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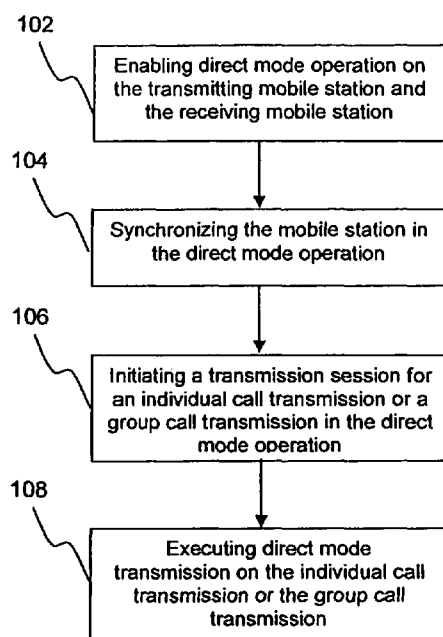
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[Continued on next page]

(54) Title: MEDIUM ACCESS CONTROL FOR DIRECT MODE OPERATION OVER WIMAX

100

FIG. 1



(57) Abstract: A method (100) for allowing a transmitting mobile station to initiate a direct mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC), the method comprising the steps of enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network (102), synchronizing the mobile station in the direct mode operation (104), initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation (106) and executing direct mode transmission on the individual call transmission or the group call transmission (108). The method of enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network (102) characterized in that enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network further comprises loading configuration for direct mode operation by utilizing the medium access control (MAC) (202), scanning for transparent zones inside frames of the wireless network (204) and defining beacon transmission slots and direct mode operation channels in each transparent zone (206).



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GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted
a patent (Rule 4.17(ii))*

MEDIUM ACCESS CONTROL FOR DIRECT MODE OPERATION OVER WiMAX**FIELD OF INVENTION**

- 5 The present invention relates to a method for allowing a transmitting mobile station to initiate a direct mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC).

BACKGROUND ART

- 10 At present, the WiMAX IEEE 802.16e standards do not stipulate direct communication between two or more mobile stations. As such, MAC (Medium Access Control) mechanism for direct mobile station-to-mobile station is also not stipulated.

- United States Patent Application No. 10/597,391 (Del Prado Pavon et al.) discloses a distributed MAC protocol that includes a superframe having a slotted Beaconsing Period and a data transfer period. The provided superframe comprises a plurality of medium access slots and the plurality of medium access slots is assigned to the slotted Beaconsing Period. The Beaconsing Period length may be fixed or variable. The provided Beaconsing protocol defines initializing an ad hoc network by means of starting a Beaconsing Period, joining an existing Beaconsing Period of ad hoc network and resolving collisions during the Beaconsing Period. The protocol does not teach any method which utilizes MAC in Direct Mode Operation (DMO) over WiMAX as beacon transmission slots (BTS) and DMO channels are utilized by Mobile Station (MS) to exchange control messages in the format of beacons before the actual voice (or data) transmission can take place. The uniqueness of the present invention lies in the configuration and the algorithm of the MAC which supports direct communication.

- In another patent (International Patent Application No. PCT/IB2008/055128) discloses a flexible wireless system and method that support both centralized and distributed modes of MAC protocols, using a new recurring MAC superframe. The said prior art comprises a beacon period (BP), a data/sense/sleep period (DSSP) for data selective communication, sleep and channel sensing for detecting primary users in cognitive systems; and a signaling window (SW) used for exchanging network entry messages

and channel reservation requests, the system including beacon operation, a peer beacon device in distributed mode and a master beacon device in centralized mode which are used to selectively participate in the beacon operation, as well as a slave beacon device associated with the master device. The system may employ controlled channel access for the beacon period, the channel access being reservation based. The invention provides a unified MAC protocol that can be adopted in the standards, and supports flexible operation in distributed mode or centralized mode, and seamless transfer from one to the other. However, the prior art does not provide for direct mode operation.

The subject matter claimed herein is not limited to embodiments that solve any disadvantages or that operate only in environments such as those described above. Rather, this background is only provided to illustrate one exemplary technology area where some embodiments described herein may be practice.

SUMMARY OF INVENTION

One object of the invention relates to a method for allowing a transmitting mobile station to initiate a direct mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC), the method comprising the steps of
5 enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network, synchronizing the mobile station in the direct mode operation, initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation and executing direct mode transmission on the individual call transmission or the group call transmission. The
10 method of enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network further comprises loading configuration for direct mode operation by utilizing the medium access control (MAC), scanning for transparent zones inside frames of the wireless network and defining beacon transmission slots and direct mode operation channels in each transparent zone.

15 Preferably, the method of synchronizing the mobile station in the direct mode operation further comprises determining existence of a direct mode zone, scanning for beacon transmission slots and performing an idle mode operation by transmitting an idle beacon periodically.

20 Preferably, the method of performing an idle mode operation by transmitting an idle beacon periodically further comprises sending beacon on its beacon transmission slot and listening to beacons of other mobile station.

25 Preferably, the method of initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation further comprises obtaining a user request for transmission from the transmitting mobile station to a receiving mobile station and determining availability of the receiving mobile station.

30 The present invention consists of features and a combination of parts hereinafter fully described and illustrated in the accompanying drawings, it is being understood that various changes in the details may be made without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS

To further clarify various aspects of some embodiments of the present invention, a more particular description of the invention will be rendered by references to specific
5 *embodiments thereof, which are illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail through the accompanying drawings in which:*

10 **FIG. 1 is a flowchart illustrating a method for allowing a transmitting mobile station to initiate a direct mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC).**

15 **FIG. 2 is a flowchart illustrating a method for enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network.**

FIG. 3 is a flowchart illustrating a method for synchronizing the mobile station in the direct mode operation.

20 **FIG. 4 is a flowchart illustrating a method for performing an idle mode operation by transmitting an idle beacon periodically.**

25 **FIG. 5 is a flowchart illustrating a method for initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation which includes the method for determining availability of the receiving mobile station.**

FIG. 6 is a flowchart illustrating a method for exchanging control messages in beacon format.

30 **FIG. 7 is an overview of the architecture of Direct Mode Operation Transparent Zones.**

FIG. 8 is an overview of each transparent zone.

FIG. 9 is an overview of the Beacon Transmission Slot allocations.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the invention relate to a method for allowing a transmitting mobile station to initiate a direct mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC). Hereinafter, this specification will describe the present invention according to the preferred embodiments of the present invention. However, it is to be understood that limiting the description to the preferred embodiments of the invention is merely facilitating discussion of the present invention and it is envisioned without departing from the scope of the appended claims.

The present invention describes a method for allowing a transmitting mobile station to initiate a direct mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC). These Direct Mode Operation communications occur in transparent zones defined inside the WiMAX frames. Each transparent zone consists of beacon transmission slots and direct mode operation channels.

Mobile station uses beacon transmission slots to exchange control messages in the format of beacons such as to inform other mobile station that it is idle or request to make a call to another mobile station or talkgroup before the actual voice transmission can take place. In particular, the present invention addresses the beacon and the beacon transmission slots implementations in direct mode operation over WiMAX where the mobile station of the direct mode operation uses the beacon transmission slots to inform other mobile stations that it is idle.

In addition, the beacon transmission slots are utilized by the mobile station to make a call request to another mobile station or talkgroup, accept a call from another mobile station or talkgroup, decline a call request from another mobile station, inform other mobile stations that it is engaged in a call, as a caller or a receiver and inform the mobile station that it is communicating and it wants to end the call.

Reference is first being made to FIG. 1, FIG.2, FIG. 7 and FIG. 8 collectively. FIG. 1 is a flowchart illustrating a method for allowing a transmitting mobile station to initiate a direct

mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC) while FIG.2 is a flowchart illustrating a method for enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network. The method (100) for allowing a transmitting mobile station to initiate a direct mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC), the method comprising the steps of enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network (102), synchronizing the mobile station in the direct mode operation (104), initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation (106) and executing direct mode transmission on the individual call transmission or the group call transmission (108).

The direct mode operation communications occur in the transparent zones defined in the WiMAX frames. As shown in FIG. 7 and FIG. 8, each transparent zone comprises of Beacon transmission slots (BTS) and Direct Mode Operation (DMO) channels.

The method for enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network further comprises loading configuration for direct mode operation by utilizing the medium access control (MAC) (202), scanning for transparent zones inside frames of the wireless network (204) and defining beacon transmission slots and direct mode operation channels in each transparent zone (206). The mobile station is thereafter synchronized in the direct mode operation (104).

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The present invention focuses on the fixed or pre assignment and allocations for beacon transmission slots and direct mode operation channels. Each mobile station of the direct mode operation is allocated a unique beacon transmission slot which transmits a beacon periodically. A Beacon Transmission Period (BTP) defines the maximum number of direct mode operation mobile stations in the system. For example, 1-sec period allows 200 concurrent direct mode operation mobile stations based on one transparent zone for every 5ms WiMAX frame. The number of concurrent direct mode operation mobile stations can be increased by setting more transparent zones in each WiMAX frame. The format for the beacon is as tabulated in Table 1.0. The term "group call" may be referred

to as "talkgroup call" and the term "individual call" may be referred to as "MS-MS" call wherein the terms will be used interchangeably.

Fields	IEI	IEI Type	Length	Value	Remarks	Description
OP	1	M	4 bits	0000b	Null	
				0001b	Idle	
				0010b	Request to make call	
				0011b	Accept call request	
				0100b	Making a call	
				0101b	Receiving a call	
				0110b	Call completed	
				0111b	Ending call	May be used by the receiver to inform the caller that it wants to leave the call
				1000b	Reject call request	
				Rest	Reserved	For future use
CallType	2	M	2 bits	00b	Null	For example in the case of Idle beacon
				01b	MS-MS	Individual call.
				10b	TG	Group call.
Src	3	M	6 bytes	48-bit MAC Address	Source MS ID	This is to specify where the beacon originated from.
Dst	5	O	6 bytes	48-bit MAC Address	Destination MS ID	This field is to specify who the beacon is intended for. It is not needed when an MS wants to initiate a group call.

Group	6	O	6 bytes	Group ID	Talkgroup ID	This field is not needed for MS-MS call.
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Note : M-Mandatory, O-Optional

Table 1.0: Beacon Frame Format

The mobile station will load the configuration of the direct mode operation system which includes the information of the beacon transmission slot. The configuration of the direct mode operation is as listed in Table 2.0.

Items	Default Value
DMO feature	Either "Enabled" or "Disabled"
List of DMO MSs that the MS can communicate with, in the case of individual calls. Priority level may be assigned as well.	Varies from MS to MS
List of talkgroups the MS belongs to, along with the talkgroup priority level	Varies from MS to MS
The number of WiMAX frames per BTP period	200 (So BTP period = (# of WiMAX frames) * (frame duration))
The number of BTS in each frame	1
The network ID that the MS is part of	Varies from MS to MS
The BTS slot number that MS owns	Unique to a DMO MS
DMO network ID that the MS belongs to. This is to prevent foreign MS to enter another network.	Varies from MS to MS

Table 2.0: Direct Mode Operation System Configuration

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Reference is now being made to FIG. 3 and FIG. 4 respectively. FIG. 3 is a flowchart illustrating a method for synchronizing the mobile station in the direct mode operation while FIG. 4 is a flowchart illustrating a method for performing an idle mode operation by transmitting an idle beacon periodically. Synchronization of the mobile station in the direct mode operation further comprises determining existence of a direct mode zone (302), scanning for beacon transmission slots (304) and performing an idle mode operation by transmitting an idle beacon periodically (306). The method for performing an idle mode operation by transmitting an idle beacon periodically (306) further

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comprises sending beacon on its beacon transmission slot (402) and listening to beacons of other mobile station (404).

Reference is now being made to FIG. 5. FIG. 5 is a flowchart illustrating a method for initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation which includes the method for determining availability of the receiving mobile station. The method for initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation further comprises obtaining a user request for transmission from the transmitting mobile station to a receiving mobile station (502) and determining availability of the receiving mobile station (504). A user alert is initiated if mobile station is not available (506). Simultaneously, other beacons will be decoded to initiate transmission if mobile station is available (508).

Reference is now being made to FIG. 6. FIG. 6 is a flowchart illustrating a method for exchanging control messages in beacon format. The method for exchanging control messages in beacon format comprises sending a request beacon in its allocated beacon transmission slot from the transmitting mobile station to the receiving mobile station (602). An accept beacon is received at the transmitting mobile station from the receiving mobile station to accept transmission (604) while voice or data will be transmitted from the transmitting mobile station to the receiving mobile station (606) and thereafter returning to the idle mode operation by transmitting the idle beacon periodically (608).

A typical scenario of the present invention of a talkgroup call is described in Table 3.0. Talkgroup calls have higher priorities than individual calls. And each talkgroup is assigned a priority level. The user interface shall provide the user the option to answer an incoming group call either automatically or manually. If the user has chosen the former choice and is engaged in an individual call, then the MS shall end the current incoming call and automatically answer the incoming group call. If the user has elected to answer a group call manually, then he will have the option to answer or decline an incoming group call request. The scenario as provided in Table 3.0 allocates MS1, MS1, MS2, MS3 and MS4 in TG1 talkgroup while MS3 and MS5 are in TG2 talkgroup. MS3 is talking to MS2 while MS5 wants to initiate group call to TG2. MS3 has been configured to answer incoming group call automatically, so when MS3 senses the group call

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request from MS5, it ends the individual call in the next BTP before sending out a "call acceptance" beacon.

	BTP 1					
	MS1	MS2	MS3	MS4	MS5	MS6
Beacon:						
OP	Idle	Receiving call	Making call	Idle	Call request	Idle
CallType	X	MS-MS	MS-MS	X	TG	X
Src	MS1	MS2	MS3	MS4	MS5	MS6
Dst	X	MS3	MS2	X	X	X
Group	X	X	X	X	TG2	X

	BTP 2					
	MS1	MS2	MS3	MS4	MS5	MS6
Beacon:						
OP	Idle	Receiving call	End call	Idle	Call request	Idle
CallType	X	MS-MS	MS-MS	X	TG	X
Src	MS1	MS2	MS3	MS4	MS5	MS6
Dst	X	MS3	MS2	X	X	X
Group	X	X	X	X	TG2	X

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	BTP 3					
	MS1	MS2	MS3	MS4	MS5	MS6
Beacon:						
OP	Idle	Idle	Accept call	Idle	Making call	Idle
CallType	X	X	TG	X	TG	X
Src	MS1	MS2	MS3	MS4	MS5	MS6
Dst	X	X	MS5	X	MS3	X
Group	X	X	TG2	X	TG2	X

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	BTP 4					
	MS1	MS2	MS3	MS4	MS5	MS6
Beacon:						
OP	Idle	Idle	Receiving call	Idle	Making call	Idle
CallType	X	X	TG	X	TG	X
Src	MS1	MS2	MS3	MS4	MS5	MS6
Dst	X	X	MS5	X	MS3	X
Group	X	X	TG2	X	TG2	X

Table 3.0: Overview of Direct Mode Operation

5 The methodology of the present invention occurs in transparent zones defined inside the WiMAX frames provide for direct mode operation. The uniqueness of the present invention lies in the configuration and algorithm of the medium access control which supports direct communication.

10 The present invention may be embodied in other specific forms without departing from its essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore indicated by the appended claims rather than by the foregoing description. All changes, which come within the meaning and range of equivalency of the claims, are to be embraced within their scope.

CLAIMS

1. A method (100) for allowing a transmitting mobile station to initiate a direct mode operation to a receiving mobile station over WiMAX utilizing configuration of a medium access control (MAC), the method comprising the steps of:

enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network (102);
synchronizing the mobile station in the direct mode operation (104);
initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation (106); and
executing direct mode transmission on the individual call transmission or the group call transmission (108).

characterized in that enabling the direct mode operation on the transmitting mobile station and the receiving mobile station within the wireless network further comprises:

loading configuration for direct mode operation by utilizing the medium access control (MAC) (202);
scanning for transparent zones inside frames of the wireless network (204); and
defining beacon transmission slots and direct mode operation channels in each transparent zone (206).

2. The method according to claim 1 wherein synchronizing the mobile station in the direct mode operation further comprises:

determining existence of a direct mode zone (302);
scanning for beacon transmission slots (304); and
performing an idle mode operation by transmitting an idle beacon periodically (306).

3. The method according to claim 2, wherein performing an idle mode operation by transmitting an idle beacon periodically further comprises:

sending beacon on its beacon transmission slot (402); and
listening to beacons of other mobile station (404).

4. The method according to claim 1, wherein initiating a transmission session for an individual call transmission or a group call transmission in the direct mode operation further comprises:

obtaining a user request for transmission from the transmitting mobile station to a receiving mobile station (502); and
determining availability of the receiving mobile station (504).

5. The method according to claim 1, wherein executing direct mode transmission on the individual call transmission or the group call transmission further comprises exchanging control messages in beacon format.

6. The method according to claim 4, wherein determining availability of the receiving mobile station further comprises:

initiating a user alert if mobile station is not available (506); and
decoding other beacons to initiate transmission if mobile station is available (508).

7. The method according to claim 5 wherein exchanging control messages in beacon format further comprises:

sending a request beacon in its allocated beacon transmission slot from the transmitting mobile station to the receiving mobile station (602);
receiving an accept beacon at the transmitting mobile station from the receiving mobile station to accept transmission (604);
transmitting voice or data from the transmitting mobile station to the receiving mobile station (606); and
returning to the idle mode operation by transmitting the idle beacon periodically (608).

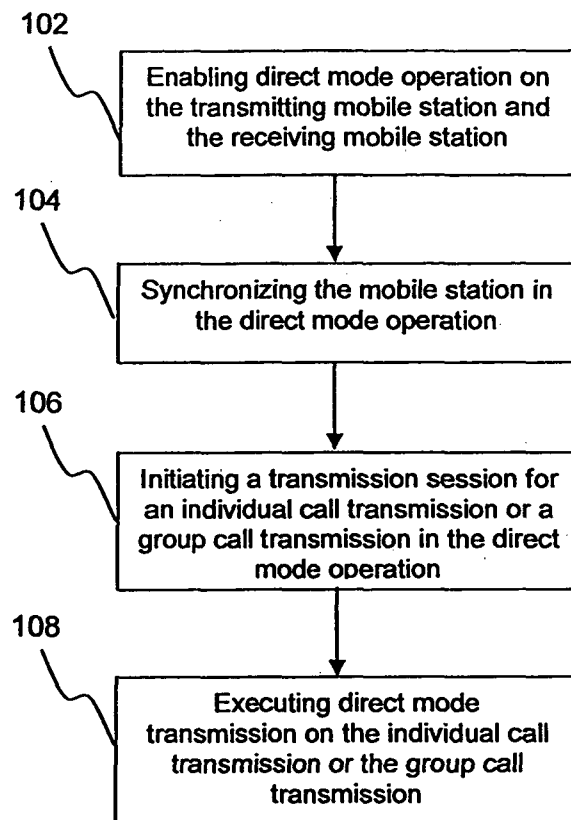
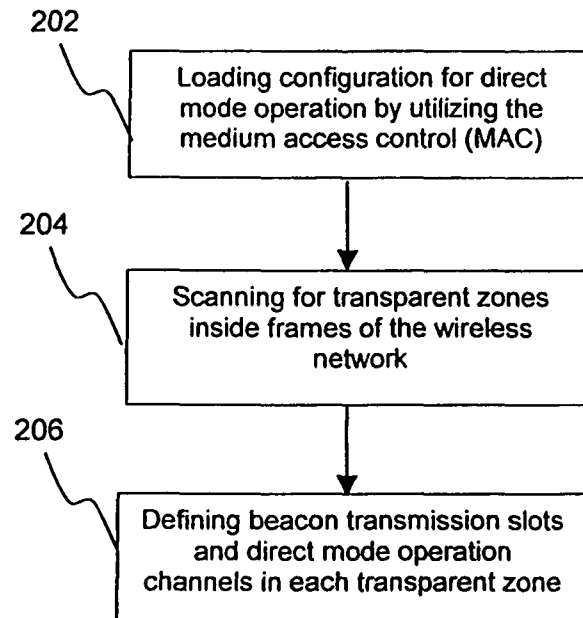
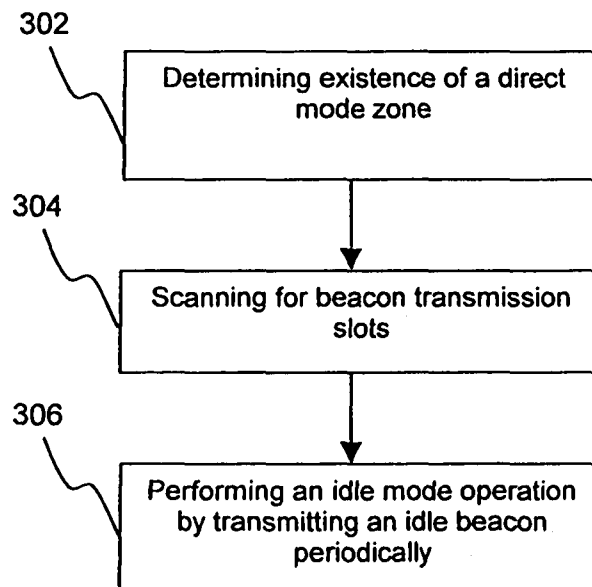
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FIG. 1

200**FIG. 2****300****FIG. 3**

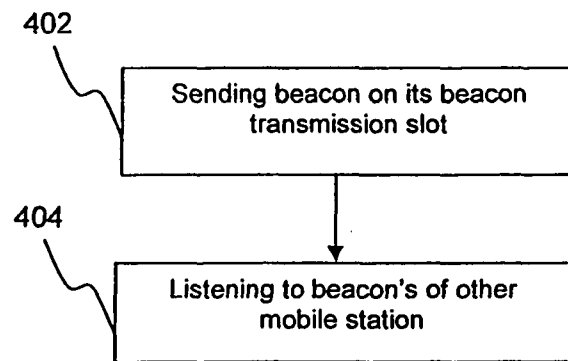
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FIG. 4

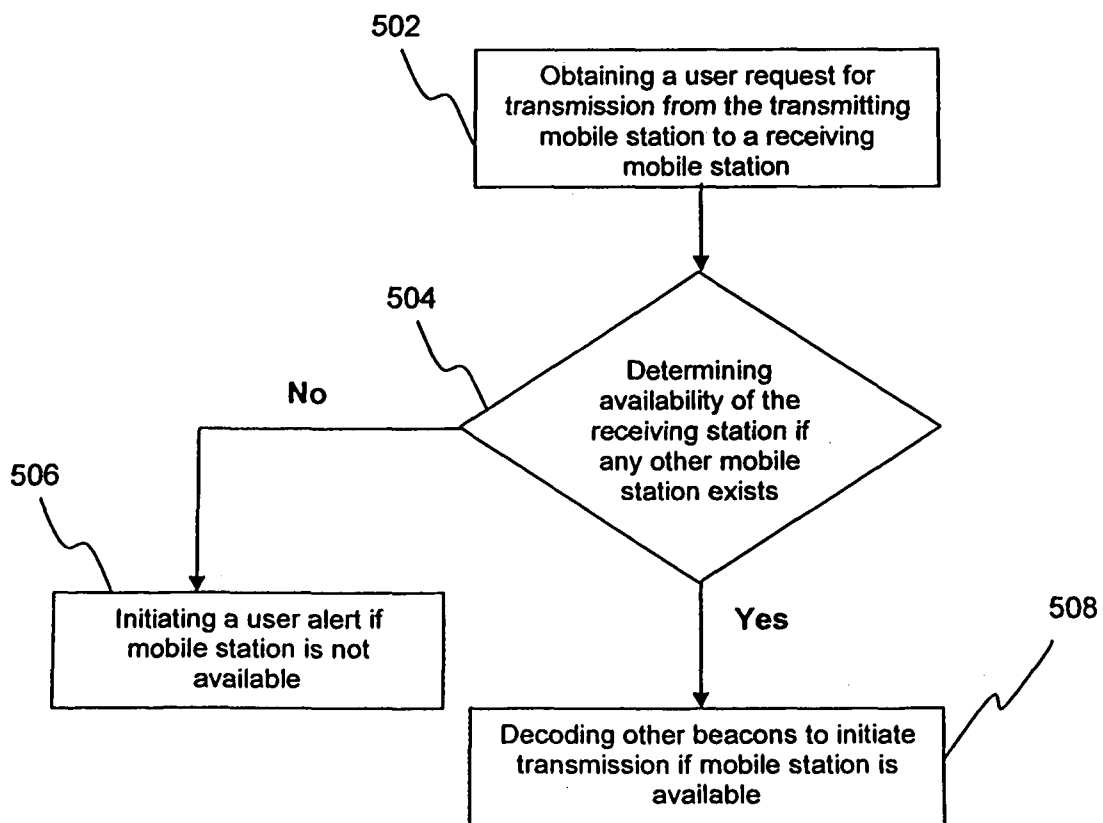
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FIG. 5

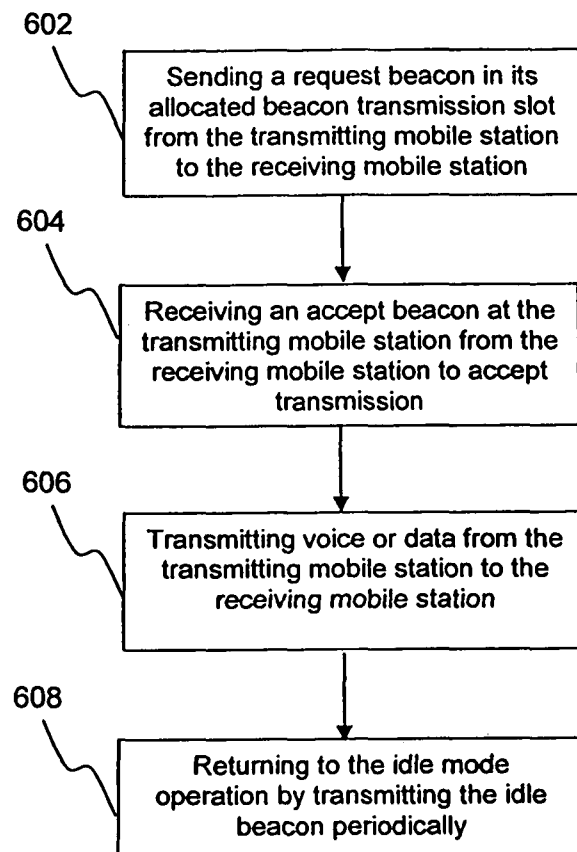
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FIG. 6

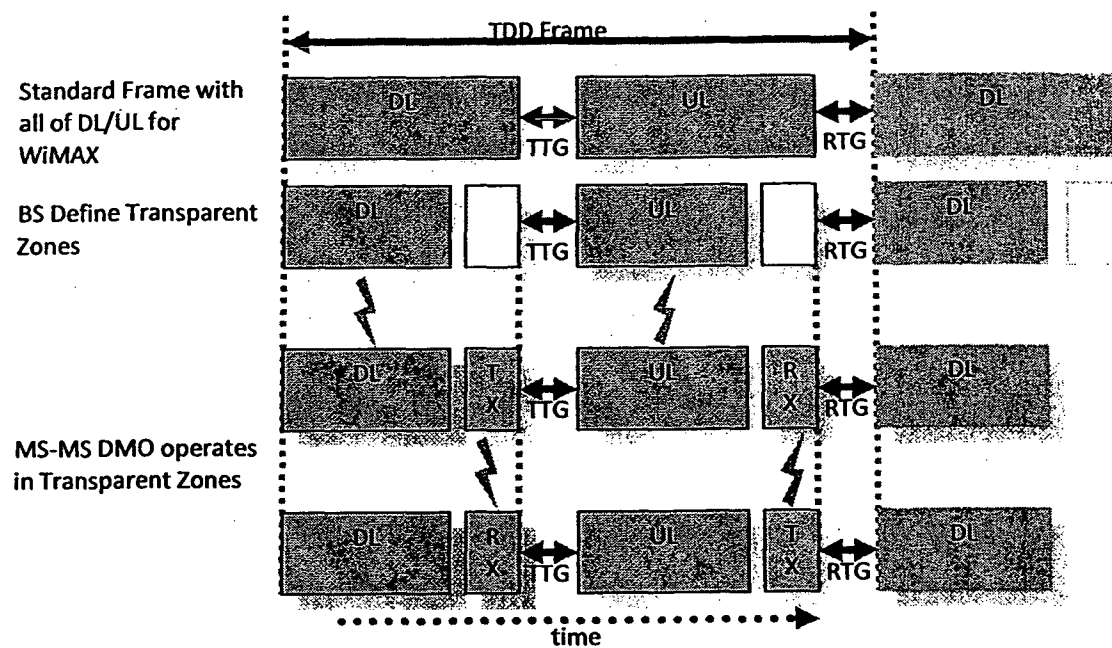


FIG. 7

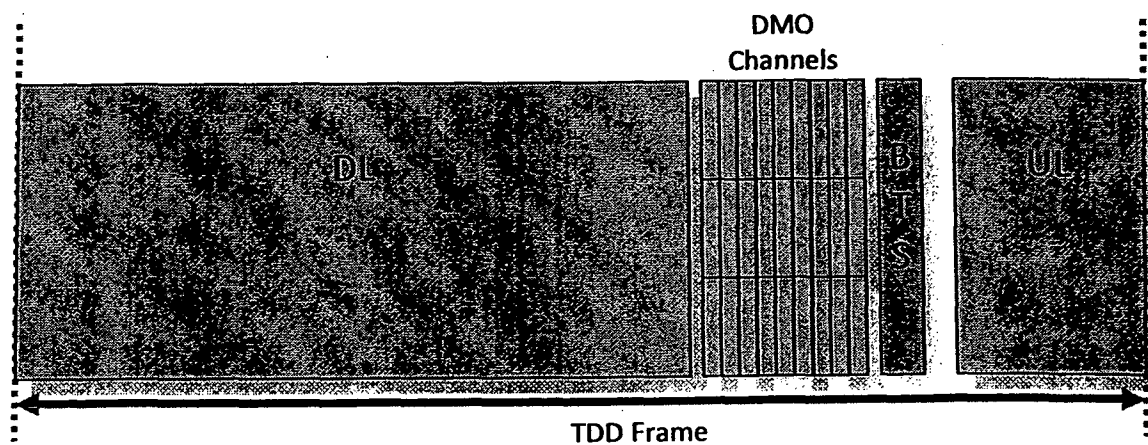


FIG. 8

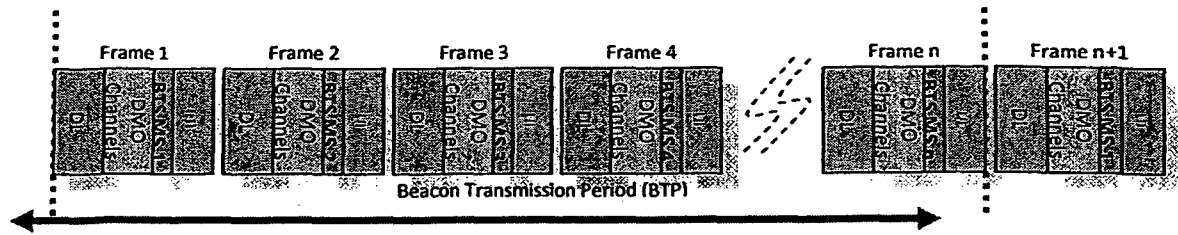


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2010/000187**A. CLASSIFICATION OF SUBJECT MATTER****H04L 29/06(2006.01)i, H04B 7/24(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)

H04L 29/06; H04J 3/06; H04Q 7/00; H04J 11/00

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

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: direct mode, beacon, synchronize

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2007-0268862 A1 (HARKIRAT SINGH et al.) 22 November 2007 See abstract, figs. 4-5 and claims 1-5	1-7
A	US 2006-0164969 A1 (RAHUL MALIK et al.) 27 July 2006 See abstract, fig 2 and claims 33-42	1-7
A	US 2009-0232126 A1 (CORDEIRO CARLOS et al.) 17 September 2009 See abstract and claims 1-5	1-7

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

15 JUNE 2011 (15.06.2011)

Date of mailing of the international search report

16 JUNE 2011 (16.06.2011)

Name and mailing address of the ISA/KR

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Seo-gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, JEONG SU

Telephone No. 82-42-481-5684



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/MY2010/000187

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007-0268862 A1	22.11.2007	None	
US 2006-0164969 A1	27.07.2006	CN 1826762 A	30.08.2006
		CN 1826762 C0	30.08.2006
		EP 1641180 A1	29.03.2006
		JP 2005-039728 A	10.02.2005
		JP 3880554 B2	14.02.2007
		US 7889701 B2	15.02.2011
		WO 2005-008967 A1	27.01.2005
US 2009-0232126 A1	17.09.2009	None	