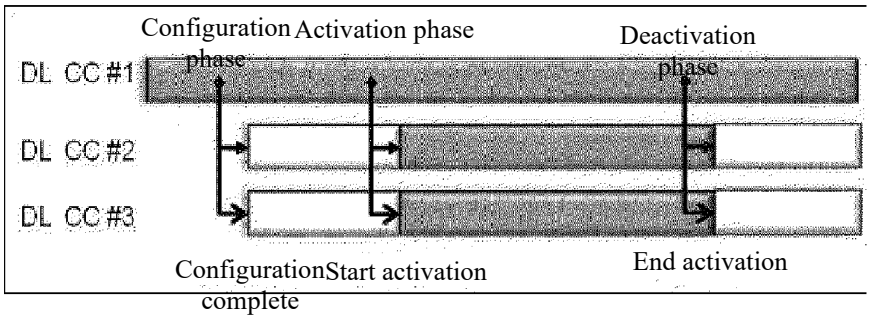
【Representatives】

FIG. 2

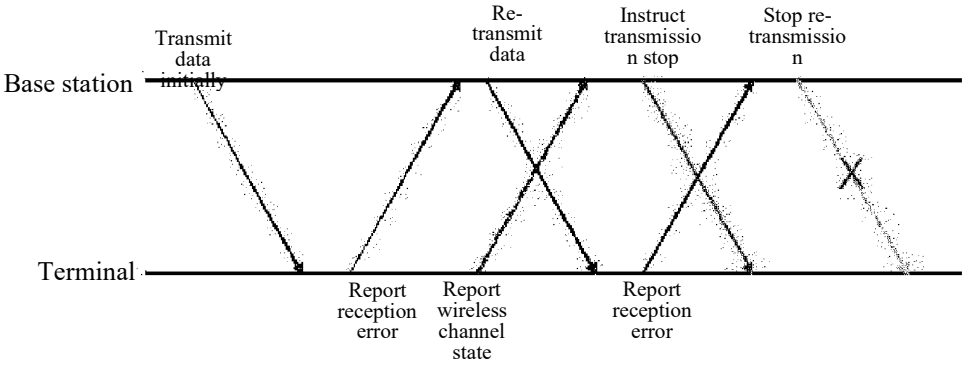
IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00023

【DRAWING】

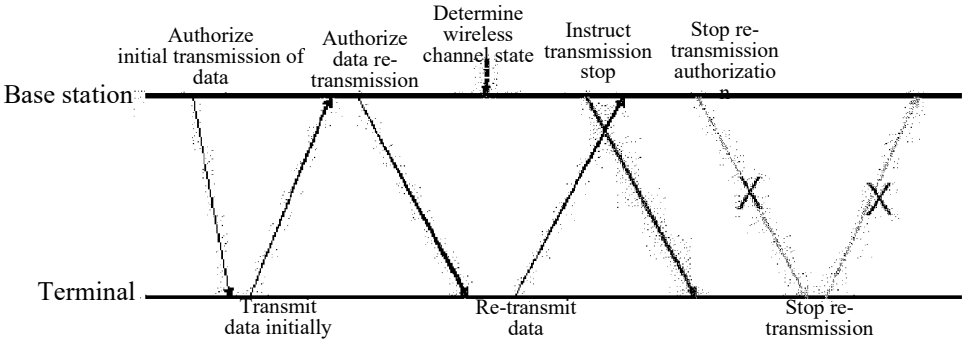
【FIG. 1】



【FIG. 2】



【FIG. 3】



IPR2024-00608
Petitioners' Ex. 1012
Ex.1012.00024