

CLAIMS

What is claimed is:

1. A Wireless Transmit/Receive Unit (WTRU) comprising:

~~a transmitter;~~

~~a receiver; and~~

a processor, ~~coupled to the transmitter and the receiver, and a transceiver which are~~
configured to:

~~receive a first message that indicates a processing state for the WTRU,
wherein the processing state is configuration information identifying groups of search
spaces associated with a particular frequency bandwidth control resource set;~~

~~monitor, according to the configuration information, a first group of the
search spaces for a first physical downlink control channel (PDCCH) transmission;~~

~~receive the first PDCCH transmission via the monitored first group of the
search spaces, the first PDCCH transmission including downlink control information
(DCI), the DCI including information indicating a second group of the search spaces
for monitoring by the WTRU for a second PDCCH transmission;~~

~~monitor, according to the DCI, the second group of the search spaces for the
second PDCCH transmission; and~~

~~receive the second PDCCH transmission via the monitored second group of
the search spaces,~~

~~wherein the transceiver and the processor are configured to monitor only one
of the first and second groups of the search spaces at a time.~~

~~determine control resource sets to monitor based on the configured
processing state, wherein the control resource sets to monitor comprise resources in
any one or more of at least time and frequency; and~~

~~monitor the determined control resource sets.~~

2. The WTRU of claim 1, wherein the ~~first message comprises Downlink Control
Information (DCI)~~DCI includes information indicating a processing state of the WTRU.

3. The WTRU of claim 2, ~~wherein the configuration information identifying the groups
of the search spaces associated with the control resource set is included in further comprising~~
~~receiving~~ a Radio Resource Control (RRC) message that configures multiple processing
states in the WTRU from which ~~the~~ configured processing state is selected.

4. The WTRU of claim 1, wherein the processor ~~is further~~ and the transceiver are configured to monitor ~~a control channel for the first PDCCH transmission~~ using any of: (1) ~~at least the determined minimum amount of resources of the one or more sets of physical resources~~ the control resource set and/or (2) a type of signaling structure.

5. The WTRU of claim 1, wherein the ~~determined~~ control resource ~~sets to monitor~~ set comprises any of: one or more control channel elements, one or more search spaces, and one or more aggregation levels.

6. The WTRU of claim 1, wherein the ~~control resource sets monitored based on the processing state comprise at least one of: (1) a particular set of resource elements, (2) a particular set of aggregation levels, and (3) a particular set of resource blocks.~~ processor and the transceiver are configured to:

determine the processing state based on scheduling activity, and
wherein the scheduling activity comprises one or more scheduling events based on any of: (1) reception of dynamic scheduling information as part of DCI, (2) semi-statically configured scheduling information, (3) autonomous transmissions of the WTRU, (4) new data becoming available for transmissions, and/or (5) a change in rate of the one or more scheduling events.

7. The WTRU of claim 2, wherein the processing state relates to the WTRU actions in at least one of: (1) control channel processing, (2) spectrum bandwidth processing, (3) beam management and processing, (4) reference signal processing, (5) Hybrid Automatic Repeat reQuest (HARQ) timing operations, (6) framing operations, (7) timing operations, or (8) logical channel properties and configuration.

~~78.~~ The WTRU of claim 1, wherein:

the processor ~~and the transceiver~~ is ~~are~~ configured to:

determine to transition from a first processing state to a second processing state based on at least one condition, wherein the at least one condition includes reception of a message from a network entity, wherein the message indicates at least one of:

an index associated with the second processing state to be configured,
a predefined time at which to transition to the second processing state,
configuration parameters defining a set of actions and/or behavior in the second processing state, and

a time difference between a time at which the message is received and a time at which the transition associated with the second processing state is to occur.

89. The WTRU of claim 78, wherein the processor ~~is~~ and the transceiver are configured to ~~perform a first number of blind decoding attempts when in a~~ associate (1) the first processing state with a first configuration for a data channel, and ~~perform a second, different number of blind decoding attempts when in a~~ (2) the second processing state with a second, different configuration for the data channel.

910. The WTRU of claim 78, wherein the processor ~~is~~ and the transceiver are configured to: ~~decode for a first number of control channel messages when in a first processing state and decode for a second, different number of control channel messages when in a second processing state~~ receive a resource assignment for the second processing state from a network entity;

transition to the second processing state; and

decode a transmission using the received resource assignment in the second processing state.

1011. The WTRU of claim 78, wherein the at least one condition includes reception of a message from a network entity, wherein the message is signaled via at least one of: (1) a Radio Resource Control (RRC) message, (2) a Medium Access Control (MAC) Control Element (CE), (3) DCI on a control channel, or (34) a wakeup signal.

1112. A method to save power implemented ~~in~~ by a Wireless Transmit/Receive Unit (WTRU), the method comprising:

~~receiving a first message that indicates a processing state for the WTRU, wherein the processing state is associated with a particular frequency bandwidth~~ configuration information identifying groups of search spaces associated with a control resource set;

monitoring, according to the configuration information, a first group of the search spaces for a first physical downlink control channel (PDCCH) transmission;

receiving the first PDCCH transmission via the monitored first group of the search spaces, the first PDCCH transmission including downlink control information (DCI), the DCI including information indicating a second group of the search spaces for monitoring by the WTRU for a second PDCCH transmission;

~~determining control resource sets to monitor based on the configured processing state, wherein the control resource sets to monitor comprise resources in any one or more of at least time and frequency; and~~

monitoring, the determined control resource sets according to the DCI, the second group of the search spaces for the second PDCCH transmission; and

receiving the second PDCCH transmission via the monitored second group of the search spaces,

wherein the WTRU monitors only one of the first and second groups of the search spaces at a time.

1213. The method of claim 1112, wherein the first message comprises Downlink Control Information (DCI) further comprising:

determining a processing state that pertains to behavior of the WTRU according to a message that configures the processing state of the WTRU.

1314. The method of claim 1213 further comprising: wherein

receiving a Radio Resource Control (RRC) message that configures multiple processing states in the WTRU from which the configured processing state is selected the DCI includes information indicating a processing state of the WTRU.

1415. The method of claim 1114, further comprising:

monitoring a control channel using any of: (1) at least the determined minimum amount of resources of the one or more sets of physical resources and (2) a type of signaling structure wherein the configuration information identifying the groups of the search spaces associated with the control resource set is included in a Radio Resource Control (RRC) message that configures multiple processing states in the WTRU from which a configured processing state is selected.

1516. The method of claim 1112, wherein the determined control resource sets to monitor comprises any of: one or more control channel elements, one or more search spaces, and one or more aggregation levels further comprising: monitoring for the first PDCCH transmission using any of: (1) the control resource set and/or (2) a type of signaling structure.

1617. The method of claim 1112, wherein the control resource sets monitored based on the processing state comprise at least one of: (1) a particular set of resource elements, (2) a particular set of aggregation levels, and (3) a particular set of resource blocks comprises any of: one or more control channel elements, one or more search spaces, or one or more aggregation levels.

1718. The method of claim 1112, further comprising:

determining of a processing state of the WTRU based on scheduling activity; and to transition from a first processing state to a second processing state based on at least one condition, wherein the at least one condition includes reception of a message from a network entity, wherein the message indicates at least one of:

an index associated with the second processing state to be configured,
a predefined time at which to transition to the second processing state,
configuration parameters defining a set of actions and/or behavior in the second processing state, and

a time difference between a time at which the message is received and a time at which the transition associated with the second processing state is to occur wherein the scheduling activity comprises one or more scheduling events based on any of: (1) reception of dynamic scheduling information as part of DCI, (2) semi-statically configured scheduling information, (3) autonomous transmissions of the WTRU, (4) new data becoming available for transmissions, and/or (5) a change in rate of the one or more scheduling events.

~~1819.~~ The method of claim ~~1713~~, further comprising:

~~performing a first number of blind decoding attempts when in a first processing state and performing a second, different number of blind decoding attempts when in a second processing state wherein the processing state relates to the WTRU actions in at least one of: (1) control channel processing, (2) spectrum bandwidth processing, (3) beam management and processing, (4) reference signal processing, (5) Hybrid Automatic Repeat reQuest (HARQ) timing operations, (6) framing operations, (7) timing operations, or (8) logical channel properties and configuration.~~

~~1920.~~ The method of claim ~~1712~~, further comprising:

~~decoding for a first number of control channel messages when in a first processing state and decoding for a second, different number of control channel messages when in a second processing state performing a Fast Fourier Transform (FFT) to receive a data channel, wherein a size of the FFT is a function of the determined processing state.~~

~~20.—The method of claim 17 wherein the at least one condition includes reception of a message from a network entity, wherein the message is signaled via at least one of: (1) a Radio Resource Control (RRC) message, (2) a Medium Access Control (MAC) Control Element (CE), and (3) a wakeup signal.~~