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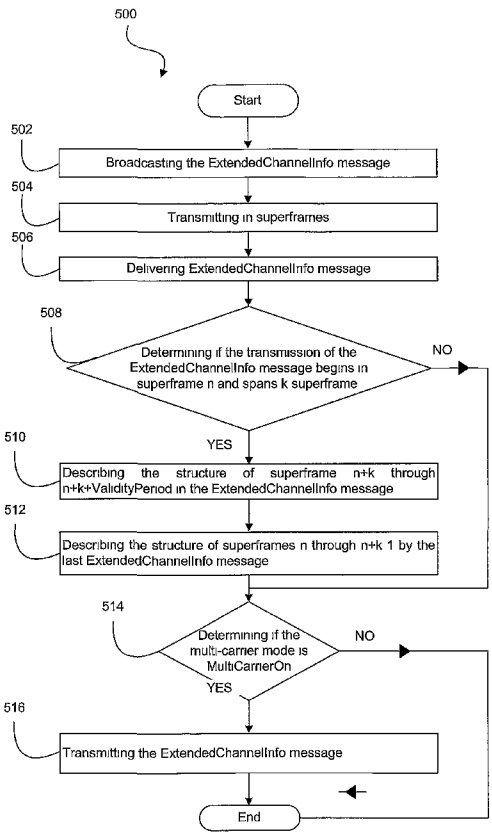
(54) Title: METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING AN EXTENDEDCHANNELINFO MESSAGE IN AN ACTIVE STATE IN WIRELESS COMMUNICATION SYSTEM



(57) Abstract: A method and apparatus for transmitting and receiving an ExtendedChannelInfo message. The method comprises broadcasting the ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control (MAC); transmitting the ExtendedChannelInfo message in superframes, wherein the superframe number is divisible by NOMPExtendedChannelInfo; delivering the ExtendedChannelInfo message in one superframe or in a set of consecutive superframes; and determining if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe. The ExtendedChannelInfo message is transmitted and received over a communication link.

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METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING AN EXTENDEDCHANNELINFO MESSAGE IN AN ACTIVE STATE IN WIRELESS COMMUNICATION SYSTEM

CLAIM OF PRIORITY UNDER 35 U.S.C. § 119

[0001] The present Application for Patent claims priority to Provisional Application Ser. No. 60/731,126, entitled "METHODS AND APPARATUS FOR PROVIDING MOBILE BROADBAND WIRELESS LOWER MAC", filed 10/27/2005, assigned to the assignee hereof, and expressly incorporated herein by reference.

BACKGROUND

Field

[0002] The present disclosure relates generally to wireless communication and more particularly to methods and apparatus for transmitting and receiving an ExtendedChannelInfo message in an Active state.

Background

[0003] Wireless communication systems have become a prevalent means by which a majority of people worldwide have come to communicate. Wireless communication devices have become smaller and more powerful in order to meet consumer needs and to improve portability and convenience. The increase in processing power in mobile devices such as cellular telephones has lead to an increase in demands on wireless network transmission systems. Such systems typically are not as easily updated as the cellular devices that communicate there over. As mobile device capabilities expand, it can be difficult to maintain an older wireless network system in a manner that facilitates fully exploiting new and improved wireless device capabilities.

[0004] Wireless communication systems generally utilize different approaches to generate transmission resources in the form of channels. These systems may be code division multiplexing (CDM) systems, frequency division multiplexing (FDM) systems, and time division multiplexing (TDM) systems. One commonly utilized variant of FDM is orthogonal frequency division multiplexing (OFDM) that effectively partitions the overall system bandwidth into multiple orthogonal subcarriers. These subcarriers

may also be referred to as tones, bins, and frequency channels. Each subcarrier can be modulated with data. With time division based techniques, each subcarrier can comprise a portion of sequential time slices or time slots. Each user may be provided with a one or more time slot and subcarrier combinations for transmitting and receiving information in a defined burst period or frame. The hopping schemes may generally be a symbol rate hopping scheme or a block hopping scheme.

[0005] Code division based techniques typically transmit data over a number of frequencies available at any time in a range. In general, data is digitized and spread over available bandwidth, wherein multiple users can be overlaid on the channel and respective users can be assigned a unique sequence code. Users can transmit in the same wide-band chunk of spectrum, wherein each user's signal is spread over the entire bandwidth by its respective unique spreading code. This technique can provide for sharing, wherein one or more users can concurrently transmit and receive. Such sharing can be achieved through spread spectrum digital modulation, wherein a user's stream' of bits is encoded and spread across a very wide channel in a pseudo-random fashion. The receiver is designed to recognize the associated unique sequence code and undo the randomization in order to collect the bits for a particular user in a coherent manner.

[0006] A typical wireless communication network *(e.g.,* employing frequency, time, and/or code division techniques) includes one or more base stations that provide a coverage area and one or more mobile *(e.g.,* wireless) terminals that can transmit and receive data within the coverage area. A typical base station can simultaneously transmit multiple data streams for broadcast, multicast, and/or unicast services, wherein a data stream is a stream of data that can be of independent reception interest to a mobile terminal. A mobile terminal within the coverage area of that base station can be interested in receiving one, more than one or all the data streams transmitted from the base station. Likewise, a mobile terminal can transmit data to the base station or another mobile terminal. hi these systems the bandwidth and other system resources are assigned utilizing a scheduler.

[0007] The signals, signal formats, signal exchanges, methods, processes, and techniques disclosed herein provide several advantages over known approaches. These include, for example, reduced signaling overhead, improved system throughput, increased signaling flexibility, reduced information processing, reducedjxansmission

bandwidth, reduced bit processing, increased robustness, improved efficiency, and reduced transmission power

SUMMARY

[0008] The following presents a simplified summary of one or more aspects in order to provide a basic understanding of such aspects. This summary is not an extensive overview of all contemplated aspects, and is intended to neither identify key or critical elements of all aspects nor delineate the scope of any or all aspects. Its sole purpose is to present some concepts of one or more aspects in a simplified form as a prelude to the more detailed description that is presented later.

[0009] According to an embodiment, a method is provided for transmitting an ExtendedChannelInfo message in an Active state, the method comprising broadcasting the ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control (MAC), transmitting the ExtendedChannelInfo message in superframes, wherein the superframe number is divisible by NoMPExtendedchanneiMo, delivering the ExtendedChannelInfo message in one superframe or in a set of consecutive superframes and determining if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe.

[0010] According to another embodiment, a computer readable medium is described having_a first set of instructions for broadcasting an ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control (MAC), a second set of instructions for transmitting the ExtendedChannelInfo message in superframes, wherein the superframe number is divisible by NoMPExtendedchanneiMo, a third set of instructions for delivering the ExtendedChannelInfo message in one superframe or in a set of consecutive superframes and a fourth set of instructions for determining if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe.

[0011] According to yet another embodiment, an apparatus operable in a wireless communication system is described which includes means for broadcasting an ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control(MAC), means for transmitting the ExtendedChannelInfo message in superframes, wherein the superframe number is divisible by NoMPExtendedcha$_{nne}$i$_{M\ o}$, means for delivering the ExtendedChannelInfo message in one superframe or in a set of

consecutive superframes and means for determining if the transmission of the ExtendedChannellnfo message begins in superframe n and spans k superframe

[0012] According to yet another embodiment, a method is provided for receiving the ExtendedChannellnfo message from a sector, determining a superframe number n when an access network started ExtendedChannellnfo transmission, determining a superframe n+k-1 when the access network ends the transmission of ExtendedChannellnfo message, determining if the received ExtendedChannellnfo message differs from the ExtendedChannellnfo message in public data in any field except SystemTime, SectorParametersSignature or ValidityPeriod, generating an *ExtendedChannellnfoUpdated* indication, storing the ExtendedChannellnfo message, indexed by PilotPN and CarrierlD, in the public data, setting an ExtendedChannellnfoExpiryTime for the message in the public data to n+ValidityPeriod, determining if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannellnfo message, comparing the SectorParametersSignature in the ExtendedChannellnfo message with the SectorParametersSignature in the stored SectorParameters message, determining if the signatures do not match and purging the SectorParameters message from the public data.

[0013] According to yet another embodiment, a computer-readable medium is described having a first set of instructions for receiving an ExtendedChannellnfo message from a sector, a second set of instructions for determining a superframe number n when an access network started ExtendedChannellnfo transmission, a third set of instructions for determining a superframe n+k-1 when the access network end the transmission of ExtendedChannellnfo message, a fourth set of instructions for determining if the received ExtendedChannellhfo message differs from the ExtendedChannellnfo message in public data in any field except SystemTime, SectorParametersSignature or ValidityPeriod, a fifth set of instructions for generating an *ExtendedChannellnfoUpdated* indication, a sixth set of instructions for storing the ExtendedChannellnfo message, indexed by PilotPN and CarrierlD, in the public data, a seventh set of instructuions for setting an ExtendedChannellnfoExpiryTime for the message in the public data to n+ValidityPeriod, an eighth set of instructions for determining if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannellnfo message, a ninth set of

instructions for comparing the SectorParametersSignature in the ExtendedChannelInfo message with the SectorParametersSignature in the stored SectorParameters message, a tenth set of instructions for determining if the signatures do not match and an eleventh set of instructions for purging the SectorParameters message from the public data.

[0014] According to yet another embodiment, an apparatus operable in a wireless communication system is described which includes means for receiving an ExtendedChannelInfo message from a sector and means for determining a superframe number n when an access network started ExtendedChannelInfo transmission, means for determining a superframe n+k-1 when the access network ends the transmission of the ExtendedChannelInfo message, means for determining if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in public data in any fields except SystemTime, SectorParametersSignature or ValidityPeriod, means for generating an *ExtendedChannelInfoUpdated* indication, means for storing the ExtendedChannelInfo message, indexed by PilotPN and CarrierID, in the public data, means for setting an ExtendedChannelInfoExpiryTime for the message in the public data to n+ValidityPeriod, means for determining if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannelInfo message, means for comparing the SectorParametersSignature in the ExtendedChannelInfo message with the SectorParametersSignature in the stored SectorParameters message, means for determining if the signatures do not match and means for purging the SectorParameters message from the public data.

[0015] To the accomplishment of the foregoing and related ends, the one or more aspects comprise the features hereinafter fully described and particularly pointed out in the claims. The following description and the annexed drawings set forth in detail certain illustrative aspects of the one or more aspects. These aspects are indicative, however, of but a few of the various ways in which the principles of various aspects may be employed and the described aspects are intended to include all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Fig. 1 illustrates aspects of a multiple access wireless communication system.

[0017] Fig. 2 illustrates aspects of a transmitter and receiver in a multiple access wireless communication system.

[0018] Figs. 3A and 3B illustrate aspects of superframe structures for a multiple access wireless communication system.

[0019] Fig. 4 illustrates an aspect of a communication between an access terminal and an access network.

[0020] Fig. 5A illustrates a flow diagram of a process used by an access network.

[0021] Fig. 5B illustrates one or more processors configured for transmitting an ExtendedChannelInfo message.

[0022] Fig. 6A illustrates a flow diagram of a process used by an access terminal.

[0023] Fig. 6B illustrates one or more processors configured for receiving an ExtendedChannelInfo message.

DETAILED DESCRIPTION

[0024] Various aspects are now described with reference to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more aspects. It may be evident, however, that such aspect(s) may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing one or more aspects.

[0025] Referring to Fig. 1, a multiple access wireless communication system according to one aspect is illustrated. A multiple access wireless communication system 100 includes multiple cells, e.g. cells 102, 104, and 106. In the aspect of Fig. 1, each cell 102, 104, and 106 may include an access point 150 that includes multiple sectors. The multiple sectors are formed by groups of antennas each responsible for communication with access terminals in a portion of the cell. In cell 102, antenna groups 112, 114, and 116 each correspond to a different sector. In cell 104, antenna groups 118, 120, and 122 each correspond to a different sector. In cell 106, antenna groups 124, 126, and 128 each correspond to a different sector.

[0026] Each cell includes several access terminals which are in communication with one or more sectors of each access point. For example, access terminals 130 and 132 are in communication base 142, access terminals 134 and 136 are in communication with access point 144, and access terminals 138 and 140 are in communication with access point 146.

[0027] Controller 130 is coupled to each of the cells 102, 104, and 106. Controller 130 may contain one or more connections to multiple networks, e.g. the Internet, other packet based networks, or circuit switched voice networks that provide information to, and from, the access terminals in communication with the cells of the multiple access wireless communication system 100. The controller 130 includes, or is coupled with, a scheduler that schedules transmission from and to access terminals. In other aspects, the scheduler may reside in each individual cell, each sector of a cell, or a combination thereof.

[0028] As used herein, an access point may be a fixed station used for communicating with the terminals and may also be referred to as, and include some or all the functionality of, a base station, a Node B, or some other terminology. An access terminal may also be referred to as, and include some or all the functionality of, a user equipment (UE), a wireless communication device, terminal, a mobile station or some other terminology.

[0029] It should be noted that while Fig. 1, depicts physical sectors, i.e. having different antenna groups for different sectors, other approaches may be utilized. For example, utilizing multiple fixed "beams" that each cover different areas of the cell in frequency space may be utilized in lieu of, or in combination with physical sectors. Such an approach is depicted and disclosed in co-pending US Patent Application Serial No. 11/260,895, entitled "Adaptive Sectorization in Cellular System."

[0030] Referring to Fig.2, a block diagram of an aspect of a transmitter system 210 and a receiver system 250 in a MIMO system 200 is illustrated. At transmitter system 210, traffic data for a number of data streams is provided from a data source 212 to transmit (TX) data processor 214. In an aspect, each data stream is transmitted over a respective transmit antenna. TX data processor 214 formats, codes, and interleaves the traffic data for each data stream based on a particular coding scheme selected for that data stream to provide coded data.

[0031] The coded data for each data stream may be multiplexed with pilot data using OFDM, or other orthogonalization or non-orthogonalization techniques. The pilot data is typically a known data pattern that is processed in a known manner and may be used at the receiver system to estimate the channel response. The multiplexed pilot and coded data for each data stream is then modulated (i.e., symbol mapped) based on one or more particular modulation schemes (e.g., BPSK, QSPK, M-PSK, or M-QAM) selected for that data stream to provide modulation symbols. The data rate, coding, and modulation for each data stream may be determined by instructions performed on provided by processor 230.

[0032] The modulation symbols for all data streams are then provided to a TX processor 220, which may further process the modulation symbols (e.g., for OFDM). TX processor 220 then provides N_T modulation symbol streams to N_T transmitters (TMTR) 222a through 222t. Each transmitter 222 receives and processes a respective symbol stream to provide one or more analog signals, and further conditions (e.g., amplifies, filters, and upconverts) the analog signals to provide a modulated signal suitable for transmission over the MIMO channel. N_T modulated signals from transmitters 222a through 222t are then transmitted from N_T antennas 224a through 224t, respectively.

[0033] At receiver system 250, the transmitted modulated signals are received by N_R antennas 252a through 252r and the received signal from each antenna 252 is provided to a respective receiver (RCVR) 254. Each receiver 254 conditions (e.g., filters, amplifies, and downconverts) a respective received signal, digitizes the conditioned signal to provide samples, and further processes the samples to provide a corresponding "received" symbol stream.

[0034] An RX data processor 260 then receives and processes the N_R received symbol streams from N_R receivers 254 based on a particular receiver processing technique to provide N_T "detected" symbol streams. The processing by RX data processor 260 is described in further detail below. Each detected symbol stream includes symbols that are estimates of the modulation symbols transmitted for the corresponding data stream. RX data processor 260 then demodulates, deinterleaves, and decodes each detected symbol stream to recover the traffic data for the data stream. The processing by RX data processor 218 is complementary to that performed by TX processor 220 and TX data processor 214 at transmitter system 210.

[0035] RX data processor 260 may be limited in the number of subcarriers that it may simultaneously demodulate, e.g. 512 subcarriers or 5 MHz, and such a receiver should be scheduled on a single carrier. This limitation may be a function of its FFT range, e.g. sample rates at which the processor 260 may operate, the memory available for FFT, or other functions available for demodulation. Further, the greater the number of subcarriers utilized, the greater the expense of the access terminal.

[0036] The channel response estimate generated by RX processor 260 may be used to perform space, space/time processing at the receiver, adjust power levels, change modulation rates or schemes, or other actions. RX processor 260 may further estimate the signal-to-noise-and-interference ratios (SNRs) of the detected symbol streams, and possibly other channel characteristics, and provides these quantities to a processor 270. RX data processor 260 or processor 270 may further derive an estimate of the "operating" SNR for the system. Processor 270 then provides channel state information (CSI), which may comprise various types of information regarding the communication link and/or the received data stream. For example, the CSI may comprise only the operating SNR. In other aspects, the CSI may comprise a channel quality indicator (CQI), which may be a numerical value indicative of one or more channel conditions. The CSI is then processed by a TX data processor 278, modulated by a modulator 280, conditioned by transmitters 254a through 254r, and transmitted back to transmitter system 210.

[0037] At transmitter system 210, the modulated signals from receiver system 250 are received by antennas 224, conditioned by receivers 222, demodulated by a demodulator 240, and processed by a RX data processor 242 to recover the CSI reported by the receiver system. The reported CSI is then provided to processor 230 and used to (1) determine the data rates and coding and modulation schemes to be used for the data streams and (2) generate various controls for TX data processor 214 and TX processor 220. Alternatively, the CSI may be utilized by processor 270 to determine modulation schemes and/or coding rates for transmission, along with other information. This may then be provided to the transmitter which uses this information, which may be quantized, to provide later transmissions to the receiver.

[0038] Processors 230 and 270 direct the operation at the transmitter and receiver systems, respectively. Memories 232 and 272 provide storage for program codes and data used by processors 230 and 270, respectively.

[00391 At the receiver, various processing techniques may be used to process the NR received signals to detect the NT transmitted symbol streams. These receiver processing techniques may be grouped into two primary categories (i) spatial and space-time receiver processing techniques (which are also referred to as equalization techniques); and (ii) "successive nulling/equalization and interference cancellation" receiver processing technique (which is also referred to as "successive interference cancellation" or "successive cancellation" receiver processing technique).

[0040] While Fig. 2 discusses a MIMO system, the same system may be applied to a multi-input single-output system where multiple transmit antennas, e.g. those on a base station, transmit one or more symbol streams to a single antenna device, e.g. a mobile station. Also, a single output to single input antenna system may be utilized in the same manner as described with respect to Fig. 2.

[0041] The transmission techniques described herein may be implemented by various means. For example, these techniques may be implemented in hardware, firmware, software, or a combination thereof. For a hardware implementation, the processing units at a transmitter may be implemented within one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), processors, controllers, micro-controllers, microprocessors, electronic devices, other electronic units designed to perform the functions described herein, or a combination thereof. The processing units at a receiver may also be implemented within one or more ASICs, DSPs, processors, and so on.

[0042] For a software implementation, the transmission techniques may be implemented with modules (e.g., procedures, functions, and so on) that perform the functions described herein. The software codes may be stored in a memory (e.g., memory 230, 272x or 272y in FIG. 2) and executed by a processor (e.g., processor 232, 27Ox or 27Oy). The memory may be implemented within the processor or external to the processor.

[0043] It should be noted that the concept of channels herein refers to information or transmission types that may be transmitted by the access point or access terminal. It does not require or utilize fixed or predetermined blocks of subcarriers, time periods, or other resources dedicated to such transmissions.

[0044] Referring to Figs. 3A and 3B, aspects of superframe structures for a multiple access wireless communication system are illustrated. Fig. 3A illustrates aspects of superframe structures for a frequency division duplexed (FDD) multiple access wireless communication system, while Fig. 3B illustrates aspects of superframe structures for a time division duplexed (TDD) multiple access wireless communication system. The superframe preamble may be transmitted separately for each carrier or may span all of the carriers of the sector.

[0045] In both Figs. 3A and 3B, the forward link transmission is divided into units of superframes. A superframe may consist of a superframe preamble followed by a series of frames. In an FDD system, the reverse link and the forward link transmission may occupy different frequency bandwidths so that transmissions on the links do not, or for the most part do not, overlap on any frequency subcarriers. In a TDD system, N forward link frames and M reverse link frames define the number of sequential forward link and reverse link frames that may be continuously transmitted prior to allowing transmission of the opposite type of frame. It should be noted that the number of N and M may be vary within a given superframe or between superframes.

[0046] In both FDD and TDD systems each superframe may comprise a superframe preamble. In certain aspects, the superframe preamble includes a pilot channel that includes pilots that may be used for channel estimation by access terminals, a broadcast channel that includes configuration information that the access terminal may utilize to demodulate the information contained in the forward link frame. Further acquisition information such as timing and other information sufficient for an access terminal to communicate on one of the carriers and basic power control or offset information may also be included in the superframe preamble. In other cases, only some of the above and/or other information may be included in this superframe preamble.

[0047] As shown in Figs. 3A and 3B, the superframe preamble is followed by a sequence of frames. Each frame may consist of a same or a different number of OFDM symbols, which may constitute a number of subcarriers that may simultaneously utilized for transmission over some defined period. Further, each frame may operate according to a symbol rate hopping mode, where one or more non-contiguous OFDM symbols are assigned to a user on a forward link or reverse link, or a block hopping mode, where users hop within a block of OFDM symbols. The actual blocks or OFDM symbols may or may not hop between frames.

[0048] Fig. 4 illustrates communication between an access network 404 and an access terminal 402. Using a communication link 406 and based upon predetermined timing, system conditions, or other decision criteria, the access network 404 transmits an ExtendedChannelInfo message over a communication link 406 to the access terminal 402. The communication link may be implemented using communication protocols/standards such as World Interoperability for Microwave Access (WiMAX), infrared protocols such as Infrared Data Association (IrDA), short-range wireless protocols/technologies, Bluetooth® technology, ZigBee® protocol, ultra wide band (UWB) protocol, home radio frequency (HomeRF), shared wireless access protocol (SWAP), wideband technology such as a wireless Ethernet compatibility alliance (WECA), wireless fidelity alliance (Wi-Fi Alliance), 802.11 network technology, public switched telephone network technology, public heterogeneous communications network technology such as the Internet, private wireless communications network, land mobile radio network, code division multiple access (CDMA), wideband code division multiple access (WCDMA), universal mobile telecommunications system (UMTS), advanced mobile phone service (AMPS), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal frequency division multiple (OFDM), orthogonal frequency division multiple access (OFDMA), orthogonal frequency division multiple FLASH (OFDM-FLASH), global system for mobile communications (GSM), single carrier (IX) radio transmission technology (RTT), evolution data only (EV-DO) technology, general packet radio service (GPRS), enhanced data GSM environment (EDGE), high speed downlink data packet access (HSPDA), analog and digital satellite systems, and any other technologies/protocols that may be used in at least one of a wireless communications network and a data communications network.

[0049] The access network 404 is configured to transmit an ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control(MAC), transmit the ExtendedChannelInfo message in superframes wherein the superframe number is divisible by NoMPExtendedchanneiMo, deliver the ExtendedChannelInfo message in one superframe or in a set of consecutive superframes, and determine if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe. The access network 404 may incorporate the ExtendedChannelInfo message into a data packet or multiple data packets (not shown), and the data packets are transmitted on a link 406. In another

aspect, the ExtendedChannelInfo message may be transmitted without being incorporated in packets. The data packet comprises header information that indicates whether that data packets contain the ExtendedChannelInfo message. The data packets are transmitted on the communication link 406 using one or more channels.

[0050] The access terminal 402 is configured to receive data packets on the communication link 406, one of which may comprise the ExtendedChannelInfo message. Various methods may be used to extract the ExtendedChannelInfo message from the communication link 406. For example, once the access terminal 402 has extracted the data packets from one of the channels of the link, the access network 402 may check the header information of the data packets to determine if the data packets comprises the ExtendedChannelInfo message.

[0051] Fig.5A illustrates a flow diagram of process 500, according to an embodiment. At 502, an ExtendedChannelInfo message is broadcasted over a Forward Traffic Channel Medium Access Control (MAC). At 504, the ExtendedChannelInfo message is transmitted in superframes, wherein the superframe number is divisible by NoMPExtendedchanneiMo- At 506, the ExtendedChannelInfo message is delivered in one superframe or in a set of consecutive superframes. At 508, it is determined if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe. At 510, if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe, a structure of superframes n+k through n+k+ValidityPeriod is described by the ExtendedChannelInfo message, wherein the ValidityPeriod is a field of the ExtendedChannelInfo message. At 512, a structure of superframes n through n+k-1 is described by a last ExtendedChannelInfo message transmitted before superframe n. At 514, it is determined if a multi-carrier mode is MultiCarrierOn. At 516, when the multi-carrier mode is MultiCarrierOn, the ExtendedChannelInfo message is transmitted on each carrier.

[0052] Fig. 5B illustrates an apparatus 550 for transmitting an ExtendedChannelInfo message. The apparatus 550 may be an electronic device and may comprise a processor 564, which in turn may include one or more processors 552 through 566. Processor 552 is configured to broadcast the ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control(MAC). Processor 554 is configured to transmit in superframes, wherein the superframe numbers is divisible by NoMPExtendedchanneiinfo- Processor 556 is configured to deliver the ExtendedChannelInfo

message in one superframe or in a set of consecutive superframes. Processor 558 is configured to determine if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe. Processor 560 is configured to describe the structure of superframe n+k through n+k+ValidityPeriod in the ExtendedChannelInfo message. Processor 562 is configured to describe the structure of superframes n through n+k-1 by the last ExtendedChannelInfo message. Processor 564 is configured to determine if the multi-carrier mode is MultiCarrierOn. Processor 566 is configured to transmit the ExtendedChannelInfo message. The functionality of the discrete processors 552 through 566 depicted in the figure 5A may be combined into the single processor 564. A memory 568 is also coupled to the processor 564.

[0053] In an embodiment, an apparatus is described which includes means for broadcasting an ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control(MAC), means for transmitting the ExtendedChannelInfo message in superframes, wherein the superframe number is divisible by NoMPExtendedChanneiMo, means for delivering the ExtendedChannelrnfo message in one superframe or in a set of consecutive superframes and means for determining if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe. The means described herein may comprise one or more processors.

[0054] Fig.6A illustrates a flow diagram of process 600, according to another embodiment. At 602, the ExtendedChannelInfo message is received from a sector. At 604, a superframe number n is determined when an access network started ExtendedChannelInfo transmission. At 606, the superframe n+k-1 when the access network end the transmission of ExtendedChannelInfo block is determined. At 608, it is determined if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in the public data in any fields except the SystemTime, SectorParametersSignature or ValidityPeriod. If the answer is yes, at 610 an *ExtendedChannelInfoUpdated* indication is generated. At 612 the ExtendedChannelInfo message, indexed by PilotPN and CarrierlD, is stored in the public data. At 614 the ExtendedChannelInfoExpiryTime for the message is set in the public data to n+ValidityPeriod. At 616, it is determined if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannelInfo block. If the answer is yes, at 618, the SectorParametersSignature in the ExtendedChannelInfo block is compared with the SectorParametersSignature in the

stored SectorParameters message. At 620, it is determined if the signatures do not match. If the signatures do not match, at 622, the SectorParameters message is purged from the public data.

[0055] Fig. 6B illustrates an apparatus 650 for processing an ExtendedChannelInfo message. The apparatus 650 may be an electronic device and may comprise a processor 6744, which in turn may include one or more processors 652 through 672. Processor 652 is configured to receive the ExtendedChannelInfo message from a sector. Processor 654 is configured to determine a superframe number n when an access network started ExtendedChannelInfo transmission. Processor 656 is configured to determining the superframe n+k-1 when the access network end the transmission of ExtendedChannelInfo block. Processor 658 is configured to determine if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in the public data in any fields except the SystemTime, SectorParametersSignature or ValidityPeriod. Processor 660 is configured to generate, an *ExtendedChannelInfoUpdated* indication. Processor 662 configured to store the ExtendedChannelInfo message indexed by PilotPN and CarrierID in the public data. Processor 664 is configured to set the ExtendedChannelInfoExpiryTime for the message in the public data to n+ValidityPeriod. Processor 666 is configured to determine if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannelInfo block. Processor 668 is configured to compare the SectorParametersSignature in the ExtendedChannelInfo block with the SectorParametersSignature in the stored SectorParameters message. Processor 670 is configured to determine if the signatures do not match. Processor 672 is configured to purge the SectorParameters message from the public data. The functionality of the discrete processors 652 through 672 depicted in the figure 6B may be combined into the single processor 674. A memory 676 is also coupled to the processor 674.

[0056] In an embodiment, an apparatus is described which includes means for receiving an ExtendedChannelInfo message from a sector and means for determining a superframe number n when an access network started ExtendedChannelInfo transmission, means for determining a superframe n+k-1 when the access network ends the transmission of the ExtendedChannelInfo message, means for determining if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in public data in any fields except SystemTime, SectorParametersSignature or

Validity? eriod, means for generating an *ExtendedChannelInfoUpdated* indication, means for storing the ExtendedChannelInfo message, indexed by PilotPN and CarrierlD, in the public data, means for setting an ExtendedChannelInfoExpiryTime for the message in the public data to n+ValidityPeriod, means for determining if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannelInfo message, means for comparing the SectorParametersSignature in the ExtendedChannelInfo message with the SectorParametersSignature in the stored SectorParameters message, means for determining if the signatures do not match and means for purging the SectorParameters message from the public data. The means described herein may comprise one or more processors.

[0057] Furthermore, embodiments may be implemented by hardware, software, firmware, middleware, microcode, or any combination thereof. When implemented in software, firmware, middleware or microcode, the program code or code segments to perform the necessary tasks may be stored in a machine readable medium such as a separate storage(s) not shown. A processor may perform the necessary tasks. A code segment may represent a procedure, a function, a subprogram, a program, a routine, a subroutine, a module, a software package, a class, or any combination of instructions, data structures, or program statements. A code segment may be coupled to another code segment or a hardware circuit by passing and/or receiving information, data, arguments, parameters, or memory contents. Information, arguments, parameters, data, etc. may be passed, forwarded, or transmitted via any suitable means including memory sharing, message passing, token passing, network transmission, etc.

[0058] Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects. Thus, the description is not intended to be limited to the aspects shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

CLAIMS

We Claim:

1. A method of transmitting an ExtendedChannelInfo message in an Active state in wireless communication system, the method comprising:

broadcasting the ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control (MAC);

transmitting the ExtendedChannelInfo message in superframes, wherein the superframe number is divisible by NoMPExtendedchanneiMo;

delivering the ExtendedChannelInfo message in one superframe or in a set of consecutive superframes; and

determining if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe.

2. The method as claimed in claim 1, further comprising, if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe, describing a structure of superframes n+k through n+k+ValidityPeriod by the ExtendedChannelInfo message, wherein the ValidityPeriod is a field of the ExtendedChannelInfo message.

3. The method as claimed in claim 1, further comprising, if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe, describing a structure of superframes n through n+k-1 by a last ExtendedChannelInfo message transmitted before superframe n.

4. The method as claimed in claim 1, further comprising determining if a multi-carrier mode is MultiCarrierOn.

5. The method as claimed in claim 4, further comprising, when the multi-carrier mode is MultiCarrierOn, transmitting the ExtendedChannelInfo message on each carrier.

6. A computer readable medium including instruction stored thereon, comprising:

a first set of instructions for broadcasting an ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control (MAC);

a second set of instructions for transmitting the ExtendedChannelInfo message in superframes, wherein the superframe number is divisible by NoMP$_{E}$x$_{t}$endedChanneiinfo;

a third set of instructions for delivering the ExtendedChannelInfo message in one superframe or in a set of consecutive superframes; and

a fourth set of instructions for determining if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe

7. An apparatus operable in a wireless communication system, comprising:

means for broadcasting an ExtendedChannelInfo message over a Forward Traffic Channel Medium Access Control(MAC);

means for transmitting the ExtendedChannelInfo message in superframes, wherein the superframe number is divisible by N$_{O}$MPExtendedChanneiMo;

means for delivering the ExtendedChannelInfo message in one superframe or in a set of consecutive superframes; and

means for determining if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe

8. The apparatus as claimed in claim 7, further comprising means for describing a structure of superframes n+k through n+k+ValidityPeriod by the ExtendedChannelInfo message when the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe, wherein the ValidityPeriod is a field of the ExtendedChannelInfo message.

9. The apparatus as claimed in claim 7, further comprising means for describing a structure of superframes n through n+k-1 by a last ExtendedChannelInfo message transmitted before superframe n when the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe.

10. The apparatus as claimed in claim 7, further comprising means for determining if a multi-carrier mode is MultiCarrierOn.

11. The apparatus as claimed in claim 7, further comprising means for transmitting the ExtendedChannelInfo message on each carrier when the multi-carrier mode is MultiCarrierOn.

12. A method for processing an ExtendedChannelInfo message in an Active State in wireless communication system, the method comprising:

receiving the ExtendedChannelInfo message from a sector;

determining a superframe number n when an access network started ExtendedChannelInfo transmission;

determining a superframe n+k-1 when the access network ends the transmission of ExtendedChannelInfo message;

determining if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in public data in any field except SystemTime, SectorParametersSignature or ValidityPeriod;

generating an *ExtendedChannelInfoUpdated* indication;

storing the ExtendedChannelInfo message, indexed by PilotPN and CarrierID, in the public data;

setting an ExtendedChannelInfoExpiryTime for the message in the public data to n+ValidityPeriod;

determining if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannelInfo message;

comparing the SectorParametersSignature in the ExtendedChannelInfo message with the SectorParametersSignature in the stored SectorParameters message;

determining if the signatures do not match; and

purging the SectorParameters message from the public data.

13. A computer readable medium including instruction stored thereon, comprising:

a first set of instructions for receiving an ExtendedChannelInfo message from a sector;

a second set of instructions for determining a superframe number n when an access network started ExtendedChannelInfo transmission;

a third set of instructions for determining a superframe n+k-1 when the access network end the transmission of ExtendedChannelInfo message;

a fourth set of instructions for determining if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in public data in any field except SystemTime, SectorParametersSignature or ValidityPeriod;

a fifth set of instructions for generating an *ExtendedChannelInfoUpdated* indication;

a sixth set of instructions for storing the ExtendedChannelInfo message, indexed by PilotPN and CarrierlD, in the public data;

a seventh set of instructuions for setting an ExtendedChannelInfoExpiryTime for the message in the public data to n+ValidityPeriod;

an eighth set of instructions for determining if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannelInfo message;

a ninth set of instructions for comparing the SectorParametersSignature in the ExtendedChannelInfo message with the SectorParametersSignature in the stored SectorParameters message;

a tenth set of instructions for determining if the signatures do not match; and

an eleventh set of instructions for purging the SectorParameters message from the public data.

14. An apparatus operable in a wireless communication system, comprising:

means for receiving an ExtendedChannelInfo message from a sector; and

means for determining a superframe number n when an access network started ExtendedChannelInfo transmission;

means for determining a superframe n+k-1 when the access network ends the transmission of the ExtendedChannelInfo message;

means for determining if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in public data in any fields except SystemTime, SectorParametersSignature or ValidityPeriod;

means for generating an *ExtendedChannelInfoUpdated* indication;

means for storing the ExtendedChannelInfo message, indexed by PilotPN and CarrierlD, in the public data;

means for setting an ExtendedChannelInfoExpiryTime for the message in the public data to n+ValidityPeriod;

means for determining if the public data contains a SectorParameters message with the same PilotPN as the sector that transmitted the ExtendedChannelInfo message;

means for comparing the SectorParametersSignature in the ExtendedChannelInfo message with the SectorParametersSignature in the stored SectorParameters message;

means for determining if the signatures do not match; and

means for purging the SectorParameters message from the public data.

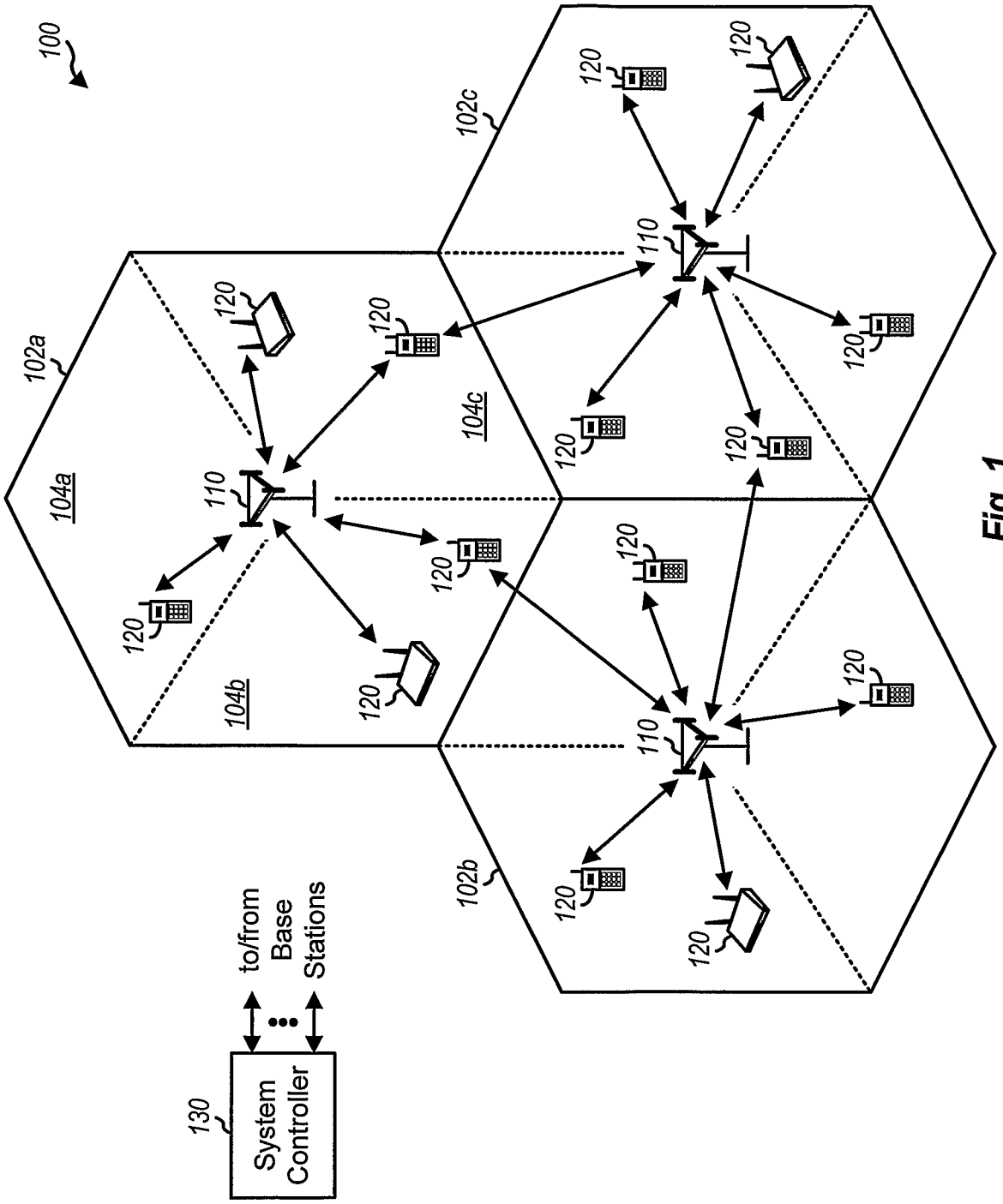
100
102a
102b
102c
104a
104b
104c
110
120
130
System Controller
to/from Base Stations

Fig. 1

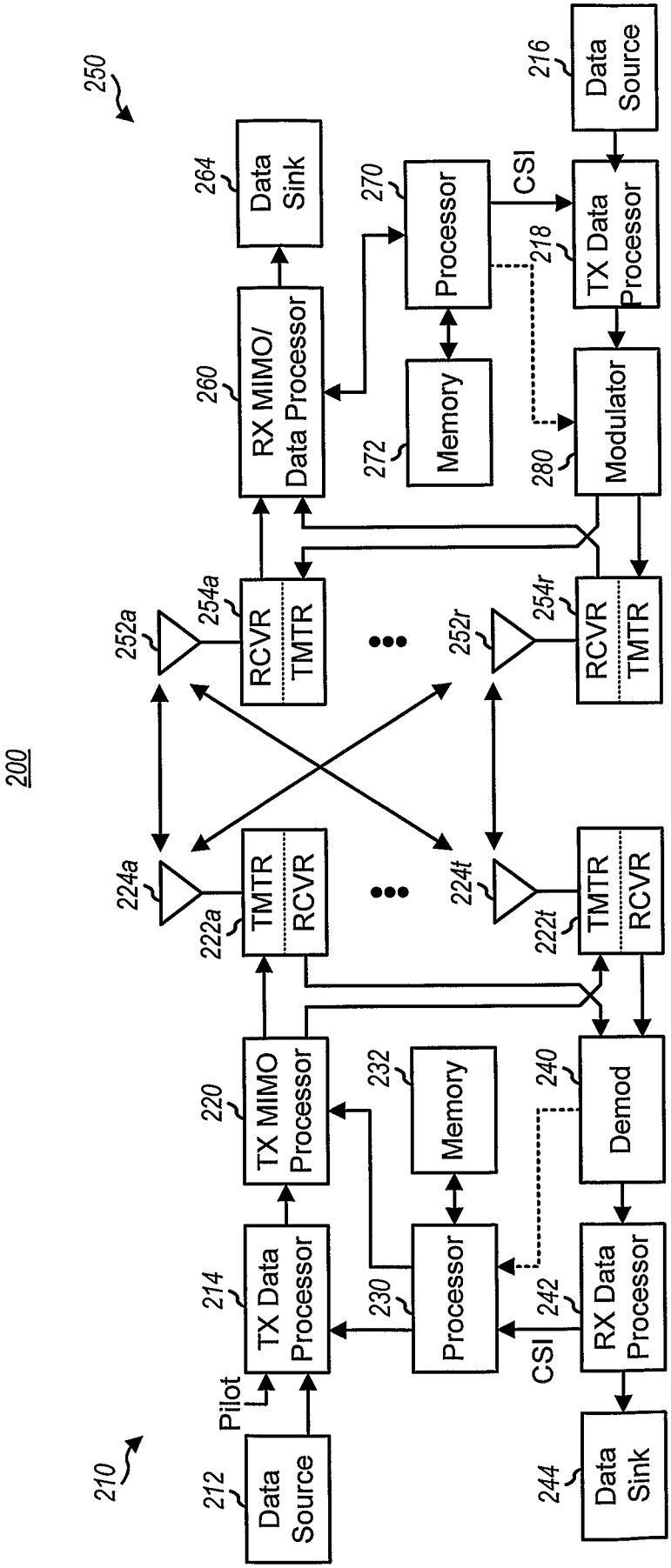
200
210
212
Data Source
Pilot
214
TX Data Processor
220
TX MIMO Processor
222a
TMTR
RCVR
224a
230
Processor
232
Memory
CSI
242
RX Data Processor
244
Data Sink
240
Demod
222t
TMTR
RCVR
224t
250
252a
254a
RCVR
TMTR
252r
254r
RCVR
TMTR
260
RX MIMO/ Data Processor
264
Data Sink
270
Processor
272
Memory
CSI
218
TX Data Processor
280
Modulator
216
Data Source

Fig 2

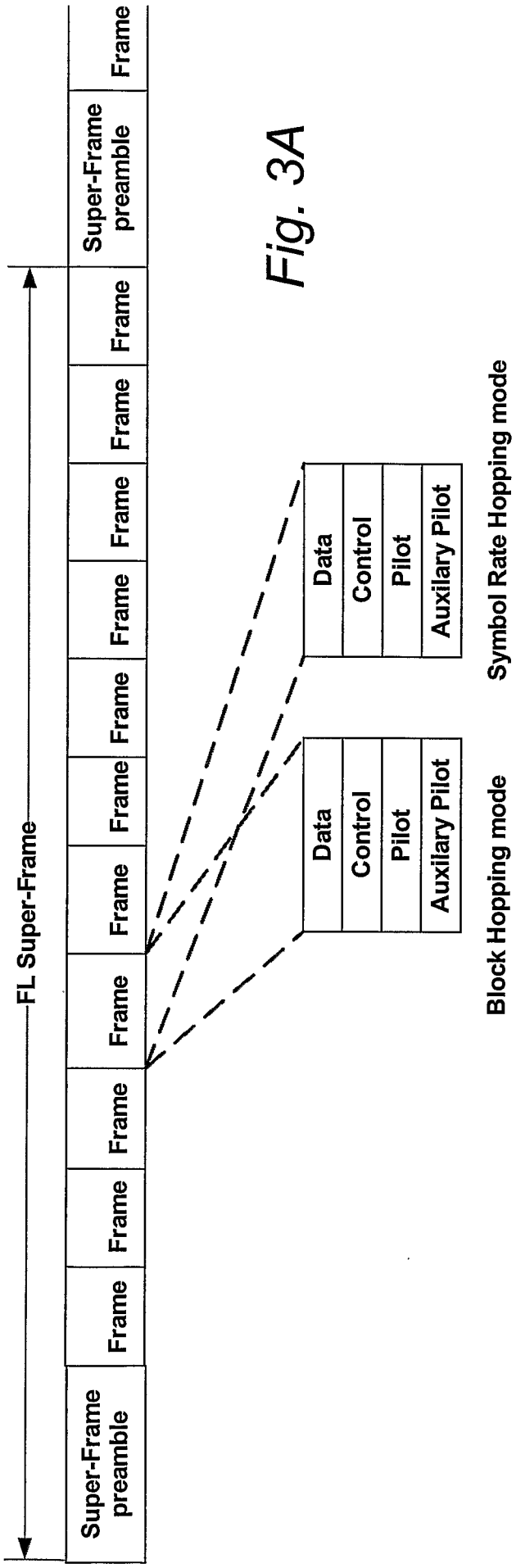
FL Super-Frame
Super-Frame preamble
Frame
Frame
Frame
Frame
Frame
Frame
Frame
Frame
Frame
Super-Frame preamble
Frame
Data
Control
Pilot
Auxilary Pilot
Block Hopping mode
Data
Control
Pilot
Auxilary Pilot
Symbol Rate Hopping mode

Fig. 3A

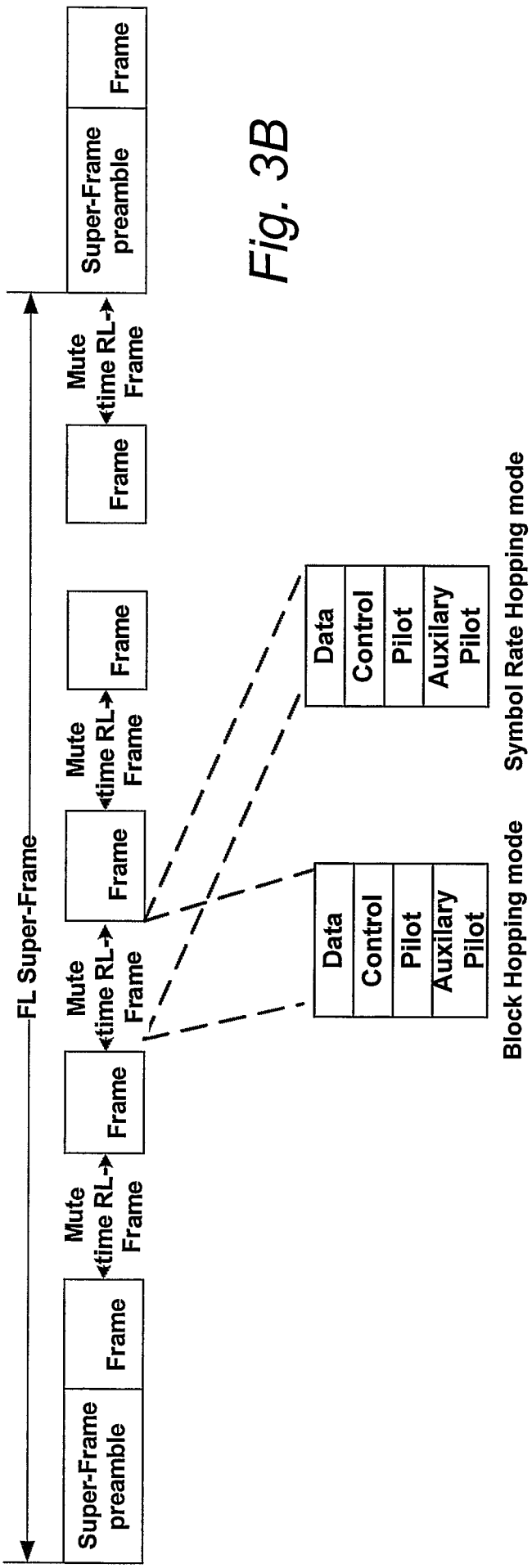
FL Super-Frame
Super-Frame preamble
Frame
Mute time RL→ Frame
Frame
Mute time RL→ Frame
Frame
Mute time RL→ Frame
Frame
Mute time RL→ Frame
Frame
Super-Frame preamble
Frame
Data
Control
Pilot
Auxilary Pilot
Block Hopping mode
Data
Control
Pilot
Auxilary Pilot
Symbol Rate Hopping mode

Fig. 3B

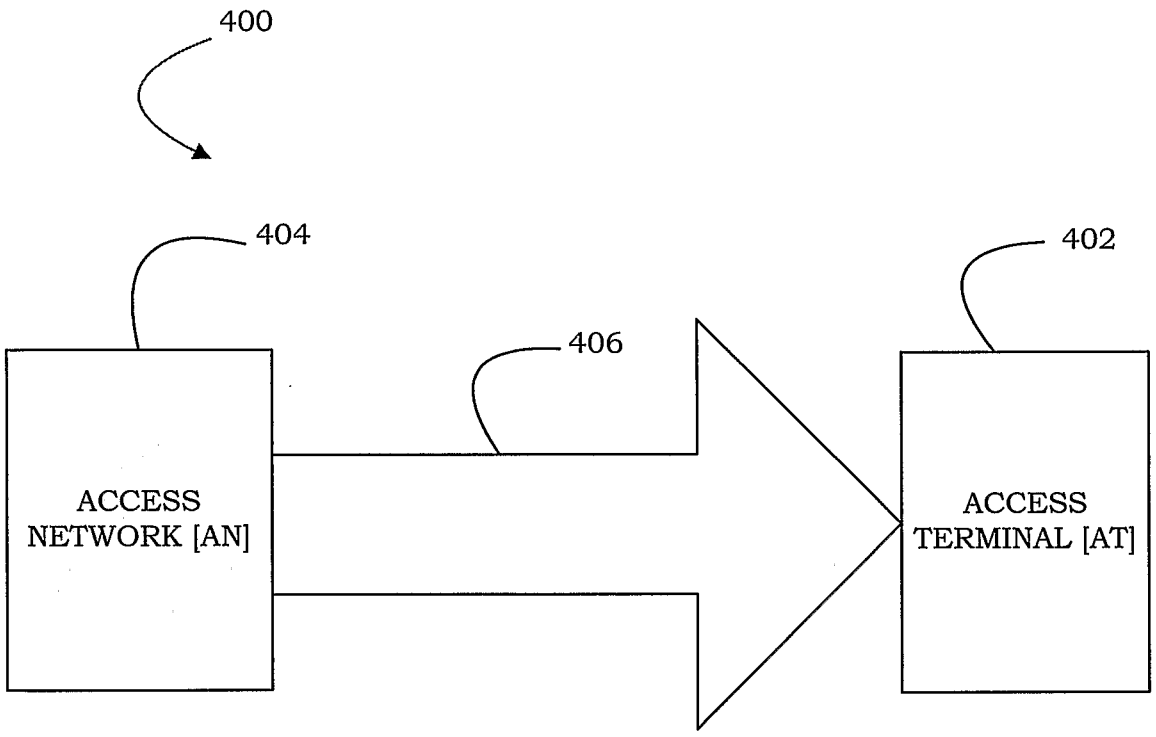

FIGURE 4

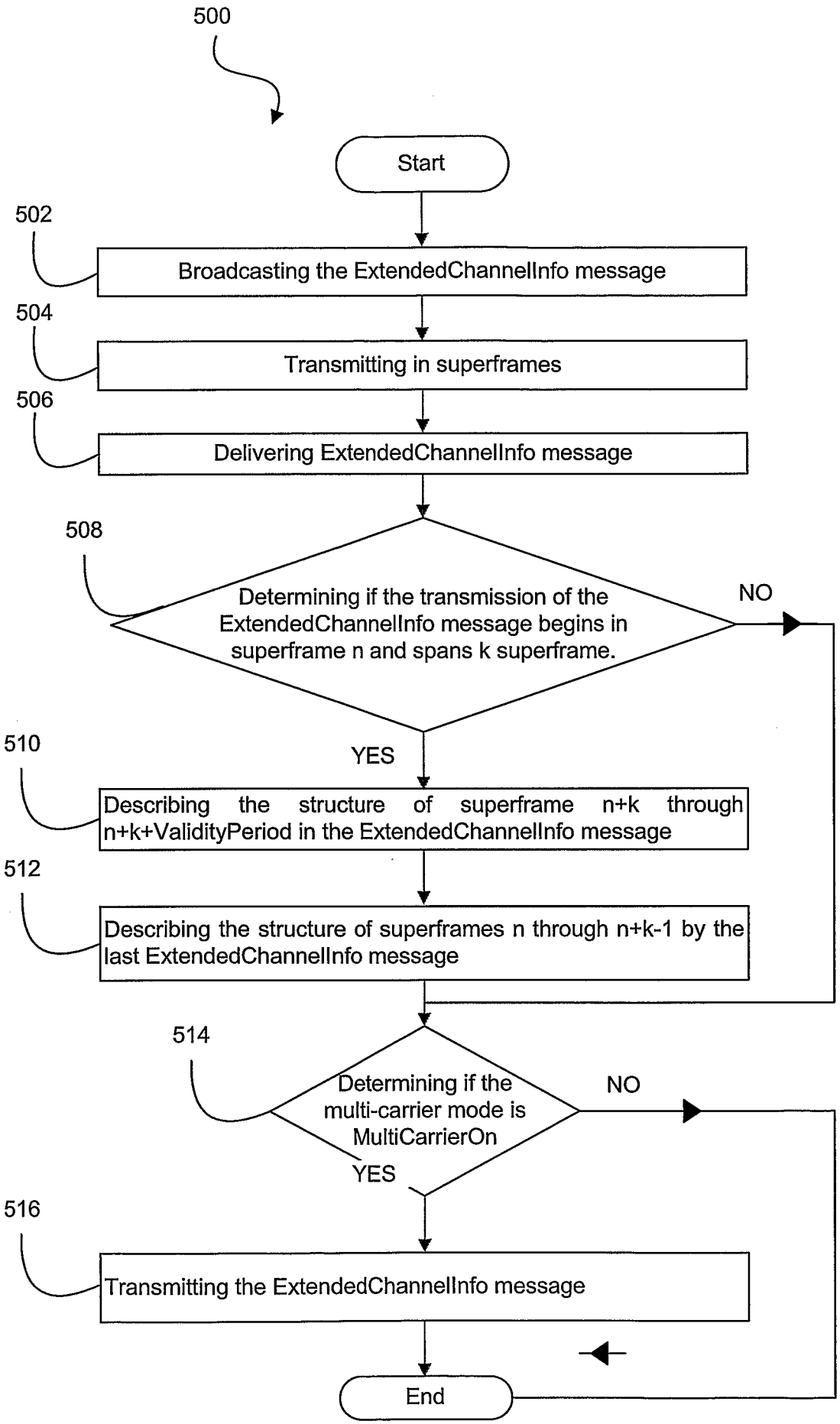
500
Start
502
Broadcasting the ExtendedChannelInfo message
504
Transmitting in superframes
506
Delivering ExtendedChannelInfo message
508
Determining if the transmission of the ExtendedChannelInfo message begins in superframe n and spans k superframe.
NO
YES
510
Describing the structure of superframe n+k through n+k+ValidityPeriod in the ExtendedChannelInfo message
512
Describing the structure of superframes n through n+k-1 by the last ExtendedChannelInfo message
514
Determining if the multi-carrier mode is MultiCarrierOn
NO
YES
516
Transmitting the ExtendedChannelInfo message
End

Fig. 5 A

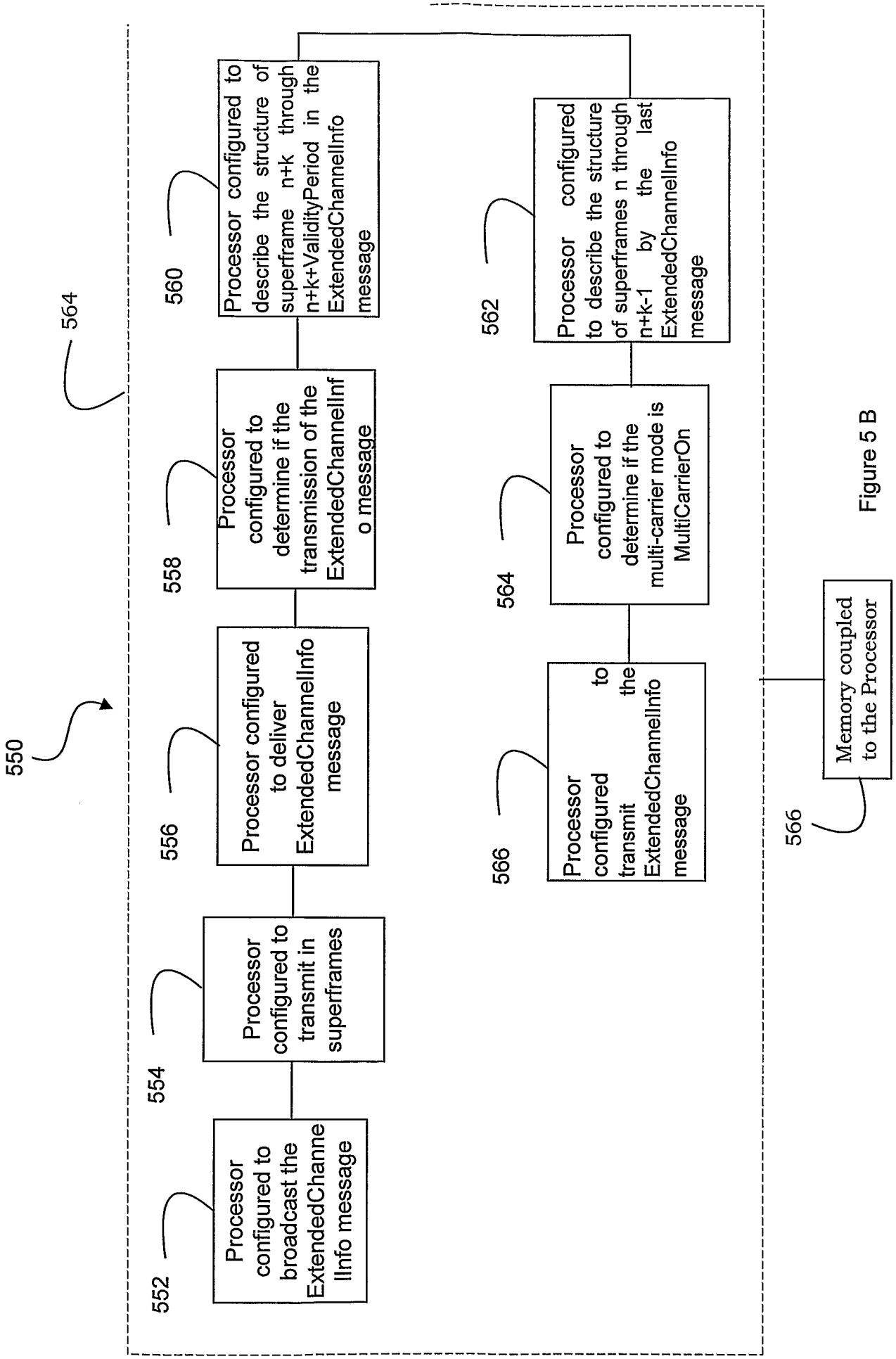
550
552
Processor configured to broadcast the ExtendedChanne lInfo message
554
Processor configured to transmit in superframes
556
Processor configured to deliver ExtendedChannelInfo message
558
Processor configured to determine if the transmission of the ExtendedChannelInf o message
560
Processor configured to describe the structure of superframe n+k through n+k+ValidityPeriod in the ExtendedChannelInfo message
562
Processor configured to describe the structure of superframes n through n+k-1 by the last ExtendedChannelInfo message
564
Processor configured to determine if the multi-carrier mode is MultiCarrierOn
564
566
Processor configured to transmit the ExtendedChannelInfo message
566
Memory coupled to the Processor

Figure 5 B

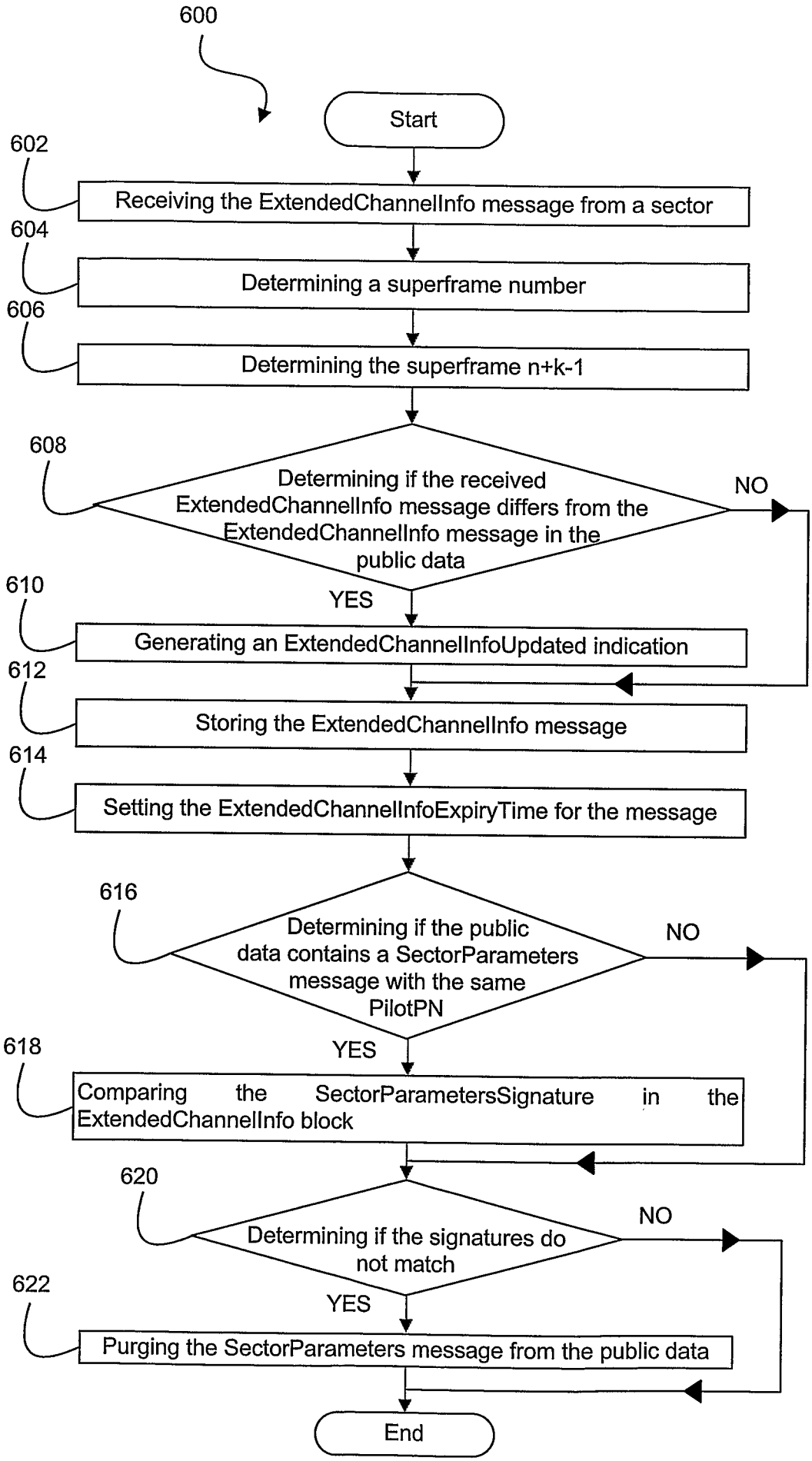
600
Start
602
Receiving the ExtendedChannelInfo message from a sector
604
Determining a superframe number
606
Determining the superframe n+k-1
608
Determining if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in the public data
NO
YES
610
Generating an ExtendedChannelInfoUpdated indication
612
Storing the ExtendedChannelInfo message
614
Setting the ExtendedChannelInfoExpiryTime for the message
616
Determining if the public data contains a SectorParameters message with the same PilotPN
NO
YES
618
Comparing the SectorParametersSignature in the ExtendedChannelInfo block
620
Determining if the signatures do not match
NO
YES
622
Purging the SectorParameters message from the public data
End

Fig. 6 A

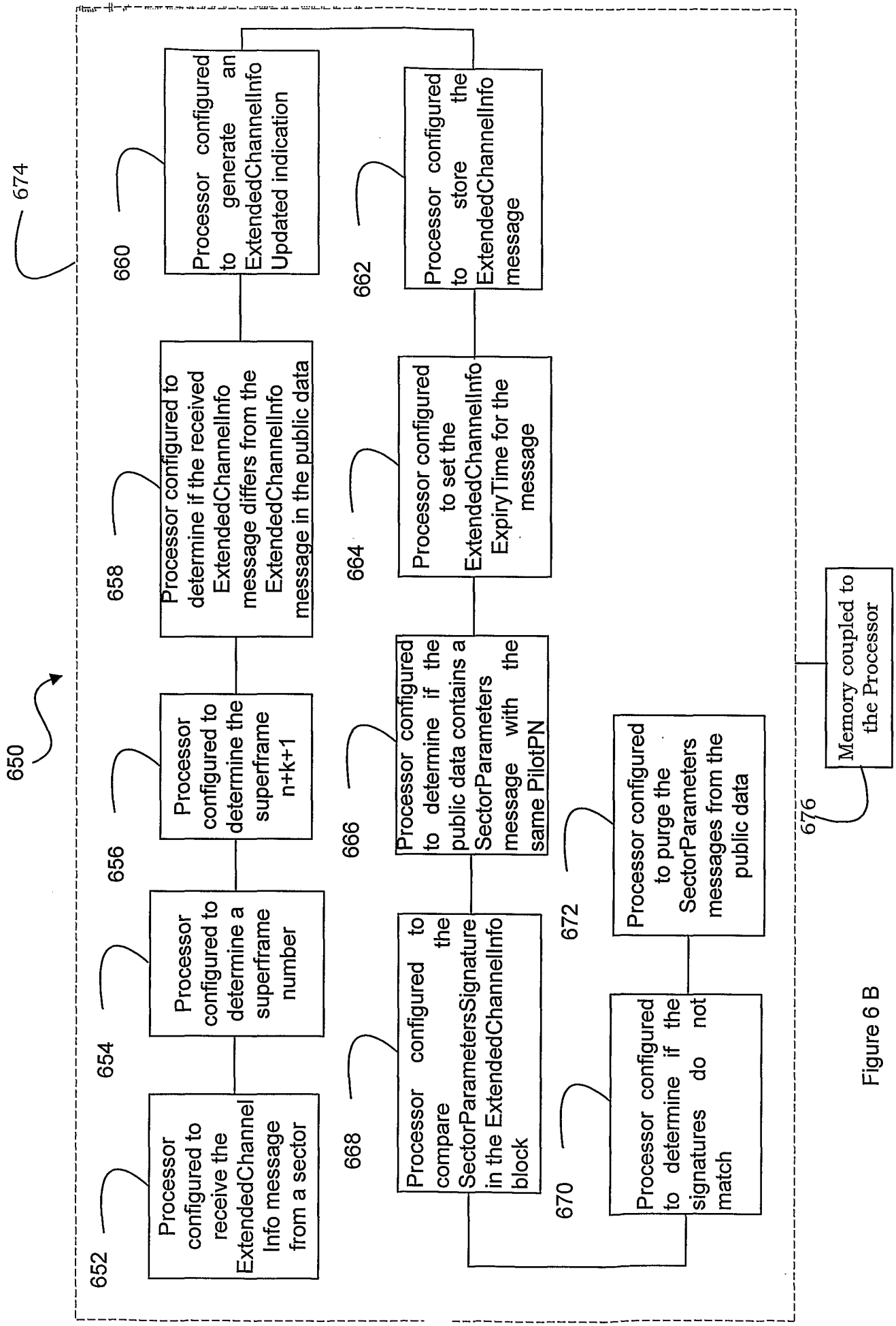
650
652
Processor configured to receive the ExtendedChannel Info message from a sector
654
Processor configured to determine a superframe number
656
Processor configured to determine the superframe n+k+1
658
Processor configured to determine if the received ExtendedChannelInfo message differs from the ExtendedChannelInfo message in the public data
660
Processor configured to generate an ExtendedChannelInfo Updated indication
662
Processor configured to store the ExtendedChannelInfo message
664
Processor configured to set the ExtendedChannelInfo ExpiryTime for the message
666
Processor configured to determine if the public data contains a SectorParameters message with the same PilotPN
668
Processor configured to compare SectorParametersSignature in the ExtendedChannelInfo block
670
Processor configured to determine if the signatures do not match
672
Processor configured to purge the SectorParameters messages from the public data
674
676
Memory coupled to the Processor

Figure 6 B

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2006/041963

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04B7/005 H04L1/00 H04L12/28

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

B. FIELDS SEARCHED

Minimum documθntation searched (classification system followed by classification symbols)
H04B H04L

Documentation searched other than minimum documentation to the extent that such documents are included In the fields searched

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

EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to claim No
X	US 6 795 425 Bl (RAITH ALEX KRISTER [US]) 21 September 2004 (2004-09-21) abstract figures lla-12 column 3, line 65 - column 4, line 36 column 13, line 10 - column 14, line 39 column 15, line 18 - line 67 ----- -/--	1-14

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents

"A' document defining the general state of the art Which is not considered to be of particular relevance

[1]E" earlier document but published on or after the international filing date

"L" document which may throw doubts on pnonty claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

[1]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 pnortty date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X[1] document of particular relevance, the claimed invention cannol be considered novel or cannot be considered to involve an inventive step when the documant is taken alone

"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 docu¬ments such combination being obvious to a person stalled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 March 2007	21/03/2007

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P B 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel (+31-70) 340-2040, Tx 31 651 epo nl Fax (+31-70) 340-3016	Matt, Stefan

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2006/041963

C(Coπtlnuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with Indication, where appropriate, ot the relevant passages	Relevant to claim No.
P,X	JIM TOMCIK: "C802.20-05/69: QFDD and QTDD: Proposed Draft Air Interface Specification" CONTRIBUTIONS TO IEEE 802.20 SESSION 17: 14-17 NOVEMBER 2005, [Online] 28 October 2005 (2005-10-28), pages 1, 6-52-6-62, XP002423945 Retrieved from the Internet: URL:http://1eee802.org/20/Contributions.html> [retrieved on 2007-03-09] paragraph [6.5.5.4.1.3] paragraph [6.5.5.4.2.3]	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2006/041963

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6795425 Bl	21-09-2004	BR 9915288 A	07-08-2001
		CA 2350438 Al	25-05-2000