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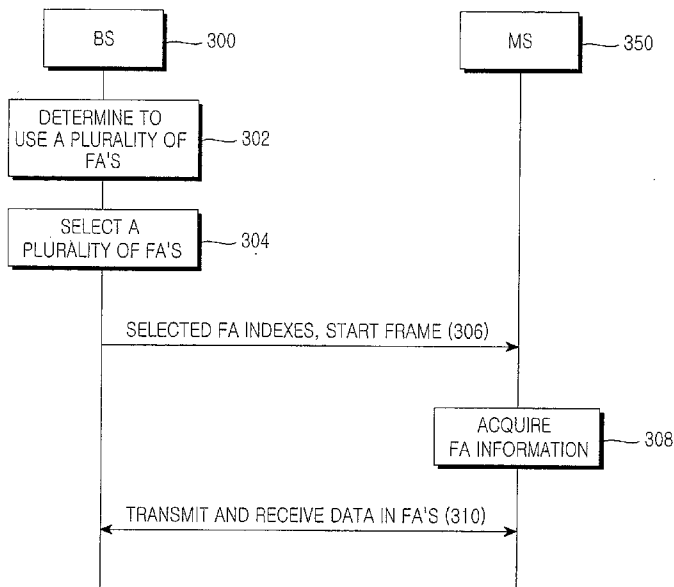
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(54) Title: METHOD AND SYSTEM FOR TRANSMITTING AND RECEIVING SIGNAL USING MULTIPLE FREQUENCY BANDS IN A WIRELESS COMMUNICATION SYSTEM



(57) Abstract: A method for transmitting and receiving signals using multiple frequency band in a wireless communication system are provided, in which a BS determines whether an MS is to use a plurality of FAs, selects the plurality of FAs if it is determined that the MS is to use the plurality of FAs, transmits FA information about the selected FAs to the MS, and transmits and receives signals to and from the MS in the selected FAs.

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**METHOD AND SYSTEM FOR TRANSMITTING AND RECEIVING  
SIGNAL USING MULTIPLE FREQUENCY BANDS IN A WIRELESS  
COMMUNICATION SYSTEM**

**BACKGROUND OF THE INVENTION**

**1. Field of the Invention**

The present invention generally relates to a wireless communication system. More particularly, the present invention relates to a method and system for transmitting and receiving a signal in multiple frequency bands.

**2. Description of the Related Art**

The development of wireless communication systems is a driving force behind increasing demands for various types of services and a large amount of service data. To satisfy the demands, broadband wireless communication systems have emerged. Limited frequency resources of the wireless communication systems leads to limited frequency bands available to the broadband wireless communication systems. Nevertheless, the demand for frequency bands is increasing to provide broadband services.

FIG. 1 illustrates a single-frequency band support structure and a two-frequency band support structure in a conventional wireless communication system.

In a wireless communication system, particularly a broadband wireless communication system based on Institute of Electrical and Electronics Engineers (IEEE) 802.16, a Base Station (BS) manages one or more Frequency Assignments (FAs) and provides services to Mobile Stations (MSs) in the FA or FAs.

Referring to FIG. 1, an MS 100 can move from a first FA 120 (FA1) to a second FA 140 (FA2). If the MS 100 operates in only one FA or the two FAs 120 and 140 are operated by different BSs, the MS 100 receives a service in FA2 by inter-FA handover.

As compared to the MS 100, if an MS 150 is capable of operating in two

or more FAs or the same BS operates two FAs 160 and 180 (FA1 and FA2), the MS 150 can receive a service in the FAs 160 and 180. Transmission and reception of signals between the MS and the BS in multiple frequency bands facilitates high-speed, large-data data transmission and reception. However, no procedures have been agreed between the MS and the MS so far for using multiple frequency bands between them. Moreover, there is no technique for specifying an FA in which the MS will communicate after an inter-FA handover or network entry and network re-entry.

### SUMMARY OF THE INVENTION

An aspect of exemplary embodiments of the present invention is to address at least the problems and/or disadvantages and to provide at least the advantages described below. Accordingly, an aspect of exemplary embodiments of the present invention is to provide a method for enabling use of multiple frequency bands in a wireless communication system.

Another aspect of exemplary embodiments of the present invention is to provide a method and system for efficiently using frequency resources in a wireless communication system.

In accordance with an aspect of exemplary embodiments of the present invention, there is provided a method for transmitting and receiving signals in a BS in a wireless communication system, in which it is determined whether a MS is to use a plurality of FAs selecting the plurality of FAs if it is determined that the MS is to use the plurality of FAs, FA information about the selected FAs is transmitted to the MS, and signals are transmitted to and received from the MS in the selected FAs.

In accordance with another aspect of exemplary embodiments of the present invention, there is provided a method for transmitting and receiving signals in an MS in a wireless communication system, in which a neighbor BS information message including FA information about a neighbor BS of the serving BS is received from a serving BS in a primary FA in current use for communications with the serving BS, total FAs managed by the serving BS and

the neighbor BS are scanned, a handover is requested in the primary FA to the serving BS according to the scanning, a handover response message is received in the primary FA from the serving BS, a message including information about a final target BS in the primary FA is transmitted to the serving BS, network re-entry to the final target BS is performed, the final target BS is notified that the MS can transmit and receive signals in at least two FAs, and information about FAs to be used with the final target BS is exchanged.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The above and other objects, features and advantages of certain exemplary embodiments of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates a single-frequency band support structure and a two-frequency band support structure in a conventional wireless communication system;

FIG. 2 is a signal diagram illustrating an initial network entry procedure for supporting an overlay mode according to an exemplary embodiment of the present invention;

FIG. 3 is a signal diagram illustrating an operation for providing FA information by a BS in a wireless communication system according to an exemplary embodiment of the present invention;

FIG. 4 illustrates a protocol stack for supporting a plurality of FAs according to an exemplary embodiment of the present invention;

FIG. 5 is a diagram illustrating a signal flow for a handover operation of an MS supporting a plurality of FAs according to an exemplary embodiment of the present invention;

FIG. 6 is a flowchart of an operation for commanding the MS to change a default band in the BS according to an exemplary embodiment of the present invention;

FIG. 7 is a flowchart illustrating a network entry operation of the MS when the MS receives a default band change command according to an exemplary embodiment of the present invention;

FIG. 8 is a flowchart of an operation for commanding the MS to change a

default band in the BS according to another exemplary embodiment of the present invention;

FIG. 9 is a flowchart of a network entry operation of the MS when the MS receives a default band change command according to another exemplary embodiment of the present invention;

FIG. 10 is a flowchart of an operation for commanding the MS to change a default band in the BS according to a third exemplary embodiment of the present invention; and

FIG. 11 is a flowchart of a network entry operation of the MS when the MS receives a default band change command according to a third exemplary embodiment of the present invention.

Throughout the drawings, the same drawing reference numerals will be understood to refer to the same elements, features and structures.

## **DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS**

The matters defined in the description such as a detailed construction and elements are provided to assist in a comprehensive understanding of exemplary embodiments of the invention. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope and spirit of the invention. Also, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

Exemplary embodiments of the present invention provide a method and system for transmitting and receiving data in a plurality of frequency bands between a BS and an MS in a wireless communication system. For this purpose, the MS performs network entry or network re-entry by switching between an initial access frequency band (hereinafter, default band) and a primary band. The frequency bands can be FAs.

The default band is a frequency band that the MS uses during an initial access to the BS. That is, the MS communicates with the BS, starting from contention-based initial ranging to the BS in the default band. The primary band

is a main frequency band that the MS uses for communications with the BS among the plurality of frequency bands. The primary band usually delivers control information required for data transmission to and reception from the BS. In accordance with the present invention, the MS performs initial ranging in the default band and uses the default band as the primary band after the initial ranging.

Herein, an overlay mode is defined as a mode in which the MS and the BS can exchange data in a plurality of frequency bands. The overlay mode will be described in the context of an IEEE 802.16 communication system, for example, although the present invention is also applicable to other communication systems such as Mobile Worldwide Interoperability for Microwave Access (WiMAX) and Mobile WiMAX evolution.

FIG. 2 is a signal diagram illustrating an initial network entry procedure for supporting the overlay mode according to an exemplary embodiment of the present invention.

Referring to FIG. 2, an MS 250 acquires synchronization to a BS 200 in a particular FA in step 201. The BS 200 and the MS 250 perform initial ranging by exchanging ranging messages in step 203.

The MS 250 transmits a Subscriber Basic Capability REQuest (SBC-REQ) message to the BS 200 in step 205. The SBC-REQ message may include information indicating whether the MS supports the overlay mode and, if the MS supports the overlay mode, information about the maximum number of supported FAs. The information can be included in a REGistration REQuest (REG-REQ) message during registration or any other control message related to the network entry.

The BS 200 replies to the MS 250 with a Subscriber Basic Capability ReSPonse (SBC-RSP) message in step 207. The SBC-RSP message may include information indicating whether the BS supports the overlay mode and, if the BS supports the overlay mode, information about the number of FAs supported by the BS 200. The SBC-RSP message may further include information about all FA

indexes managed by the BS 200, information about the center frequency of each FA, and synchronization information. Or the SBC-RSP message may further include information about only part of the FAs, that is, only as many FAs as supported by the MS 250.

The information included in the SBC-RSP message can be included in a REGistration ReSPonse (REG-RSP) message used during the registration or any other message related to the network entry, instead of the SBC-RSP message.

In steps 209 and 211, the BS 200 and the MS 250 perform authentication and registration.

Meanwhile, an MS that is in data communication with the BS in one or more FAs may need an FA change procedure. For this purpose, the MS should receive FA information from the BS. The BS can make a decision as to whether the MS needs to change its current FAs and as to which FAs are suitable for the MS, based on the quality measurement of each FA reported by the MS. The MS can report the quality measurement of each used FA on a Channel Quality Indicator CHannel (CQICH) allocated for the FA, or by a report message. When needed, the BS can control the MS to report the quality measurements of FAs unused for communications between the BS and the MS.

FIG. 3 is a signal diagram illustrating an operation for providing FA information by the BS in a wireless communication system according to an exemplary embodiment of the present invention.

Referring to FIG. 3, a BS 300 determines whether to transmit and receive data to and from an MS 350 in a plurality of FAs in step 302. The BS 300 may determine to change FAs of the MS 350 according to a system-set rule in step 302 if the MS 350 is already communicating with the BS 300 in a plurality of FAs.

In either of the above cases, the BS 300 selects all or part of its current managed FAs in step 304. The selection is made taking into account the number of FAs supported by the MS 350.

In step 306, the BS 300 transmits to the MS 350 the indexes of the selected FAs and information about a start frame in which to start data transmission and reception in the selected FAs. The BS 300 may transmit to the MS 350 information about the index of an FA added to existing FAs used between the MS 350 and the BS 300 and information about a start frame in which to start data transmission and reception in the added FA. Also, the BS 300 may transmit to the MS 350 information about FAs which will not be used any longer among the existing FAs used between the BS 300 and the MS 350 and information about a time when the use of the FAs is discontinued. When an existing FA used for data transmission and reception is changed to a new FA, the BS 300 can transmit to the MS 350 information about the index of the new FA and information about a time when data transmission and reception start in the new FA.

The MS 350 acquires the FA information, that is, the FA indexes and the start frame information in step 308 and transmits and receives data to and from the BS 300 in the selected FAs in step 310.

After acquiring the FA information in step 308, the MS 350 may signal to the BS 300 in the selected FAs that it is ready for data transmission and reception in the selected FAs.

The BS 300 provides the FA information about the added FA (additional FA information), i.e. an FA index and start frame information to the MS 350 during network entry or upon completion of the network entry in the procedure of FIG. 3 by an SBC-RSP message, an REG-RSP message, or any other message related to the network entry, which carries band information about the BS in the procedure of FIG. 2.

FIG. 4 illustrates a protocol stack for supporting a plurality of FAs according to an exemplary embodiment of the present invention.

Referring to FIG. 4, a Medium Access Control (MAC) layer 400 performs MAC-layer operations defined in IEEE 802.16. That is, the MAC layer 400 converts data received from an upper layer to MAC-layer data and processes the MAC-layer data by mapping of an associated Connection Identifier (CID), band

allocation, connection setup, connection maintenance, and MAC-layer data transmission scheduling.

An adaptation layer 420 controls data transmission and reception in each FA when an MS transmits and receives data in a plurality of FAs.

A physical layer includes first and second Radio Frequency (RF) modules 440 and 460 (RF1 and RF2). RF1 and RF2 transmit and receive physical-layer data in FAs.

The adaptation layer 420 will be described in more detail.

The adaptation layer 420 is under the MAC layer 400. It may include a fragmentation module 480 for fragmenting the MAC-layer data for transmission to RF1 connected to FA1 and RF2 connected to FA2, and an assembly module 490 for assembling physical-layer data received from RF1 and RF2 and transmitting the assembled data to the MAC layer 400. The adaptation layer 420 also determines an FA in which fragmented data is to be transmitted and received, manages control information about the quality measurement or transmit power of each FA, and manages ordering of the fragmented data.

As described above, the adaptation layer 420 should manage fragmentation information and assembly information about data. For example, when data is fragmented and transmitted in a plurality of FAs, the adaptation layer 420 can include FA index information in data to indicate an FA in which the data is transmitted or transmit the data in an FA according to a preset order without including the FA index information in the data. If the BS transmits FA information to the MS by an SBC-RSP message, for example, data can be transmitted and received in an FA order indicated by the SBC-RSP message.

Meanwhile, CIDs are allocated to the MS in a conventional manner irrespective of FAs used for the MS. That is, a basic CID, a primary management CID, and a secondary management CID are allocated to the MS during initial network entry. The MS may further be allocated a transport CID. As described before, even when an FA of the MS is changed, a connection of the MS can be

identified by a CID allocated to the MS. If the MS transmits and receives data in a plurality of FAs, an FA in which the MS performs the initial network entry, a preset FA between the BS and the MS, or an explicitly signaled FA is set as a primary band and the primary band can be used for controlling each of the plurality of FAs or for transmission of signals for controlling the MS except data transmission in each FA. The BS can set any other band than the primary band as a new primary band for communications with the MS. The new primary band can be used for controlling each of the plurality of FAs or for transmission of signals for controlling the MS except data transmission in each FA. The primary band can be changed according to the procedure illustrated in FIG. 3.

FIG. 5 is a diagram illustrating a signal flow for a handover operation of an MS supporting a plurality of FAs according to an exemplary embodiment of the present invention.

Referring to FIG. 5, a first BS 510 (BS1) is a serving BS for an MS 500 and second and third BSs 520 and 530 (BS2 and BS3) are neighbor BSs to the serving BS 510. A primary FA and a secondary FA for each BS are set from the perspective of the MS 500. In other words, FAs that the MS 500 has selected from among a plurality of FAs can be a primary FA and a secondary FA and the MS operates in the selected FAs. For example, the primary FA and the secondary FA that the MS 500 uses with BS1 may be in the same band as or in different bands from those of BS2 after handover.

BS1 exchanges BS information with BS2 and BS3 in step 501. The BS information of a BS may include information about FAs that the BS manages.

BS1 forms a neighbor BS information message including the FA information of BS2 and BS3 and transmits the neighbor BS information message to the MS 500 in the primary FA in step 503. The MS 500 scans the FAs managed by BS1, BS2 and BS3 based on the neighbor BS information message in step 505.

The MS 500 transmits a handover request message in the primary FA to BS1 according to the scanning result in step 507. It is assumed herein that the handover request message indicates BS2 as an MS-selected target BS. A plurality

of BSs can be selected as target BSs.

BS1 exchanges information with BS 2 in step 509. The information may include information indicating whether the MS 500 supports the overlay mode, the maximum number of FAs supported by the MS 500, and service level information about the MS 500. The service level information is about a service level that the MS 500 can achieve when BS1 transmits data in all FAs used for communications between BS1 and the MS 500 and a service level that the MS 500 can achieve when BS2 transmits data in all FAs supported for the MS 500.

BS1 transmits a handover response message including the information exchanged with BS2 to the MS 500 in the primary FA in step 511. As BS2 satisfies a handover condition, the MS 500 transmits to BS1 a handover indication message indicating that it will perform a handover to BS2 in step 513.

In step 515, BS1 transmits information about a context of the MS 500 to BS2. While not shown, the MS 500 and BS2 perform network re-entry. Meanwhile, the context information can be exchanged between BS1 and BS2 during the network re-entry.

During the network re-entry, the MS 500 may receive from BS2 information about whether the overlay mode will be used, and if the overlay mode will be used, information about a primary FA, the number of FAs supported in the overlay mode, FA information such as the indexes of the FAs or the central frequencies of the FAs, and a start frame in which the overlay mode starts. After the network re-entry, the MS 500 transmits and receives data in the primary FA and a secondary FA to and from BS2 as indicated by BS2. Meanwhile, the MS 500 can exchange FA information for use in a final target BS during the network re-entry.

While BS2 provides the MS 500 with the FA information for use in the overlay mode and the start frame information for the overlay mode in the above description, it can be further contemplated that the MS 500 determines to perform the overlay mode using the FA information received from BS2 and notifies BS2 that the overlay mode will be performed, rather than BS2 transmits the start frame

information to the MS 500. The notification can be transmitted in the primary FA or a secondary FA in which the overlay mode will be performed.

In the illustrated case of FIG. 5, the MS 500 requests the handover. Instead, BS1 can request the handover. In this case, the handover is performed similarly to the procedure of FIG. 5, except that BS1 requests the handover to the MS 500.

If the signal quality of the secondary FA is decreased during communications between the MS and the BS in the primary FA and the secondary FA, the secondary FA can be replaced with a new secondary FA. If the MS does not receive a satisfactory communication service due to the decreased signal quality of the secondary FA, the BS can request a handover to another BS to the MS.

Conventionally, the MS completes ranging in a predetermined default band. Yet, no procedure for determining an FA in which signals are to be transmitted and received after the ranging has been specified. In this context, a method for transmitting and receiving signals to and from the BS by the MS after the ranging will be described below.

FIG. 6 is a flowchart of an operation for commanding the MS to change a default band in the BS according to an exemplary embodiment of the present invention.

Referring to FIG. 6, the BS performs code ranging with the MS in a default band that the MS has arbitrarily selected, FA1 in step 601. As the coding ranging is successful, the BS receives an initial ranging request message from the MS in FA1 in step 603. The initial ranging request message may include information about whether the MS supports the overlay mode. In the present invention, it is assumed that the MS can transmit and receive signals in the overlay mode.

In step 605, the BS determines whether the default band F1 can be used as a primary band for the MS. The determination is made taking into account load

balancing among a plurality of FAs or the processing overload of the MS. For example, if FA1 is in use as a primary band for more MSs than a predetermined number, relative to other FAs of the BS, the BS should command the MS to use any other FA as the primary band. That is, if the BS determines to use FA1 as the primary band for the MS in step 605, it goes to step 607. Otherwise, the BS goes to step 611.

The BS transmits to the MS a ranging response message including information indicating FA1 as the primary band of the MS in step 607 and performs the remaining network entry procedure in the default band, FA1 in step 609. During the remaining network entry procedure, the BS provides the MS with information about a secondary FA for the MS. Upon completion of the network entry, the MS transmits and receives signals using the primary band being FA1 and the secondary band in the overlay mode.

Meanwhile, the BS transmits to the MS a ranging response message including information indicating a new FA as the primary band of the MS in step 611 and re-starts the network entry in the new FA in step 613. That is, the MS restarts the network entry in the new FA, starting from initial code ranging. The new FA can be at once a default band and a primary band.

FIG. 7 is a flowchart illustrating a network entry operation of the MS when the MS receives a default band change command according to an exemplary embodiment of the present invention.

Referring to FIG. 7, the MS performs initial code ranging to the BS using FA1 as a default band in step 701 and transmits a ranging request message to the BS in FA1 in step 703. The ranging request message includes information indicating whether the MS supports the overlay mode. Further, the ranging request message may include information about the number of FAs supported by the MS. The information about the number of supported FAs can be transmitted by an SBC-REQ message during network entry.

In step 705, the MS receives a ranging response message in FA1 from the BS. The MS determines whether the ranging response message includes

information indicating FA1 as a primary band in step 707. If the information indicating FA1 as a primary band is included, the MS performs the remaining network entry procedure in FA1 in step 709. If information indicating another FA as a primary band is included, the MS re-starts an initial network entry procedure in the new FA in step 711. Thus, the MS should restart from initial code ranging to the BS in the new FA.

FIG. 8 is a flowchart of an operation for commanding the MS to change a default band in the BS according to another exemplary embodiment of the present invention.

Referring to FIG. 8, the BS performs initial ranging with the MS in a default band FA1 in step 801 and receives an SBC-REQ message from the MS in FA1 in step 803. The SBC-REQ message includes information indicating whether the MS supports the overlay mode. It is assumed in FIG. 8 that the MS supports the overlay mode.

In step 805, the BS determines whether to use FA1 as a primary band for the MS, taking into account load balancing among FAs. If the BS determines to use FA1 as the primary band of the MS, it transmits an SBC-RSP message including information indicating FA1 as the primary band to the MS in step 807. The SBC-RSP message may include information about a secondary band for the overlay mode of the MS. In step 809, the BS performs the remaining network entry procedure in FA1. Then, the BS transmits and receives signals to and from the MS using FA1 and the secondary band in the overlay mode.

Meanwhile, if the BS determines to use a new FA as the primary band of the MS in step 805, it transmits an SBC-RSP message including information about the new FA to the MS in step 811 and re-starts network entry with the MS in the new FA in step 813. That is, the BS re-starts from initial code ranging with the MS in the new FA.

FIG. 9 is a flowchart of a network entry operation of the MS when the MS receives a default band change command according to another exemplary embodiment of the present invention.

Referring to FIG. 9, the MS performs initial ranging with the BS in a default band, FA1 in step 901 and transmits an SBC-REQ message to the BS in FA1 in step 903. In step 905, the MS receives an SBC-RSP message from the BS.

In step 907, the MS determines whether the SBC-RSP message includes information commanding change of the default band from FA1 to a new FA. If there is no need to change the default band, FA1, the MS continues the network entry with the BS in FA1 in step 909. On the other hand, if the MS is to change the default band from FA1 to a new FA, it re-starts the network entry, starting from initial ranging in the new FA indicated by the BS in step 911.

FIG. 10 is a flowchart of an operation for commanding the MS to change a default band in the BS according to a third exemplary embodiment of the present invention.

Referring to FIG. 10, the BS performs initial ranging with the MS in a default band of the MS, FA1 in step 1001 and receives an SBC-REQ message from the MS in FA1 in step 1003. The SBC-REQ message may include information indicating whether the MS supports the overlay mode. It is assumed in FIG. 10 that the MS supports the overlay mode.

In step 1005, the BS determines whether to use FA1 as a primary band for the MS, taking into account load balancing among FAs. If the BS determines to use FA1 as the primary band of the MS, it transmits an SBC-RSP message including information indicating FA1 as the primary band to the MS in step 1007. The SBC-RSP message may include information about a secondary band for the overlay mode of the MS. In step 1009, the BS performs the remaining network entry procedure in FA1.

Meanwhile, if the BS determines to change the default band in step 1005, it transmits an SBC-RSP message including information about a new FA as the primary band to the MS in step 1011 and receives a signal indicating that the MS is ready for communications using the new FA as the default band and the primary band from the MS in step 1013. In step 1015, the BS performs the

remaining network entry procedure with the MS in the new FA.

When the BS determines to change the default band of the MS and provides information about a new FA as the default band to the MS in step 1005, it can notify the MS of at least one of a ranging code or a ranging transmission area carrying the ranging code for use in ranging in the new default band. The MS can perform ranging in the new FA using at least one of the ranging code and the ranging transmission area. This ranging is fast ranging different from contention-based initial ranging.

The allocated ranging code or ranging transmission area information facilitates fast ranging in the new default band in the MS, and can be used for the MS to notify the BS of an access to the BS after changing the default band as indicated by the BS.

FIG. 11 is a flowchart of a network entry operation of the MS when the MS receives a default band change command according to a third exemplary embodiment of the present invention.

Referring to FIG. 11, the MS performs initial ranging with the BS in a default band, FA1 in step 1101 and transmits an SBC-REQ message to the BS in FA1 in step 1103. In step 1105, the MS receives an SBC-RSP message from the BS. In step 1107, the MS determines whether the SBC-RSP message includes information commanding change of the default band from FA1 to a new FA. If there is no need to change the default band FA1, the MS continues the network entry with the BS in FA1 in step 1109.

On the other hand, if the MS is to change the default band from FA1 to a new FA, it performs ranging in the new FA indicated by the BS in step 1111 and notifies the BS that it is ready for communications in the new FA as the primary band in step 1113. The notification can be made by a bandwidth request header with a bandwidth request field set to 0. In step 1115, the MS performs the remaining network entry with the BS in the new FA.

As is apparent from the above description, the present invention

advantageously enables transmission and reception of a large amount of data by supporting multiple FAs to an MS in a wireless communication system.

While the invention has been shown and described with reference to certain exemplary embodiments of the present invention thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the appended claims and their equivalents.

**WHAT IS CLAIMED IS:**

1. A method for transmitting and receiving signals in a Base Station (BS) in a wireless communication system, comprising:
  - determining whether a Mobile Station (MS) is to use a plurality of Frequency Assignments (FAs);
  - selecting the plurality of FAs if it is determined that the MS is to use the plurality of FAs;
  - transmitting FA information about the selected FAs to the MS; and
  - transmitting and receiving signals to and from the MS in the selected FAs.
2. The method of claim 1, wherein the FA information includes the indexes of the selected FAs and information about a start frame in which signal transmission and reception starts in the selected FAs.
3. The method of claim 1, further comprising determining whether the MS can transmit and receive signals in a plurality of FAs during initial network entry with the MS.
4. The method of claim 3, wherein the determination as to whether the MS can transmit and receive signals in a plurality of FAs comprises acquiring information indicating whether the BS can allocate a plurality of FAs to the MS and information about the number of FAs that can be allocated to the MS by one of a Subscriber Basic Capability REQuest (SBC-REQ) message received from the MS during the initial network entry and another message related to the initial network entry, and determining whether the plurality of FAs can be allocated to the MS based on the acquired information.
5. The method of claim 3, wherein the determination as to whether the MS can transmit and receive signals in a plurality of FAs comprises transmitting to the MS information about the indexes of total FAs and the center frequency of each of the FAs by one of a Subscriber Basic Capability ReSPonse (SBC-RSP) message transmitted to the MS during the initial network entry, a REGistration ReSPonse (REG-RSP) message, and a message related to the initial network entry.

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6. The method of claim 1, further comprising, if the BS is a serving BS for the MS:

exchanging BS information with at least one neighbor BS of the serving BS;

transmitting to the MS neighbor BS information including FA information about each of the BSs in a primary FA in use for communications with the MS;

exchanging information with a handover candidate BS upon receipt of a handover request message including information about the handover candidate BS in the primary FA from the MS;

transmitting to the MS a handover response message including the exchanged information in the primary FA;

exchanging a context of the MS with a final target neighbor BS, upon receipt of a message including information about the final target neighbor BS in the primary FA from the MS; and

exchanging the context of the MS with the final target neighbor BS during network re-entry between the MS and the final target neighbor BS,

wherein the information exchanged with the handover candidate BS includes at least one of information indicating whether the MS supports an overlay mode, the maximum number of FAs supported by the MS, and information about a service level provided to the MS.

7. A method for transmitting and receiving signals in a Mobile Station (MS) in a wireless communication system, comprising:

receiving from a serving BS a neighbor BS information message including Frequency Assignment (FA) information about a neighbor BS of the serving BS in a primary FA in current use for communications with the serving BS;

scanning total FAs managed by the serving BS and the neighbor BS;

requesting a handover in the primary FA to the serving BS according to the scanning;

receiving a handover response message in the primary FA from the serving BS;

transmitting a message including information about a final target BS in the primary FA to the serving BS;

performing network re-entry to the final target BS;  
notifying the final target BS that the MS can transmit and receive signals in at least two FAs; and  
exchanging information about FAs to be used with the final target BS.

8. The method of claim 7, wherein the handover response message includes at least one of information indicating whether the MS supports an overlay mode, the maximum number of FAs supported by the MS, and information about a service level provided to the MS.

9. A method for performing network entry in a Mobile Station (MS) in a wireless communication system, comprising:

transmitting a ranging request message to a Base Station (BS) in a first frequency band;

receiving from the BS a ranging response message including information indicating whether the first frequency band is to be changed; and

performing network entry in a second frequency band indicated by the ranging response message, different from the first frequency band, if the information indicates that the first frequency band is to be changed to the second frequency band.

10. The method of claim 9, wherein the MS is in an overlay mode in which the MS transmits and receives signals to and from the BS in at least two frequency bands, further comprising:

receiving information about a third frequency band during the network entry; and

transmitting and receiving signals to and from the BS using the second frequency band and the third frequency band in the overlay mode.

11. The method of claim 10, wherein the ranging request message includes information indicating whether the MS supports the overlay mode.

12. The method of claim 9, wherein the ranging request message includes information about the number of frequency bands supported by the MS.

13. The method of claim 9, further comprising performing a subsequent network entry procedure in the first frequency band after ranging, if the information does not indicate that the first frequency band is to be changed to another frequency band.

14. A method for supporting network entry in a Base Station (BS) in a wireless communication system, comprising:

receiving a ranging request message in a first frequency band from a Mobile Station (MS);

determining a second frequency band for the MS according to a predetermined condition;

transmitting to the MS a ranging response message including at least one of information indicating whether the first frequency band is to be changed and information about the second frequency band for the MS; and

performing network entry with the MS in the second frequency band.

15. The method of claim 14, wherein the BS supports an overlay mode for the MS using at least two frequency bands, further comprising:

transmitting information about a third frequency band to the MS during the network entry; and

transmitting and receiving signals to and from the MS in the second and third frequency bands.

16. The method of claim 14, wherein the ranging request message includes information indicating whether the MS supports the overlay mode.

17. The method of claim 14, wherein the ranging request message includes information about the number of frequency bands supported by the MS.

18. The method of claim 14, wherein the second frequency band determination comprises determining to use the second frequency band different from the first frequency band for the MS, if the number of MSs using the first frequency band is equal to or larger than a predetermined number.

19. A wireless communication system comprising:

a Mobile Station (MS) for transmitting a ranging request message to a Base Station (BS) in a first frequency band, receiving from the BS a ranging response message including information indicating whether the first frequency band is to be changed, and performing network entry in a second frequency band indicated by the ranging response message, different from the first frequency band, if the information indicates that the first frequency band is to be changed to the second frequency band; and

the BS for receiving the ranging request message in the first frequency band from the MS, determining the second frequency band for the MS according to a predetermined condition, transmitting to the MS the ranging response message including at least one of information indicating whether the first frequency band is to be changed and information about the second frequency band for the MS, and performing the network entry with the MS in the second frequency band.

20. The wireless communication system of claim 19, wherein the MS is in an overlay mode in which the MS transmits and receives signals to and from the BS in at least two frequency bands, receives information about a third frequency band during the network entry, and transmits and receives signals to and from the BS using the second frequency band and the third frequency band in the overlay mode.

21. The wireless communication system of claim 20, wherein the ranging request message includes information indicating whether the MS supports the overlay mode.

22. The wireless communication system of claim 19, wherein the ranging request message includes information about the number of frequency bands supported by the MS.

23. The wireless communication system of claim 19, wherein the MS performs a subsequent network entry procedure in the first frequency band after ranging, if the information does not indicate that the first frequency band is to be changed to another frequency band.

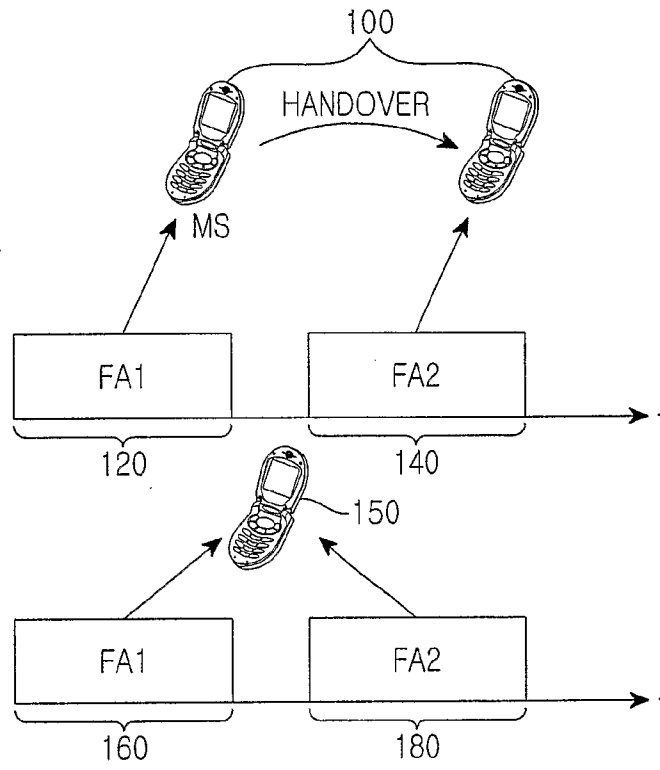


FIG. 1

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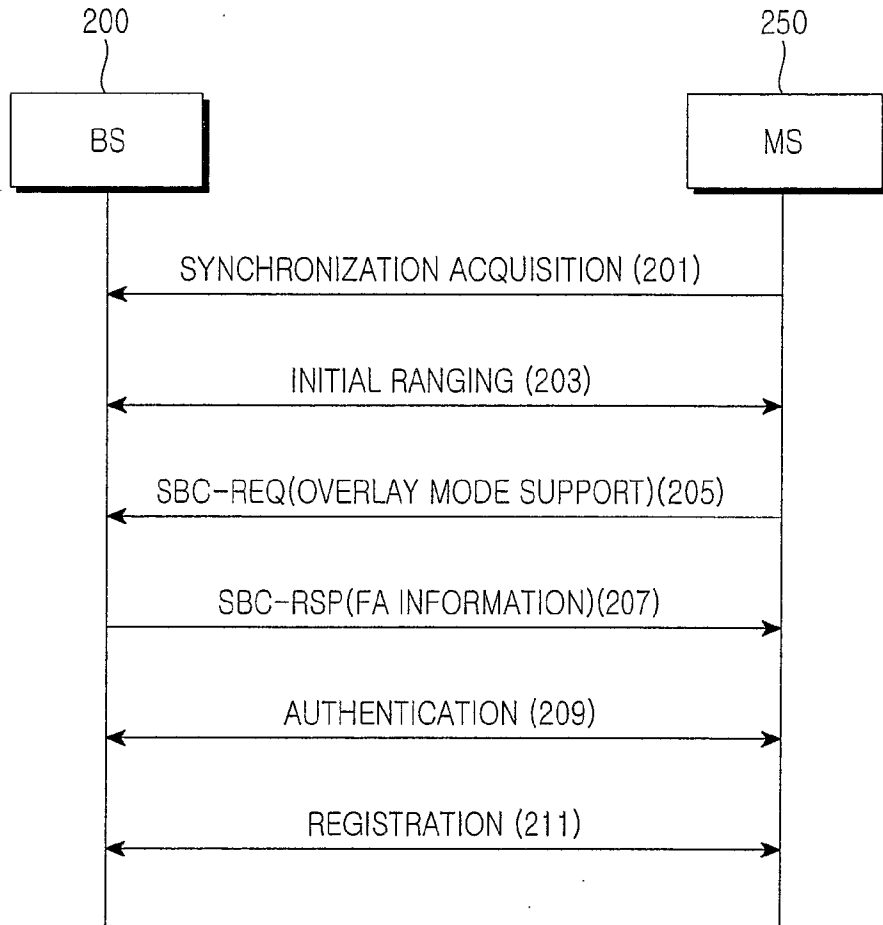


FIG.2

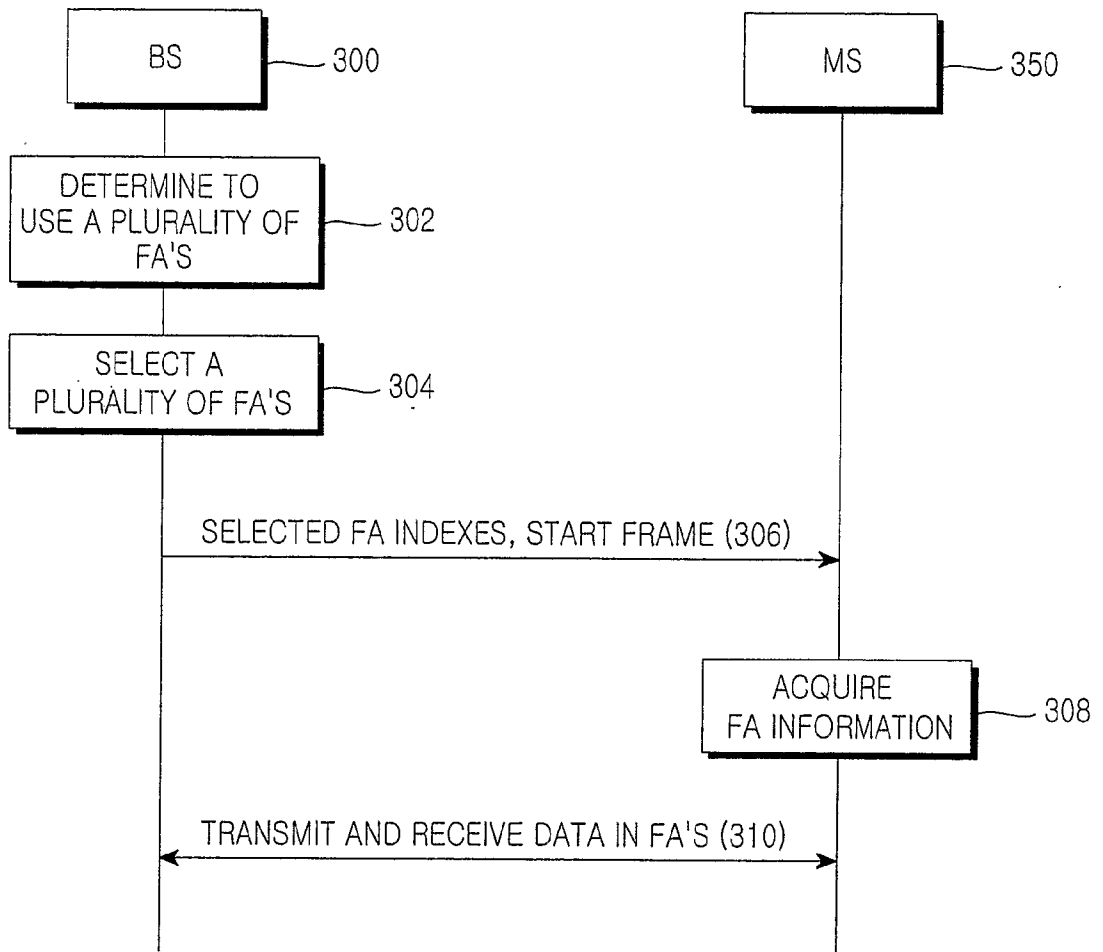


FIG.3

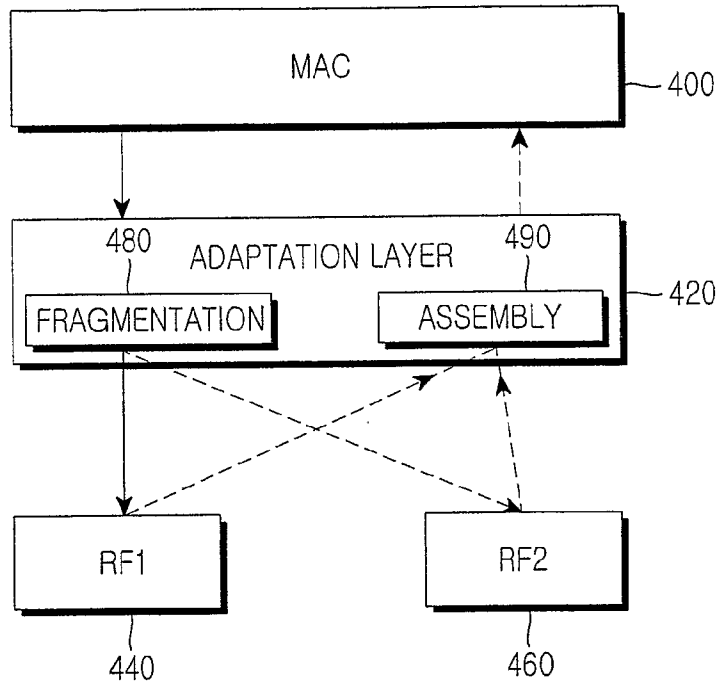


FIG.4

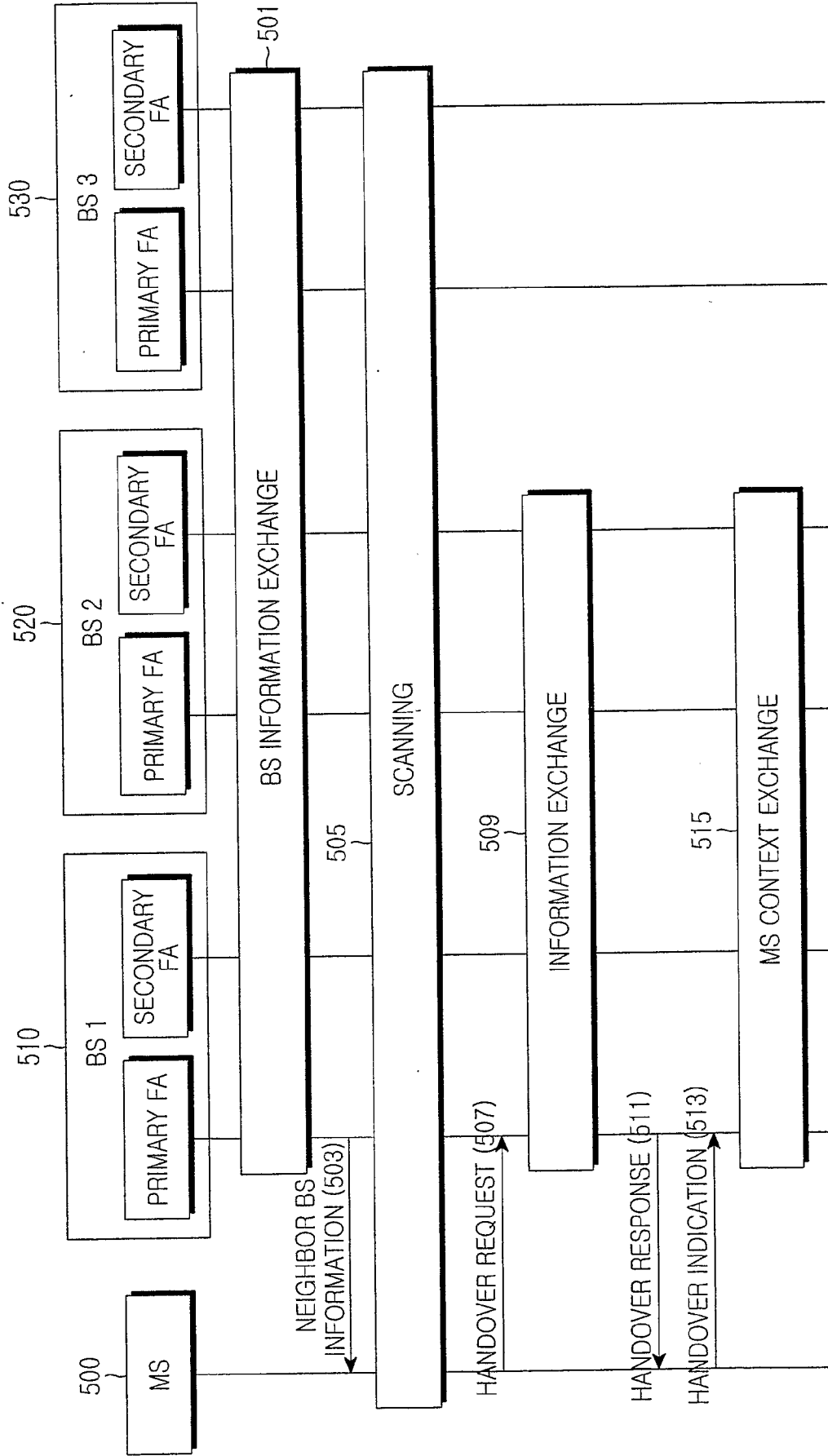


FIG.5

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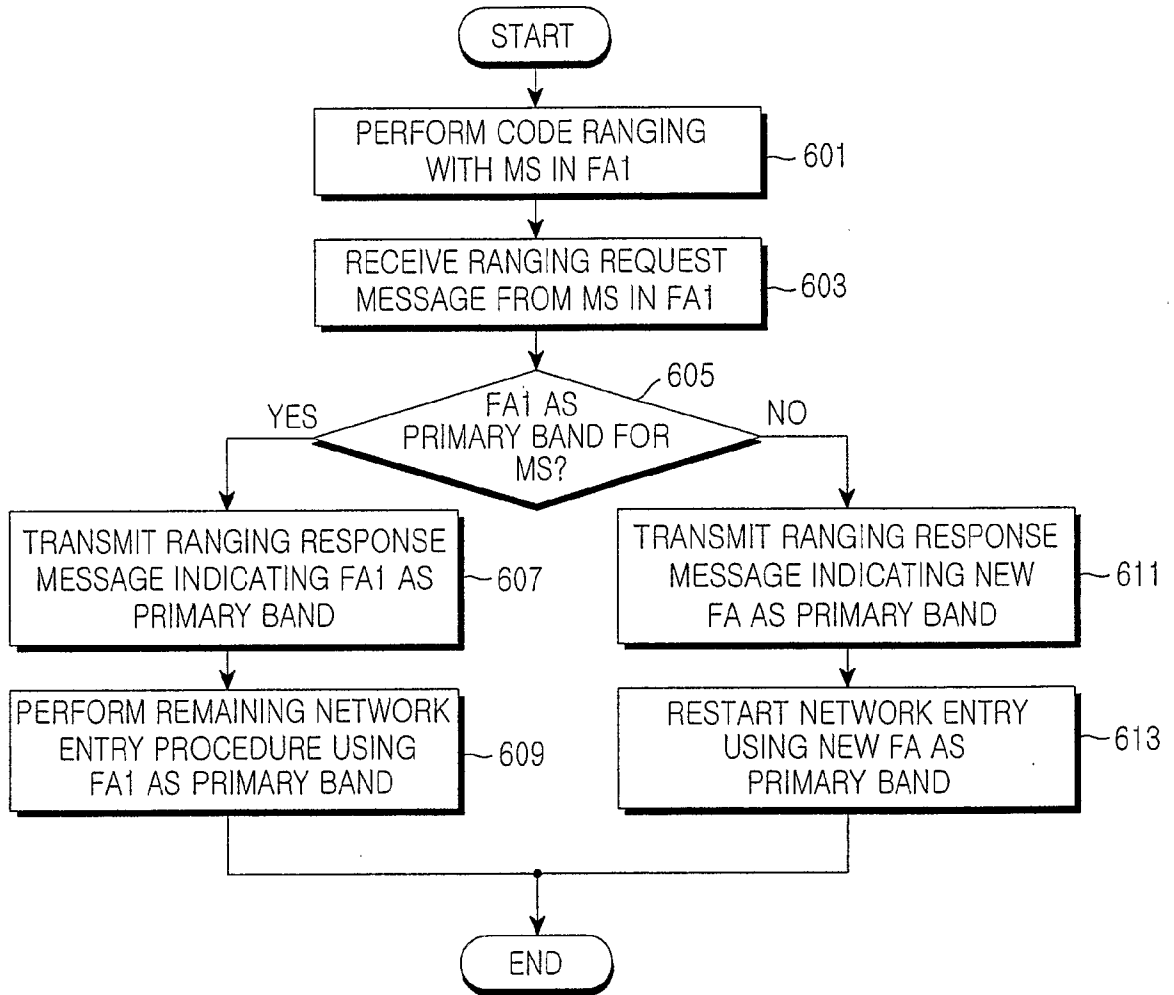


FIG.6

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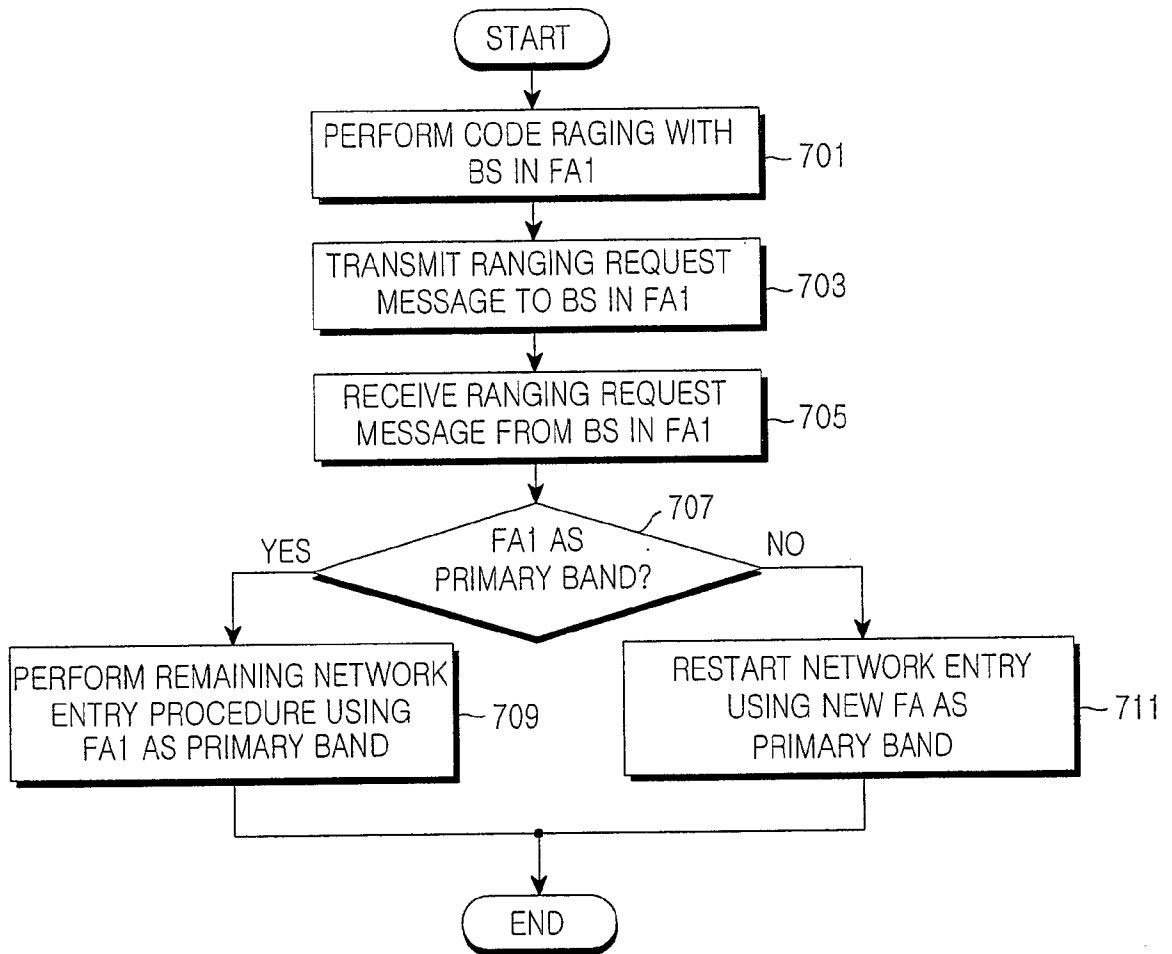


FIG.7

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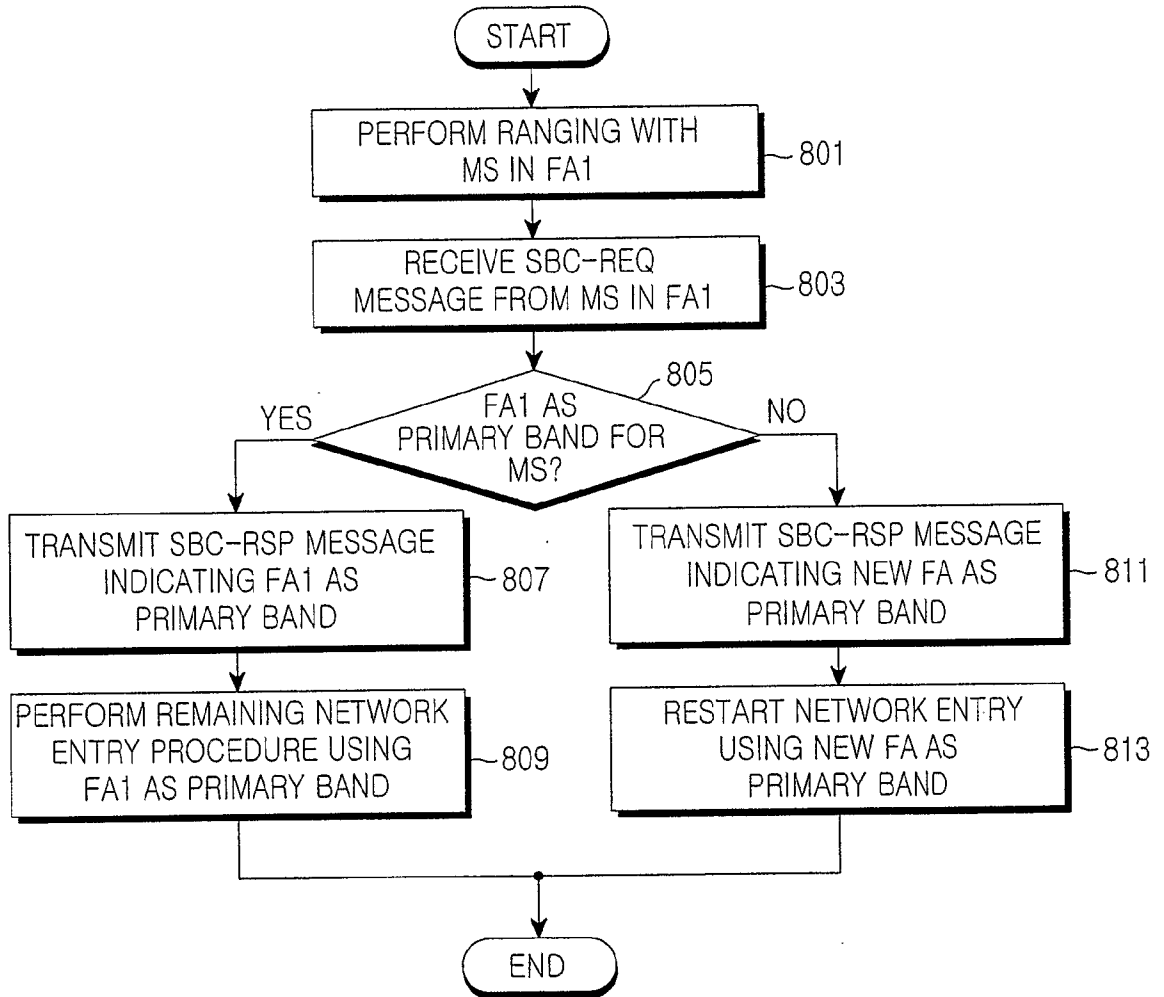


FIG. 8

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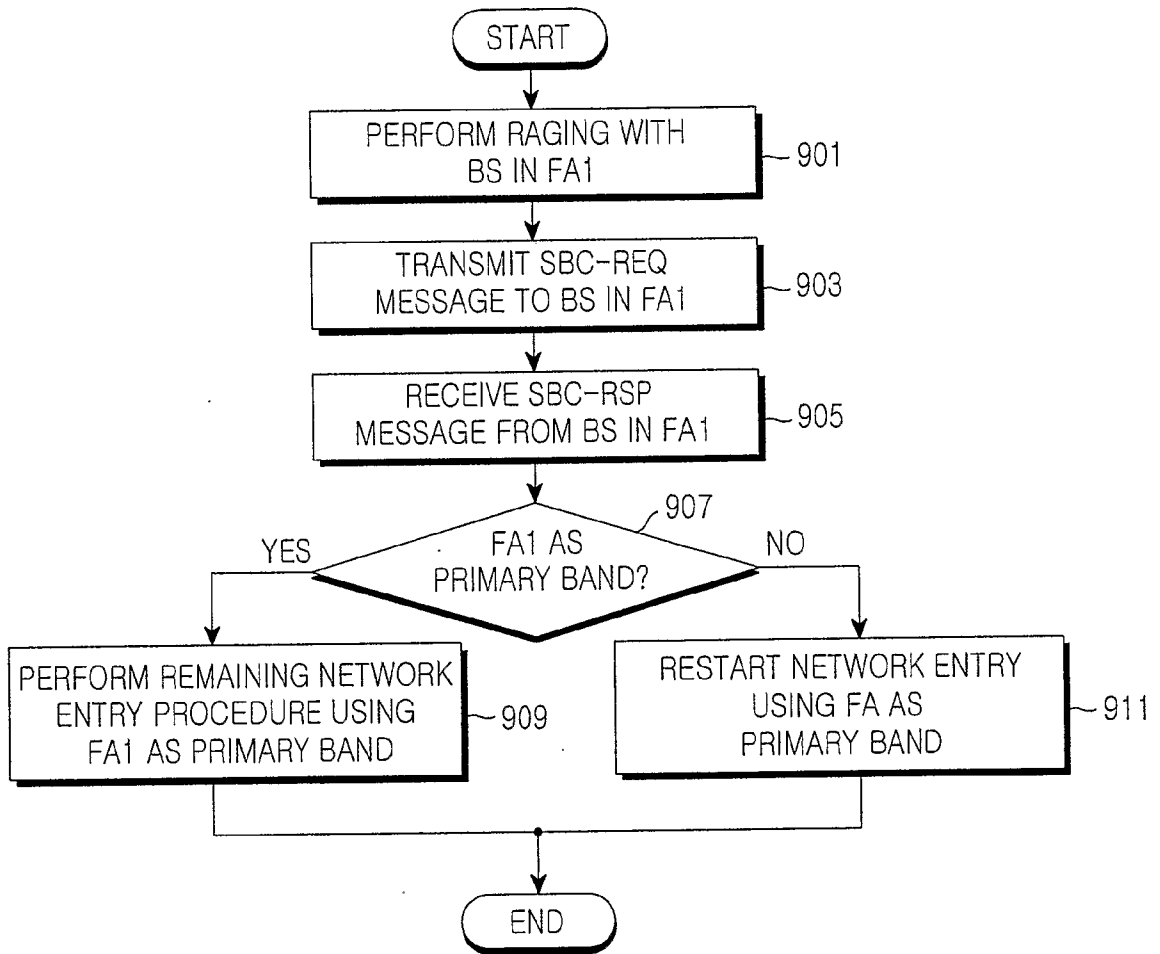


FIG.9

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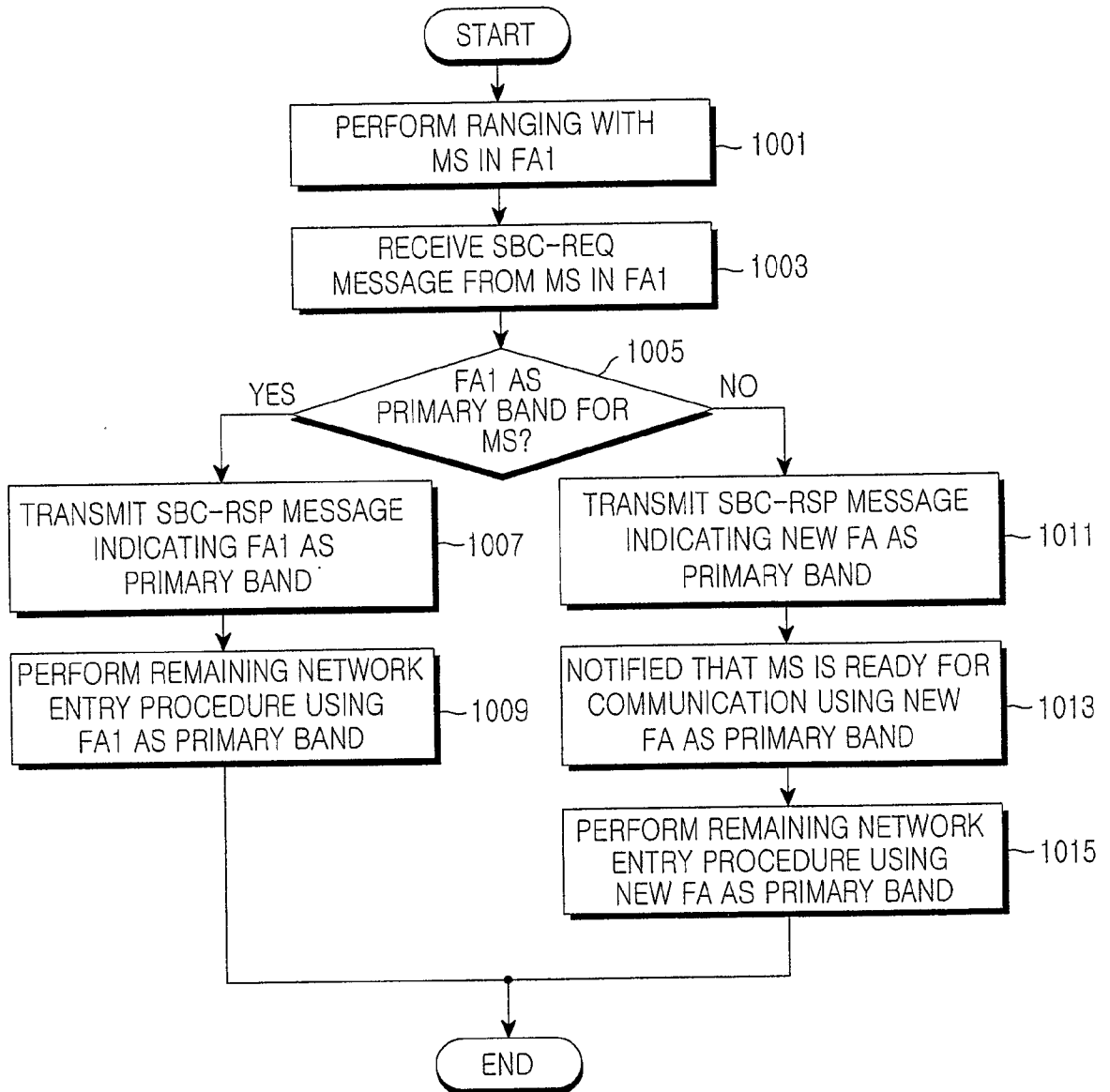


FIG.10

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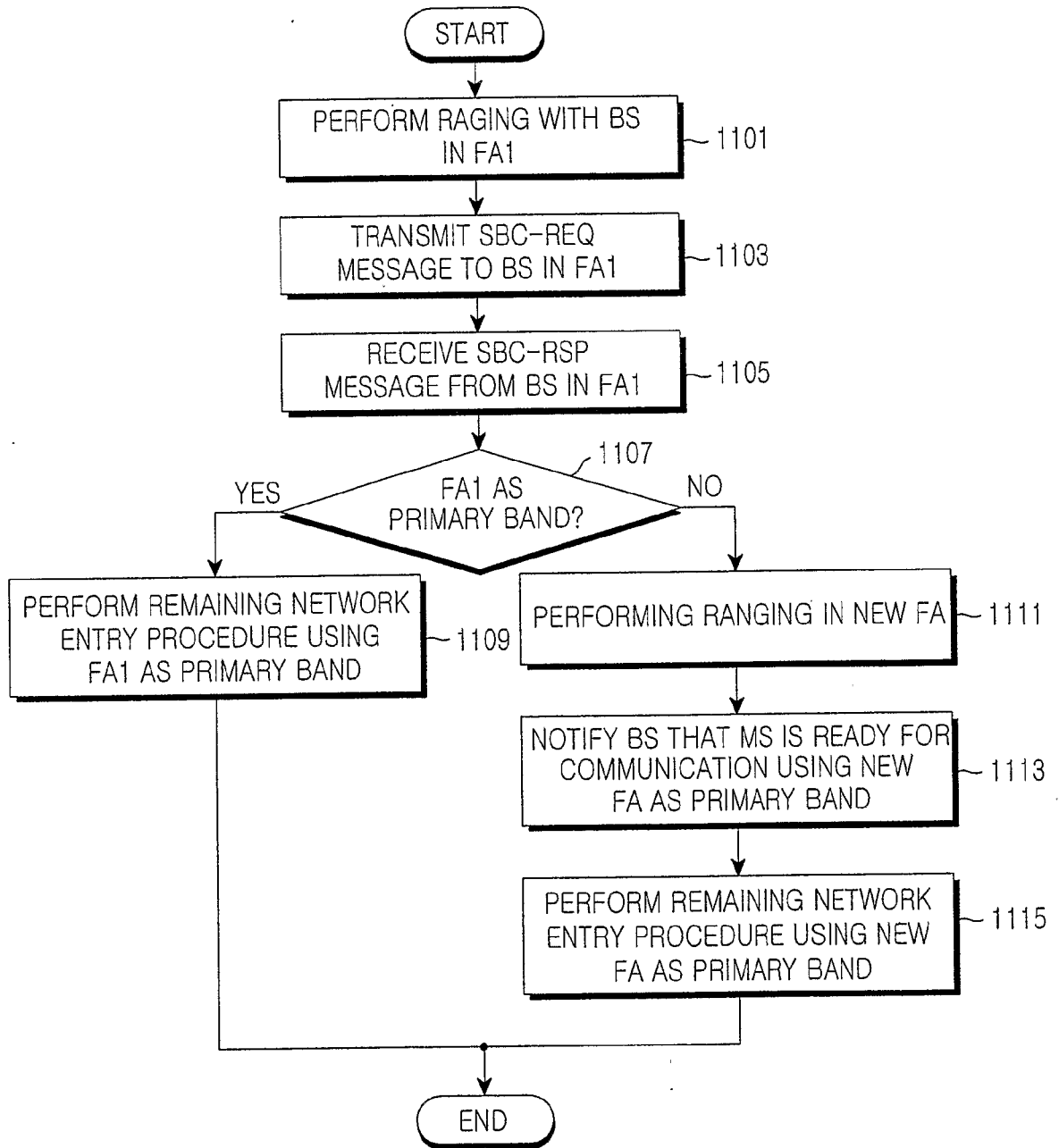


FIG.11

## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/KR2008/000196****A. CLASSIFICATION OF SUBJECT MATTER***H04B 7/26(2006.01)i*

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
KOREAN UTILITY MODELS AND APPLICATIONS FOR UTILITY MODELS SINCE 1975Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKIPASS, DELPHION, ESPACENET & Keywords : frequency assignment, multiple frequency band, and similar terms.**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 06400952 B2 (KIM et al.) 04.06.2002 * abstract, column 5 line 46 - column 6 line 33, figure 2*	1-23
A	US 06684120 B1 (OKU et al.) 27.01.2004 * abstract, column 7 line 54 - column 9 line 8, figure 1*	1-23



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

02 MAY 2008 (02.05.2008)

Date of mailing of the international search report

**02 MAY 2008 (02.05.2008)**

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Telephone No. 82-42-481-8356



**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/KR2008/000196**

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