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DESCRIPTION

Description

TECHNICAL FIELD

[0001] This application is related to wireless communications. Specifically, this application relates to the activation of component carriers in a wireless communication system.

BACKGROUND

[0002] A key feature of long term evolution advanced (LTE-A) is a higher data rate. This is supported by allowing a wireless transmit/receive unit (WTRU) to receive and transmit data on multiple LTE component carriers simultaneously in both uplink and downlink. This is referred to as carrier aggregation.

[0003] Receiving and transmitting on multiple carriers significantly increases the power consumption of the WTRU. It is known that the power consumption of the analog front-end, (which counts as a significant fraction of total power consumption at the WTRU), is linearly proportional to the bandwidth or a plurality of basic frequency blocks (i.e., component carriers) that are aggregated. Activating and deactivating additional component carriers on demand and rapidly is critical to saving WTRU resources, (e.g., hybrid automatic repeat request (HARQ) processing (including channel quality indicator (CQI) and sounding reference signal (SRS) reporting), buffer occupancy and buffer management, (e.g., buffer status report (BSR) reporting) and scheduling processing), and providing savings of power consumption.

[0004] 3GPP contribution document R1-083076 relates to supplementary carrier control for dual carrier/dual cell (DC) deactivation. 3GPP contribution document R2-084409 relates to DC-HSDPA and Continuous Packet Connectivity (CPC), and proposes that the two carriers have the same DRX status and are affected by the orders and events independently of which carriers they were sent on and triggered. 3GPP contribution document R2-083394 also relates to DC-HSDPA and CPC, and proposes for example that HS-SCCH-less operation is restricted to the anchor carrier, and a new HS-SCCH order for dual carrier activation and deactivation.

SUMMARY

[0005] A method and apparatus are described which perform bandwidth aggregation by

simultaneously monitoring and processing a number of simultaneous, non-contiguous or contiguous component carriers in the downlink. A WTRU can be configured by an evolved Node-B (eNodeB) to support additional component carriers. A pre-configured additional component carrier may be used. Various methods for activating and deactivating the additional component carrier are also described.

[0006] The invention is set out in the independent claims. Embodiments are disclosed in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] A more detailed understanding may be had from the following description, given by way of example in conjunction with the accompanying drawings wherein:

Figure 1 shows a wireless communication system including an eNodeB and a WTRU;

Figure 2 is a block diagram of the eNodeB of Figure 1;

Figure 3 is a block diagram of the WTRU of Figure 1; and

Figures 4 and 5 show procedures for monitoring and processing component carriers.

DETAILED DESCRIPTION

[0008] When referred to hereafter, the terminology "wireless transmit/receive unit (WTRU)" includes but is not limited to a user equipment (UE), a mobile station, a fixed or mobile subscriber unit, a pager, a cellular telephone, a personal digital assistant (PDA), a computer, or any other type of user device capable of operating in a wireless environment.

[0009] When referred to hereafter, the terminology "evolved Node-B (eNodeB)" includes but is not limited to a base station, a site controller, an access point (AP), or any other type of interfacing device capable of operating in a wireless environment.

[0010] Figure 1 shows a wireless communication system 100 including an eNodeB 105 and a WTRU 110. The eNodeB 105 is configured to transmit a radio resource control (RRC) connection reconfiguration message 115 to the WTRU 110.

[0011] Various methods and apparatus for activating or deactivating the reception or transmission on the different carriers in an advanced LTE system employing carrier aggregation are described.

Transition to Connected Mode

[0012] In an idle mode, the WTRU 110 monitors and processes only a single component carrier. Idle mode procedures, such as system information (SI) acquisition and paging indication (PI) monitoring are transparent to the multiple carrier capability of the WTRU 110. Schemes like cell selection and cell reselection may remain the same with or without carrier aggregation, (referred to as bandwidth aggregation hereinafter), capability or may consider the bandwidth aggregation capability of the infrastructure, (eNodeB 105), as an input to system selection. However, as the WTRU 110 transitions to an RRC connected mode, (typically through an RRC connection request), the network is informed by the WTRU 110 of the WTRU capability in terms of bandwidth aggregation.

[0013] WTRU bandwidth aggregation capability can be defined as the number of simultaneous non-contiguous component carriers that can be monitored and processed simultaneously in the downlink for each band. An alternative metric can be the number of radio frequency (RF) receivers, (with different receivers handling non-contiguous carriers), and the largest bandwidth of each receiver. Consider an example where there are five component carriers: carriers 1 and 2 are contiguous to each other but not to carriers 3, 4 and 5, and carriers 3, 4, and 5 are contiguous.

[0014] WTRU bandwidth aggregation capability can also be defined as the number of simultaneous contiguous carriers that can be monitored and processed simultaneously in the downlink for each band.

[0015] WTRU bandwidth aggregation capability can also be defined as the largest supported bandwidth of aggregated contiguous carriers, not only the number of carriers, but also bandwidth.

[0016] WTRU bandwidth aggregation capability can also be defined as the largest total bandwidth of aggregated carriers (contiguous or not).

[0017] WTRU bandwidth aggregation capability can also be defined as the largest bandwidth supported per single carrier (in line with LTE current WTRU capability).

RRC Configuration of Component Carriers

[0018] After the WTRU informs the network of the WTRU's bandwidth capability in the RRC connection procedure, an eNodeB supporting bandwidth aggregation may configure the WTRU to support additional component carriers, (i.e., pre-configured additional component carriers). This may be performed with an RRC connection reconfiguration message carrying information that allows the WTRU to set up the monitoring, (grants and assignments), of one or more

additional downlink and/or uplink carriers. Information included in the RRC connection reconfiguration message may include the cell identity (ID), the carrier center frequency, the carrier bandwidth, the carrier direction (uplink or downlink), and other information required to setup in a timely fashion the activation and synchronization of pre-configured additional component carriers.

[0019] One RRC connection reconfiguration message may be sufficient to setup more than one component carrier by stacking the information previously described for all pre-configured additional component carriers.

[0020] The reception of the RRC connection reconfiguration message alone may not activate the monitoring and processing of the additional component carriers immediately or after a delay. In this case, only an explicit or implicit activation command as described below would allow the WTRU to start monitoring and processing additional carriers. Alternatively, the RRC connection reconfiguration message may contain a field that signals whether or not the monitoring and processing should start after the successful reconfiguration procedure is completed. This may be useful to verify at setup that the pre-configured additional component carriers are operational. Alternatively, the reception of the RRC connection reconfiguration message activates the monitoring and processing of the additional component carriers immediately or after a delay.

[0021] The RRC connection reconfiguration message may contain the additional information that would allow the WTRU to setup additional component carriers controlled by another eNodeB, such as timing advance and other synchronization related information.

[0022] The RRC connection reconfiguration message can provide a specific cell radio network temporary identifier (C-RNTI) per additional component carrier.

[0023] The RRC connection reconfiguration message may, for efficiency, assign to each pre-configured additional component carrier a bit combination up to the number of maximum simultaneous additional component carriers that can be supported, so that activation or deactivation of an individual component carrier can be referred to by using this assigned bit combination.

Mechanisms to Activate or Deactivate Pre-Configured Additional Component Carriers

MAC Control Elements

[0024] Activation or deactivation of a pre-configured additional carrier or a pre-defined subset of pre-configured additional carriers can occur at the reception of a medium access control (MAC) control element (CE). The activation or deactivation can take effect after a predefined

delay, (fixed or configurable through higher layer signaling), or immediately after reception of the MAC CE. This would be implemented by a new type MAC CE, referred to as a MAC_CE_Activation control element.

[0025] The MAC_CE_Activation control element contains a bit combination field to indicate which pre-configured carrier is being activated or deactivated. Alternatively, the carrier being activated or deactivated may be indicated by the C-RNTI value used for the transmission of the MAC PDU containing the MAC control element. One MAC_CE_Activation control element may activate or deactivate multiple carriers at the same time by aggregating the bit combinations or transmitting multiple MAC PDUs using a different C-RNTI.

[0026] The indication of whether the command corresponds to activation or deactivation is performed by setting a bit or it may be implicit based on the current activation or deactivation state of the carrier. Alternatively, it may be based on the carrier the MAC PDU was received on. For example, if the MAC CE was contained in a MAC PDU received in a given carrier, (e.g., an "anchor carrier" or a "serving cell"), then the command is understood to be for activation of the carrier indicated in the MAC CE. If the MAC CE was contained in a MAC PDU received in a carrier, (possibly without explicit indication of a carrier within the MAC CE itself), then the command is understood to be a deactivation for the carrier the MAC PDU was received from, or alternatively a deactivation for a pre-defined set of carriers.

[0027] Another alternative is that all MAC_CE_Activations are always received on a specific carrier, (e.g., the carrier corresponding to the serving cell).

Activation on Demand

[0028] The reception of a physical downlink control channel (PDCCH) on a specific carrier (such as an "anchor carrier") with a new downlink control information (DCI) format (or a modified DCI format for LTE advanced) signals to the WTRU that transmission to, or reception from, a pre-configured additional uplink (PUSCH) or downlink (PDSCH) carrier, (or a pre-defined subset of pre-configured additional uplink or downlink carriers), will take place in X subframes. (To start monitoring the PDCCH on a new carrier requires a few subframes of lead time.) The delay allows the WTRU analog front-end to setup to the new carrier, which includes phase-locked loop (PLL) and automatic gain control (AGC) settling time and frequency synchronization. The new DCI format contains a field to map the activation with the pre-configured carrier as explained above. This allows the WTRU to only monitor the PDCCH from a single carrier, (e.g., a special carrier called "anchor carrier" or the carrier corresponding to the serving cell), and consequent battery savings. The indication from the anchor carrier may be for a single grant or assignment on the additional component carrier. In this case, HARQ feedback corresponding to the grant or assignment may also be delayed (with respect to the PDCCH transmission) compared to existing systems. Alternatively, the indication from the anchor carrier may signal to the WTRU that it should start monitoring the PDCCH on the additional component carrier or subset of component carriers until this carrier (or these

carriers) is (are) deactivated.

[0029] The PDCCH received with a new DCI format (or modified DCI format for LTE advanced) on a carrier, (e.g., an "anchor carrier"), may provide a time delayed allocation (physical resource blocks (PRBs), modulation and coding sets (MCS), and the like) on a pre-configured additional component carrier. The delay is based on the WTRU capability to tune and synchronize to a pre-configured component carrier. This delay may be fixed or variable based on WTRU capability. Time delayed allocation is already used for uplink allocation - a four subframe delay. However, this method allows the WTRU to know about the possibility of an upcoming uplink transmission more in advanced compared to the existing system. Such advance knowledge may be useful for uplink scheduling decisions. The same approach may be used for a pre-configured additional component carrier. This brings the advantage that pre-configured additional component carriers are activated on demand by allocating the resources in advance.

Implicit Activation

[0030] Implicit activation of one or a number of carriers may take place when the volume of traffic received on the downlink, (measured at the Physical (PHY), MAC, radio link control (RLC), or packet data convergence protocol (PDCP) layer), within a pre-determined or configured amount of time exceeds a pre-determined or configured threshold. There may be several thresholds defined, each corresponding to a particular carrier to activate. For example, carrier C1 may be activated when the volume of traffic exceeds V1, and carrier C2 may be activated when the volume of traffic exceeds V2, and the like.

[0031] Implicit activation of one or a number of carriers may also take place when the WTRU initiates transmission, (either on the random access channel (RACH), physical uplink control channel (PUCCH), or physical uplink shared channel (PUSCH)), on a certain uplink carrier that is associated to the downlink carrier to activate. This association may be pre-defined or provided to the WTRU through RRC signaling, (system information or dedicated signaling).

[0032] When a downlink carrier is activated, the WTRU initiates reception on the PDCCH configured for this carrier, (if a PDCCH is defined per carrier), and transmission on the PUCCH is configured for this carrier to transmit the feedback information.

Implicit Deactivation

[0033] Implicit deactivation may be performed based on an inactivity timer specific to the additional component carrier activity. For example, only the anchor carrier is active during a Web browsing session. If a download is started, start allocating PRBs on the pre-configured additional component carrier for this WTRU. Once the download is completed, the network

stops assigning resources to the pre-configured additional component carrier for the WTRU. After some inactivity timer, (specific to the pre-configured carrier), expires, the WTRU stops monitoring the PDCCH, (i.e., dedicated PDCCH per carrier), and shuts down the front-end radio resources allocated to this carrier. Alternatively, the WTRU may stop monitoring the PDCCH of a carrier after expiry of a timing alignment timer (or other timer) defined specifically for this carrier. Such a timing alignment timer may be restarted based on the reception of a timing alignment MAC control element from a MAC PDU received on the carrier.

[0034] In the case of activation on demand and a shared control channel on the anchor carrier, the WTRU can shut down the front-end resources allocated to a pre-configured additional component carrier as soon as the time delayed allocation to this carrier is not received. The WTRU may determine that it is more optimal to wait for a few consecutive subframes without allocation to pre-configured additional component carriers before shutting down the front-end resources associated with these carriers.

[0035] Implicit deactivation may also be based on radio conditions. As an example, if the channel conditions of a carrier remain under a certain minimum threshold for a period of time, the front-end radio resources may be de-allocated.

Explicit Deactivation Order on PDCCH

[0036] Explicit deactivation may be performed by sending a deactivation order specific to the component carrier so that the WTRU no longer needs to monitor the PDCCH, (dedicated PDCCH per carrier). The order may be sent using a PDCCH with a new DCI format on the anchor carrier for the dedicated channel. Alternatively, the deactivation order using the PDCCH may be sent only to the pre-configured additional component carrier.

Activation or Deactivation in DRX Connected Mode

[0037] MAC DRX configuration may remain the same with carrier aggregation. On-duration and DRX cycle apply to the configured carriers, (e.g., an "anchor carrier" or serving cell), as well as to activated pre-configured additional component carriers, ("resource carriers").

[0038] A DRX_Inactivity_timer running in the WTRU may be started or restarted if the PDCCH is received over an activated pre-configured additional component carrier for a new transmission.

[0039] The DRX_Inactivity_timer may also be started or restarted if a scheduled grant for an activated pre-configured additional component carrier is received for a new transmission.

[0040] Alternatively, the MAC DRX configuration may have a specific DRX_Inactivity_timer for

each of the pre-configured additional component carriers. The DRX_Inactivity_timer associated to a carrier would be started or restarted when a PDCCH assignment is received on this carrier. This would enable the WTRU to effectively deactivate these pre-configured carriers until the next on-duration cycle while the anchor carrier remains in active time.

[0041] The logic described previously for the DRX_Inactivity_Timer may also apply to other DRX timers, such as the ON_Duration_Timer and the DRX_Retransmission_Timer.

[0042] Figure 2 is a block diagram of the eNodeB 105 of Figure 1. The eNodeB 105 includes an antenna 205, a receiver 210, a processor 215 and a transmitter 220. The receiver 210 is configured to receive a signal indicating a bandwidth aggregation capability of the WTRU 110. The transmitter 220 is configured to transmit an RRC connection reconfiguration message to the WTRU 110.

[0043] Figure 3 is a block diagram of the WTRU 110 of Figure 1. The WTRU 110 includes an antenna 305, a receiver 310, a processor 315, a transmitter 320 and a discontinuous reception (DRX) inactivity timer 325.

[0044] The WTRU 110 monitors and processes component carriers. The receiver 310 in the WTRU 110 is configured to monitor and process a single component carrier. The transmitter 320 in the WTRU 110 is configured to transmit a signal indicating a bandwidth aggregation capability of the WTRU 110. The receiver 310 is further configured to receive an RRC connection reconfiguration message. The processor 315 in the WTRU 110 is configured to set up for monitoring and processing at least one pre-configured additional component carrier.

[0045] The receiver 310 may be further configured to receive a MAC CE, and the processor 315 may be configured to activate or deactivate the pre-configured additional component carrier.

[0046] The pre-configured additional component carrier may be immediately activated or deactivated in response to receiving the MAC CE, or may be activated or deactivated after a predefined delay. The pre-configured additional component carrier may be an uplink carrier or a downlink carrier.

[0047] The WTRU 110 may monitor and process the single component carrier while in an idle mode.

[0048] In one example, the bandwidth aggregation capability may indicate a number of simultaneous non-contiguous component carriers that can be monitored and processed simultaneously in the downlink for each band.

[0049] In another example, the bandwidth aggregation capability may indicate a number of RF receivers and the largest bandwidth of each receiver.

[0050] In yet another example, the bandwidth aggregation capability may indicate a number of simultaneous contiguous carriers that can be monitored and processed simultaneously in the downlink for each band.

[0051] In yet another example, the bandwidth aggregation capability may indicate the largest supported bandwidth of aggregated contiguous carriers.

[0052] In yet another example, the bandwidth aggregation capability may indicate the largest total bandwidth of aggregated carriers.

[0053] In yet another example, the bandwidth aggregation capability may indicate the largest bandwidth supported per single carrier.

[0054] The bandwidth aggregation capability may indicate more than one of the examples described above.

[0055] In another scenario, the receiver 310 may be configured to receive a PDCCH on a specific carrier with a DCI format that indicates that transmission to, or reception from, a pre-configured additional uplink or downlink carrier will take place in a certain number of subframes. The processor 315 may be configured to set up for monitoring and processing the pre-configured carrier.

[0056] Figure 4 shows a procedure 400 for monitoring and processing component carriers. In step 405, a WTRU monitors and processes a single component carrier. In step 410, the WTRU transmits a signal indicating a bandwidth aggregation capability of the WTRU. In step 415, the WTRU receives an RRC connection reconfiguration message. In step 420, the WTRU sets up for monitoring and processing at least one pre-configured additional component carrier. In step 425, the WTRU activates or deactivates the pre-configured additional component carrier in response to receiving a MAC CE.

[0057] Figure 5 shows a procedure 500 for monitoring and processing component carriers. In step 505, a WTRU monitors and processes a single component carrier. In step 510, the WTRU receives a PDCCH on a specific carrier with a DCI format that indicates that transmission to, or reception from, a pre-configured additional uplink or downlink carrier will take place in a certain number of subframes. In step 515, the WTRU sets up for monitoring and processing the pre-configured carrier.

[0058] Although features and elements are described above in particular combinations, each feature or element can be used alone without the other features and elements or in various combinations with or without other features and elements. The methods or flow charts provided herein may be implemented in a computer program, software, or firmware incorporated in a computer-readable storage medium for execution by a general purpose computer or a processor. Examples of computer-readable storage mediums include a read only memory (ROM), a random access memory (RAM), a register, cache memory,

semiconductor memory devices, magnetic media such as internal hard disks and removable disks, magneto-optical media, and optical media such as CD-ROM disks, and digital versatile disks (DVDs).

[0059] Suitable processors include, by way of example, a general purpose processor, a special purpose processor, a conventional processor, a digital signal processor (DSP), a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, application specific integrated circuits (ASICs), application specific standard products (ASSPs), field programmable gate arrays (FPGAs) circuits, any other type of integrated circuit (IC), and/or a state machine.

[0060] A processor in association with software may be used to implement a radio frequency transceiver for use in a wireless transmit receive unit (WTRU), user equipment (UE), terminal, base station, mobility management entity (MME) or evolved packet core (EPC), or any host computer. The WTRU may be used in conjunction with modules, implemented in hardware and/or software including a software defined radio (SDR), and other components such as a camera, a video camera module, a videophone, a speakerphone, a vibration device, a speaker, a microphone, a television transceiver, a hands free headset, a keyboard, a Bluetooth® module, a frequency modulated (FM) radio unit, a near field communication (NFC) module, a liquid crystal display (LCD) display unit, an organic light-emitting diode (OLED) display unit, a digital music player, a media player, a video game player module, an Internet browser, and/or any wireless local area network (WLAN) or ultra wide band (UWB) module.

Patentkrav

1. Fremgangsmåde implementeret af en trådløs sende-/modtageenhed, WTRU (110), **kendetegnet ved, at** fremgangsmåden omfatter:

at WTRU'en modtager en radioressourcestyrings-, RRC, forbindelsesrekonfigurationsmeddelelse (115) via en første komponentbærer, hvor RRC-forbindelsesrekonfigurationsmeddelelsen angiver konfigurationsinformation for WTRU'en til at understøtte en flerhed af yderligere komponentbærere, hvor enhver af flerheden af yderligere komponentbærere er indledningsvis deaktiveret for WTRU'en, og RRC-forbindelsesrekonfigurationsmeddelelsen angiver respektive identifikatorer, der er tildelt enhver af flerheden af yderligere komponentbærere til reference under efterfølgende komponentbæreraktivering;

hvor WTRU'en modtager en medieadgangsstyring, MAC, styringselement, CE, der angiver aktivering af en eller flere af flerheden af yderligere komponentbærere, hvor MAC CE'en omfatter et bitfelt, der indikerer hvilken en eller flere af flerheden af komponentbærere, som skal aktiveres;

hvor WTRU'en bestemmer, at en anden komponentbærer skal aktiveres baseret på bitfeltet, der er indeholdt i MAC CE'en, og på den respektive identifikator, der er tildelt den anden komponentbærer i RRC-forbindelsesrekonfigurationsmeddelelsen;

hvor WTRU'en overvåger for fysisk downlink-kontrolkanal, PDCCH-transmissioner via den anden komponentbærer baseret på bitfeltet, der er indeholdt i MAC CE'en, og på den respektive identifikator, der er tildelt den anden komponentbærer i RRC-forbindelsesrekonfigurationsmeddelelsen;

hvor WTRU'en modtager en PDCCH-transmission via den anden komponentbærer, hvor PDCCH-transmissionen angiver planlægningsinformation for en fysisk downlink-delt kanal, PDSCH-transmission via den anden komponentbærer; og

hvor WTRU'en modtager PDSCH-transmissionen via den anden komponentbærer i overensstemmelse med den PDCCH-transmission, der er modtaget via den anden komponentbærer.

2. Fremgangsmåde ifølge krav 1, yderligere omfattende:
at WTRU'en bestemmer, at en inaktivitetstimer for den anden komponentbærer er udløbet; og
at WTRU'en standser overvågningen for PDCCH-transmissioner via den anden komponentbærer baseret på, at WTRU'en bestemmer, at inaktivitetstimeren for den anden komponentbærer er udløbet.

3. Fremgangsmåde ifølge krav 1, hvor bitfeltet i MAC CE'en angiver, at flere af flerheden af yderligere komponentbærere skal aktiveres.

4. Fremgangsmåde ifølge krav 1, yderligere omfattende, at WTRU'en sender kapacitetsinformation, der angiver WTRU-kapaciteter til samtidig understøttelse af flere komponentbærere.

5. Fremgangsmåde ifølge krav 1, hvor WTRU'en overvåger for PDCCH-transmissioner på den anden komponentbærer efter en foruddefineret forsinkelse fra modtagelsen af MAC CE'en på den første komponentbærer.

6. Fremgangsmåde ifølge krav 1, yderligere omfattende:
at WTRU'en modtager en anden MAC CE, hvor den anden MAC CE indikerer deaktivering af en eller flere aktive komponentbærere, hvor den anden MAC CE omfatter et bitfelt, der indikerer hvilken en eller flere aktive komponentbærere, som skal deaktiveres;
at WTRU'en bestemmer, at den anden komponentbærer skal deaktiveres baseret på bitfeltet, der er indeholdt i den anden MAC CE, og på den respektive identifikator, der er tildelt den anden komponentbærer i RRC-forbindelsesrekonfigurationsmeddelelsen; og

at WTRU'en stopper overvågningen for PDCCH-transmissioner via den anden komponentbærer baseret på at bestemme, at den anden komponentbærer skal deaktiveres baseret på bitfeltet, der er indeholdt i den anden MAC CE, og på den respektive identifikator, der er tildelt den anden komponentbærer i RRC-forbindelsesrekonfigurationsmeddelelsen.

7. Fremgangsmåde ifølge krav 6, hvor den anden MAC CE indikerer en deaktivering af flere aktive komponentbærere.

8. Trådløs sende-/modtageenhed, WTRU (110), omfattende en processor (315) og hukommelse, **kendetegnet ved, at** processoren og hukommelsen er konfigureret til:

at modtage en radioressourcestyrings-, RRC, forbindelses-rekonfigurationsmeddelelse (115) via en første komponentbærer, hvor RRC-forbindelsesrekonfigurationsmeddelelsen angiver konfigurationsinformation for WTRU'en til at understøtte en flerhed af yderligere komponentbærere, hvor enhver af flerheden af yderligere komponentbærere er indledningsvis deaktiveret for WTRU'en, og RRC-forbindelsesrekonfigurationsmeddelelsen angiver respektive identifikatorer, der er tildelt enhver af flerheden af yderligere komponentbærere til reference under efterfølgende komponentbæreraktivering;

at modtage en medieadgangsstyring, MAC, styringselement, CE, der angiver aktivering af en eller flere af flerheden af yderligere komponentbærere, hvor MAC CE'en omfatter et bitfelt, der indikerer hvilken en eller flere af flerheden af komponentbærere, som skal aktiveres;

at bestemme, at en anden komponentbærer skal aktiveres baseret på bitfeltet, der er indeholdt i MAC CE'en, og på den respektive identifikator, der er tildelt den anden komponentbærer i RRC-forbindelsesrekonfigurationsmeddelelsen;

at overvåge for fysisk downlink-kontrolkanal, PDCCH-transmissioner via den anden komponentbærer baseret på bitfeltet, der er indeholdt i MAC CE'en, og på den respektive identifikator, der er tildelt den anden komponentbærer i RRC-forbindelsesrekonfigurationsmeddelelsen;

at modtage en PDCCH-transmission via den anden komponentbærer, hvor PDCCH-transmissionen indikerer planlægningsinformation for en fysisk downlink-delt kanal, PDSCH-transmission via den anden komponentbærer; og
at modtage PDSCH-transmissionen via den anden komponentbærer i overensstemmelse med PDCCH-transmissionen, der er modtaget via den anden komponentbærer.

9. WTRU ifølge krav 8, hvor processoren og hukommelsen er konfigureret til at: bestemme, at en inaktivitetstimer for den anden komponentbærer er udløbet; og stoppe overvågningen for PDCCH-transmissioner via den anden komponentbærer baseret på WTRU'en, der bestemmer, at inaktivitetstimeren for den anden komponentbærer er udløbet.

10. WTRU ifølge krav 8, hvor bitfeltet i MAC CE'en angiver, at flere af flerheden af yderligere komponentbærere skal aktiveres.

11. WTRU ifølge krav 8, hvor processoren og hukommelsen er konfigureret til at transmittere kapacitetsinformation, der angiver WTRU-kapaciteter til samtidig understøttelse af flere komponentbærere.

12. WTRU ifølge krav 8, hvor WTRU'en er konfigureret til at overvåge for PDCCH-transmissioner på den anden komponentbærer efter en foruddefineret forsinkelse fra modtagelsen af MAC CE'en på den første komponentbærer.

13. WTRU ifølge krav 8, hvor processoren og hukommelsen er konfigureret til at:
modtage en anden MAC CE, hvor den anden MAC CE indikerer deaktivering af en eller flere aktive komponentbærere, hvor den anden MAC CE omfatter et bitfelt, der indikerer hvilken en eller flere aktive komponentbærere, som skal deaktiveres;

bestemme, at den anden komponentbærer skal deaktiveres baseret på bitfeltet, der er indeholdt i den anden MAC CE, og på den respektive identifikator, der er tildelt den anden komponentbærer i RRC-forbindelsesrekonfigurationsmeddelelsen; og

stoppe overvågningen for PDCCH-transmissioner via den anden komponentbærer baseret på at bestemme, at den anden komponentbærer skal deaktiveres baseret på bitfeltet, der er indeholdt i den anden MAC CE, og på den respektive identifikator, der er tildelt den anden komponentbærer i i RRC-forbindelsesrekonfigurationsmeddelelsen.

14. WTRU ifølge krav 13, hvor den anden MAC CE indikerer deaktivering af flere aktive komponentbærere.

15. Udviklet Node-B, eNodeB (105), omfattende en processor (215) og hukommelse, **kendetegnet ved, at** processoren og hukommelsen er konfigureret til:

at sende en radioressourcestyrings-, RRC-,-forbindelsesrekonfigurationsmeddelelse (115) til en trådløs sende-/modtageenhed, WTRU (110), via en første komponentbærer, hvor RRC-forbindelsesrekonfigurationsmeddelelsen angiver konfigurationsinformation for WTRU'en for at understøtte en flerhed af yderligere komponentbærere, hvor hver af flerheden af yderligere komponentbærere initialt er deaktiveret for WTRU'en, og RRC-forbindelsesrekonfigurationsmeddelelsen angiver respektive identifikatorer, der er tildelt enhver af flerheden af yderligere komponentbærere til reference under efterfølgende komponentbæreraktivering;

at sende en medieadgangsstyring, MAC, styringselement, CE, til WTRU'en, der angiver aktivering af en eller flere af flerheden af yderligere komponentbærere, hvor MAC CE'en omfatter et bitfelt, der indikerer hvilken en eller flere af flerheden af komponentbærere, som skal aktiveres, hvor bitfeltet, der er indeholdt i MAC CE'en, angiver til WTRU'en, at en anden komponentbærer skal

aktiveres baseret på den respektive identifikator, der er tildelt den anden komponentbærer i RRC-forbindelsesrekonfigurationsmeddelelsen;

at sende en fysisk downlink-kontrolkanal, PDCCH-transmission til WTRU'en via den anden komponentbærer, hvor PDCCH-transmissionen indikerer planlægningsinformation for en fysisk downlink-delt kanal, PDSCH-transmission via den anden komponentbærer; og

at sende PDSCH-transmissionen til WTRU'en via den anden komponentbærer i overensstemmelse med PDCCH-transmissionen, der er sendt via den anden komponentbærer.

DRAWINGS

Drawing

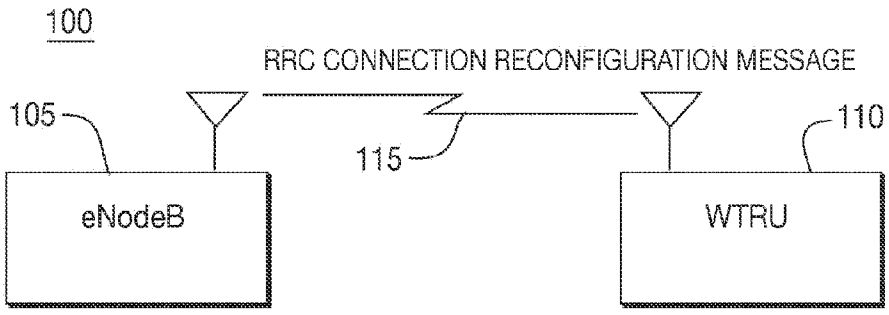

FIG. 1

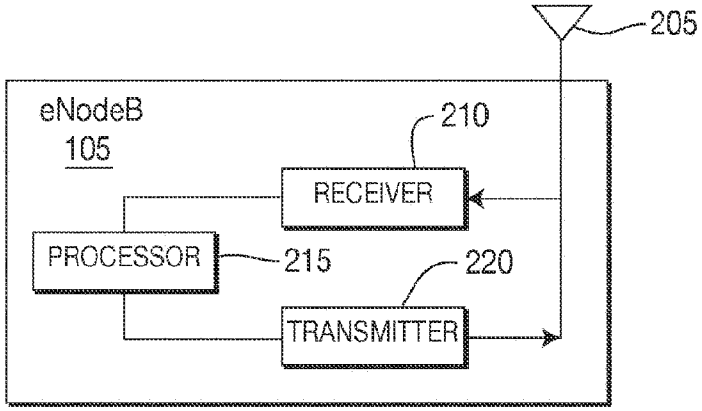

FIG. 2

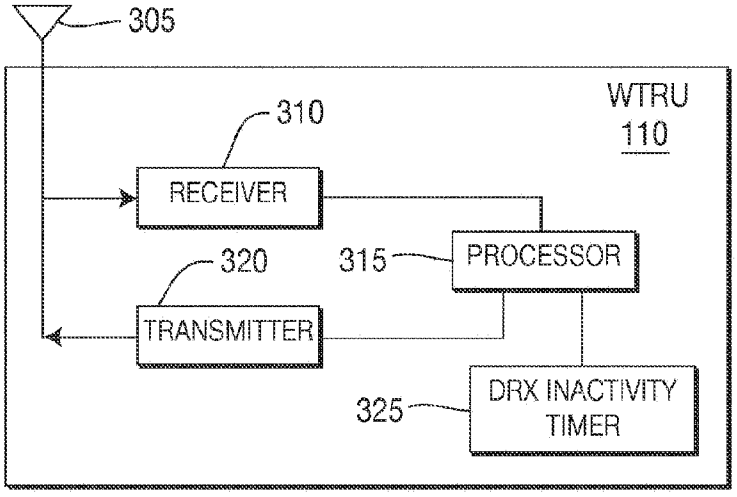

FIG. 3

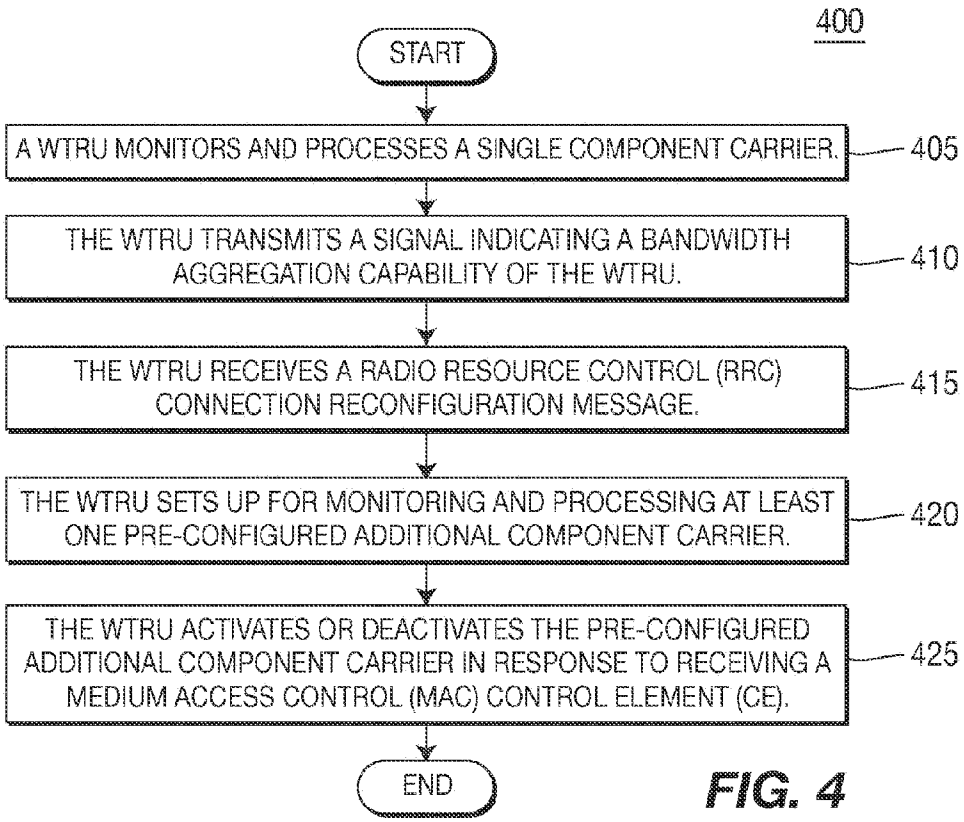
400
START
A WTRU MONITORS AND PROCESSES A SINGLE COMPONENT CARRIER.
405
THE WTRU TRANSMITS A SIGNAL INDICATING A BANDWIDTH AGGREGATION CAPABILITY OF THE WTRU.
410
THE WTRU RECEIVES A RADIO RESOURCE CONTROL (RRC) CONNECTION RECONFIGURATION MESSAGE.
415
THE WTRU SETS UP FOR MONITORING AND PROCESSING AT LEAST ONE PRE-CONFIGURED ADDITIONAL COMPONENT CARRIER.
420
THE WTRU ACTIVATES OR DEACTIVATES THE PRE-CONFIGURED ADDITIONAL COMPONENT CARRIER IN RESPONSE TO RECEIVING A MEDIUM ACCESS CONTROL (MAC) CONTROL ELEMENT (CE).
425
END

FIG. 4

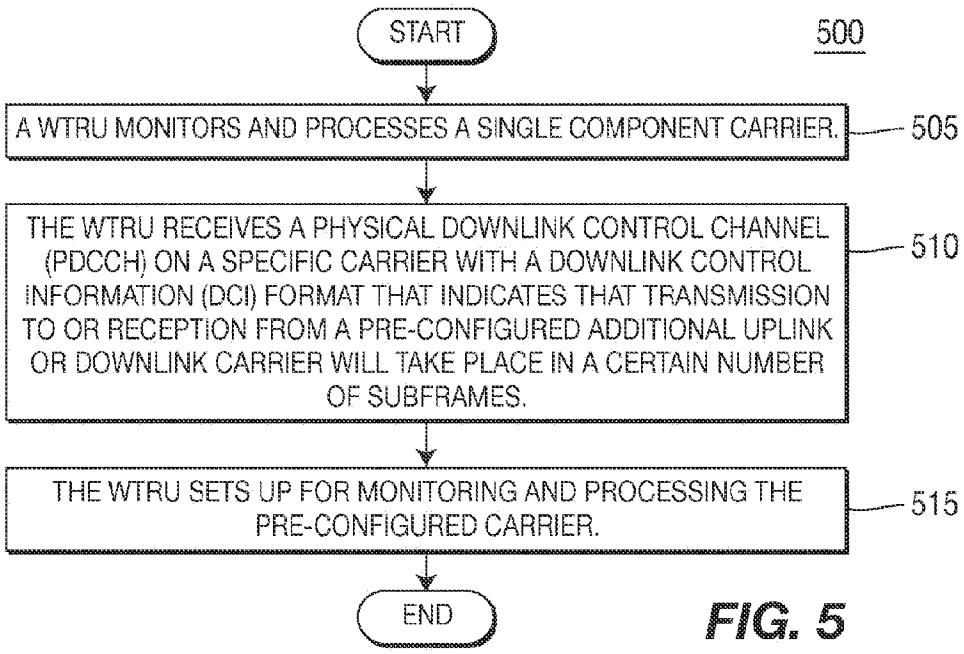
START
500
A WTRU MONITORS AND PROCESSES A SINGLE COMPONENT CARRIER.
505
THE WTRU RECEIVES A PHYSICAL DOWNLINK CONTROL CHANNEL (PDCCH) ON A SPECIFIC CARRIER WITH A DOWNLINK CONTROL INFORMATION (DCI) FORMAT THAT INDICATES THAT TRANSMISSION TO OR RECEPTION FROM A PRE-CONFIGURED ADDITIONAL UPLINK OR DOWNLINK CARRIER WILL TAKE PLACE IN A CERTAIN NUMBER OF SUBFRAMES.
510
THE WTRU SETS UP FOR MONITORING AND PROCESSING THE PRE-CONFIGURED CARRIER.
515
END

FIG. 5