CONFIGURATION OF LOW-POWER WAKE-UP SIGNAL (LP-WUS) OPERATION FOR CONNECTED MODE USER EQUIPMENT (UE)

RELATED APPLICATIONS

[0001] This application claims priority to India Patent Application Serial Number 202411010618, filed 15 February 2024 and entitled "CONFIGURATION OF LOW-POWER WAKE-UP SIGNAL (LP-WUS) OPERATION FOR CONNECTED MODE USER EQUIPMENT (UE)," the disclosure of which is incorporated by reference herein in its entirety. This application also claims priority to U.S. Provisional Application Serial No. 63/559,353 filed 29 February 2024 entitled "CONFIGURATION OF LOW-POWER WAKE-UP SIGNAL (LP-WUS) OPERATION FORCONNECTED MODE USER EQUIPMENT (UE)," the disclosure of which is incorporated by reference herein in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to wireless communications, and more specifically to power conservation in wireless communications systems.

BACKGROUND

[0003] A wireless communications system may include one or multiple network communication devices, which may be otherwise known as network equipment (NE), supporting wireless communications for one or multiple user communication devices, which may be otherwise known as user equipment (UE), or other suitable terminology. The wireless communications system may support wireless communications with one or multiple user communication devices by utilizing resources of the wireless communication system (e.g., time resources (e.g., symbols, slots, subframes, frames, or the like) or frequency resources (e.g., subcarriers, carriers, or the like). Additionally, the wireless communications system may support wireless communications across various radio access technologies including third generation (3G) radio access technology, fourth generation (4G) radio access technology, fifth generation (5G) radio access technology, among other suitable radio access technologies beyond 5G (e.g., sixth generation (6G)).

SUMMARY

[0004] An article “a” before an element is unrestricted and understood to refer to “at least one” of those elements or “one or more” of those elements. The terms “a,” “at least one,” “one or more,” and “at least one of one or more” may be interchangeable. As used herein, including in the claims, “or” as used in a list of items (e.g., a list of items prefaced by a phrase such as “at least one of” or “one or more of” or “one or both of”) indicates an inclusive list such that, for example, a list of at least one of A, B, or C means A or B or C or AB or AC or BC or ABC (i.e., A and B and C). Also, as used herein, the phrase “based on” shall not be construed as a reference to a closed set of conditions. For example, an example step that is described as “based on condition A” may be based on both a condition A and a condition B without departing from the scope of the present disclosure. In other words, as used herein, the phrase “based on” shall be construed in the same manner as the phrase “based at least in part on”. Further, as used herein, including in the claims, a “set” may include one or more elements.

[0005] Some implementations of the method and apparatuses described herein may further include a UE for wireless communication to receive low-power wake-up signal (LP-WUS) configuration at a first radio of the UE indicating one or more LP-WUS monitoring occasions for connected mode discontinuous reception (DRX)(also referred to herein as C_DRX) operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation of a second radio of the UE; monitor, by the first radio of the UE and based at least in part on the LP-WUS configuration, for LP-WUS during the one or more LP-WUS monitoring occasions; and control, based at least in part on one or more LP-WUS received during the one or more LP-WUS monitoring occasions, Physical Downlink Control Channel (PDCCH) behavior of the second radio of the UE during the active time of the connected mode DRX operation.

[0006] In some implementations of the method and apparatuses for a UE described herein, the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake the second radio and further includes monitoring occasions for Downlink Control Information (DCI), and one or more of a search space identifier for monitoring DCI, a Control Resource Set (CORESET) identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; the at

least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the one or more LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a Secondary Cell (SCell) dormancy indication with the active time of the connected mode DRX; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of the connected mode DRX.

[0007] In some implementations of the method and apparatuses for a UE described herein, the at least one processor is configured to cause the UE to receive the LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a Bandwidth Part (BWP) identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode

DRX cycle; the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration.

[0008] In some implementations of the method and apparatuses for a UE described herein, the at least one processor is configured to cause the UE to one or more of: one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; one or more of activate or deactivate LP-WUS monitoring outside the active time of the connected mode DRX; one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof; the at least one processor is configured to cause the UE to receive, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; the at least one processor is configured to cause the UE to receive the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of Synchronization Signal Block (SSB) measurement, Channel State Information (CSI) measurement, or measurement pertaining to CSI reporting; the at least one processor is configured to cause the UE to: activate LP-WUS monitoring within the active time of the connected mode DRX; and monitor for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; the LP-WUS monitoring is activated by one or more of DCI or a Medium Access Control (MAC) Control Element (CE) received by the second radio.

[0009] In some implementations of the method and apparatuses for a UE described herein, the at least one processor is configured to cause the UE to: activate LP-WUS monitoring within the active time of the connected mode DRX; monitor for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; and resume PDCCH monitoring within a PDCCH skipping duration based at least in part on an indication received via LP-WUS; the indication received via the one or more LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the

PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; the at least one processor is configured to cause the UE to activate, based at least in part on the one or more LP-WUS, the second radio for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0010] Some implementations of the method and apparatuses described herein may further include a processor for wireless communication to receive LP-WUS configuration at a first radio of a UE indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation of a second radio of the UE; monitor, by the first radio of the UE and based at least in part on the LP-WUS configuration, for LP-WUS during the one or more LP-WUS monitoring occasions; and control, based at least in part on one or more LP-WUS received during the one or more LP-WUS monitoring occasions, PDCCH behavior of the second radio of the UE during the active time of the connected mode DRX operation.

[0011] In some implementations of the method and apparatuses for a processor described herein, at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake the second radio and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the one or more LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0012] In some implementations of the method and apparatuses for a processor described herein, the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of a connected mode DRX cycle; the at least one controller is configured to cause the processor to receive the LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0013] In some implementations of the method and apparatuses for a processor described herein, the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle; the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; the at least one controller is configured to cause the processor to one or more of: one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; one or more of activate or deactivate LP-WUS monitoring outside the active time of the connected mode DRX; one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof.

[0014] In some implementations of the method and apparatuses for a processor described herein, the at least one controller is configured to cause the processor to receive, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; the at least one controller is configured to cause the processor to receive the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; the at least one controller is configured to cause the processor to: activate LP-WUS monitoring within the active time of the connected mode DRX; and monitor for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; the LP-WUS monitoring is activated by one or more of DCI or a MAC CE received by the second radio.

[0015] In some implementations of the method and apparatuses for a processor described herein, the at least one controller is configured to cause the processor to: activate LP-WUS monitoring within the active time of the connected mode DRX; monitor for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; and resume PDCCH monitoring within a PDCCH skipping duration based at least in part on an indication received via LP-WUS; the indication received via the one or more LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; the at least one controller is configured to cause the processor to activate, based at least in part on the one or more LP-WUS, the second radio for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0016] Some implementations of the method and apparatuses described herein may further include a method performed by a UE, the method including receiving LP-WUS configuration at a first radio of the UE indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the

active time of the connected mode DRX operation of a second radio of the UE; monitoring, by the first radio of the UE and based at least in part on the LP-WUS configuration, for LP-WUS during the one or more LP-WUS monitoring occasions; and controlling, based at least in part on one or more LP-WUS received during the one or more LP-WUS monitoring occasions, PDCCH behavior of the second radio of the UE during the active time of the connected mode DRX operation.

[0017] In some implementations of the method and apparatuses for a UE described herein, the method further comprising receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake the second radio and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the one or more LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0018] In some implementations of the method and apparatuses for a UE described herein, the method further comprising receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of the connected mode DRX; receiving the LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one

of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle; receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0019] In some implementations of the method and apparatuses for a UE described herein, the method further comprising the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; one or more of: one or more of activating or deactivating LP-WUS monitoring within the active time of the connected mode DRX; one or more of activating or deactivating LP-WUS monitoring outside the active time of the connected mode DRX; one or more of activating or deactivating the LP-WUS monitoring based on an explicit indication; one or more of activating or deactivating the LP-WUS monitoring based on occurrence of at least one condition; one or more of activating or deactivating the LP-WUS monitoring based on at least one rule; or combinations thereof; receiving, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; receiving the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; activating LP-WUS monitoring within the active time of the connected mode DRX; and monitoring for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH.

[0020] In some implementations of the method and apparatuses for a UE described herein, the LP-WUS monitoring is activated by one or more of DCI or a MAC CE received by the second radio; activating LP-WUS monitoring within the active time of the connected mode DRX; monitoring for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; and resuming PDCCH monitoring within a PDCCH skipping duration based at least in part on an indication received via LP-WUS; the indication received via the one or more LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or

more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; activating, based at least in part on the one or more LP-WUS, the second radio for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0021] Some implementations of the method and apparatuses described herein may further include a NE for wireless communication to transmit LP-WUS configuration indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation; and transmit one or more LP-WUS during the one or more LP-WUS monitoring occasions, the LP-WUS indicating PDCCH behavior for a UE.

[0022] In some implementations of the method and apparatuses for a NE described herein, at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0023] In some implementations of the method and apparatuses for a NE described herein, the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of a connected mode DRX cycle; the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0024] In some implementations of the method and apparatuses for a NE described herein, the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle; the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; the LP-WUS configuration includes one or more of: an indication to one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; an indication to one or more of activate or deactivate LP-WUS monitoring outside of the active time of the connected mode DRX; an indication to one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; an indication to one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; an indication to

one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof.

[0025] In some implementations of the method and apparatuses for a NE described herein, the at least one processor is configured to cause the NE to transmit, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; the at least one processor is configured to cause the NE to transmit the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; the at least one processor is configured to cause the NE to transmit, to the UE, one or more of DCI or a MAC CE to activate LP-WUS monitoring; the at least one processor is configured to cause the NE to transmit, to the UE and as part of the one or more LP-WUS, an indication to resume PDCCH monitoring within a PDCCH skipping duration.

[0026] In some implementations of the method and apparatuses for a NE described herein, the indication transmitted via the LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration. In some aspects, the techniques described herein relate to a NE, the at least one processor is configured to cause the NE to transmit the one or more LP-WUS including an indication to activate a second radio of the UE for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0027] Some implementations of the method and apparatuses described herein may further include a method performed by a NE, the method including transmitting LP-WUS configuration indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected

mode DRX operation; and transmitting one or more LP-WUS during the one or more LP-WUS monitoring occasions, the LP-WUS indicating PDCCH behavior for a UE.

[0028] In some implementations of the method and apparatuses for a NE described herein, the method further comprising transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0029] In some implementations of the method and apparatuses for a NE described herein, the method further comprising transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of a connected mode DRX cycle; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS

includes an indication to wake a second radio of the UE and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0030] In some implementations of the method and apparatuses for a NE described herein, the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; the LP-WUS configuration includes one or more of: an indication to one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; an indication to one or more of activate or deactivate LP-WUS monitoring outside of the active time of the connected mode DRX; an indication to one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; an indication to one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; an indication to one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof; transmitting, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; transmitting the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; transmitting, to the UE, one or more of DCI or a MAC CE to activate LP-WUS monitoring; transmitting, to the UE and as part of the one or more LP-WUS, an indication to resume PDCCH monitoring within a PDCCH skipping duration.

[0031] In some implementations of the method and apparatuses for a NE described herein, the indication transmitted via the LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; transmitting the one or more LP-WUS including an indication to activate a second radio of the UE for one or more of reference signal transmission or

reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] Figure 1 illustrates an example of a wireless communications system in accordance with aspects of the present disclosure.

[0033] Figure 2 illustrates an example of a low power wake up radio (LP-WUR) system.

[0034] Figure 3 illustrates example scenarios for PDCCH monitoring adaptation enhancements for UE power saving in connected mode.

[0035] Figure 4 illustrates a scenario in accordance with aspects of the present disclosure.

[0036] Figure 5 illustrates an example of a UE in accordance with aspects of the present disclosure.

[0037] Figure 6 illustrates an example of a processor in accordance with aspects of the present disclosure.

[0038] Figure 7 illustrates an example of a NE in accordance with aspects of the present disclosure.

[0039] Figure 8 illustrates a flowchart of a method in accordance with aspects of the present disclosure.

[0040] Figure 9 illustrates a flowchart of a method in accordance with aspects of the present disclosure.

DETAILED DESCRIPTION

[0041] A UE and a NE, such as a base station, in a wireless communications system can communicate using time-frequency resources. In some examples, a NE may schedule communications over the one or more of the time-frequency resources via control signaling. For example, the NE may transmit signaling to the UE indicating one or more time periods during which a transmission may arrive, referred to as monitoring occasions. The NE may indicate a

periodicity of the monitoring occasions, a starting time period of the monitoring occasions, an ending time period of the monitoring occasions, and/or a duration of the monitoring occasions, among other parameters defining the monitoring occasions.

[0042] In some examples, a UE may operate with different power consumption levels in multiple power consumption modes, such as in an active mode with relatively high power consumption and an idle or inactive mode with a relatively low power consumption. A UE in a low power mode (e.g., the idle and/or inactive mode) may operate using reduced transmission and/or reception capabilities (e.g., due to reduced transmit power, energy efficient radio transceivers, low power processors, etc.), may perform energy harvesting techniques to supplement battery power, may utilize sleep modes for different components of the UE, or the like. Examples of UEs that are operable in low power modes include, but are not limited to, internet of things (IoT) devices, wearable devices, remote sensor devices, and mobile devices. In some examples, a wireless device, for example, a UE may include multiple radios, such as a radio that operates using a relatively low power consumption level, referred to as a low power radio, and a radio that operates at a relatively high power consumption level, referred to as a main radio. Further, a low power radio may be responsible for waking a main radio from a sleep mode, such as in response to different events such as a Low-Power Wake-Up Signal (LP-WUS) transmitted by a NE to a UE.

[0043] In some scenarios power saving techniques can include PDCCH skipping applicable for longer sleep duration of a main radio of a UE, such as where PDCCH skipping for 10ms allows a UE to enter light sleep state for 10ms. Further, search space switching can be applied with and without PDCCH skipping which can be applicable for a shorter duration than PDCCH skipping and allow a UE to microsleep. A UE, for instance, can be configured to monitor a search space where in a first slot the UE monitors for PDCCH and in remaining slots the UE enters microsleep such as due to data inactivity. However, configuring power-related behavior of a UE as part of PDCCH monitoring presents a number of challenges in the context of interoperability of a main radio and a low power radio of a UE in different connected mode DRX states.

[0044] Accordingly, aspects of the disclosure are directed to configuring the operation of PDCCH of a UE within an on-duration of connected mode DRX using LP-WUS signaling. For instance, a low power radio can be configured to monitor LP-WUS from NEs both outside of an active time of connected mode DRX as well as within an active time of connected mode DRX, and to wake a main radio in response to detected LP-WUS. Thus, energy conservation in wireless

communications systems can be enhanced while mitigating effects on device performance such as by reducing signal latency.

[0045] Aspects of the present disclosure are described in the context of a wireless communications system.

[0046] **Figure 1** illustrates an example of a wireless communications system 100 in accordance with aspects of the present disclosure. The wireless communications system 100 may include one or more NE 102, one or more UE 104, and a core network (CN) 106. The wireless communications system 100 may support various radio access technologies. In some implementations, the wireless communications system 100 may be a 4G network, such as an LTE network or an LTE-Advanced (LTE-A) network. In some other implementations, the wireless communications system 100 may be a NR network, such as a 5G network, a 5G-Advanced (5G-A) network, or a 5G ultrawideband (5G-UWB) network. In other implementations, the wireless communications system 100 may be a combination of a 4G network and a 5G network, or other suitable radio access technology including Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20. The wireless communications system 100 may support radio access technologies beyond 5G, for example, 6G. Additionally, the wireless communications system 100 may support technologies, such as time division multiple access (TDMA), frequency division multiple access (FDMA), or code division multiple access (CDMA), etc.

[0047] The one or more NE 102 may be dispersed throughout a geographic region to form the wireless communications system 100. One or more of the NE 102 described herein may be or include or may be referred to as a network node, a base station, a network element, a network function, a network entity, a radio access network (RAN), a NodeB, an eNodeB (eNB), a next-generation NodeB (gNB), or other suitable terminology. An NE 102 and a UE 104 may communicate via a communication link, which may be a wireless or wired connection. For example, an NE 102 and a UE 104 may perform wireless communication (e.g., receive signaling, transmit signaling) over a Uu interface.

[0048] An NE 102 may provide a geographic coverage area for which the NE 102 may support services for one or more UEs 104 within the geographic coverage area. For example, an NE 102 and a UE 104 may support wireless communication of signals related to services (e.g., voice, video, packet data, messaging, broadcast, etc.) according to one or multiple radio access technologies. In

some implementations, an NE 102 may be moveable, for example, a satellite associated with a non-terrestrial network (NTN). In some implementations, different geographic coverage areas associated with the same or different radio access technologies may overlap, but the different geographic coverage areas may be associated with different NE 102.

[0049] The one or more UEs 104 may be dispersed throughout a geographic region of the wireless communications system 100. A UE 104 may include or may be referred to as a remote unit, a mobile device, a wireless device, a remote device, a subscriber device, a transmitter device, a receiver device, or some other suitable terminology. In some implementations, the UE 104 may be referred to as a unit, a station, a terminal, or a client, among other examples. Additionally, or alternatively, the UE 104 may be referred to as an Internet-of-Things (IoT) device, an Internet-of-Everything (IoE) device, or machine-type communication (MTC) device, among other examples.

[0050] A UE 104 may be able to support wireless communication directly with other UEs 104 over a communication link. For example, a UE 104 may support wireless communication directly with another UE 104 over a device-to-device (D2D) communication link. In some implementations, such as vehicle-to-vehicle (V2V) deployments, vehicle-to-everything (V2X) deployments, or cellular-V2X deployments, the communication link may be referred to as a sidelink. For example, a UE 104 may support wireless communication directly with another UE 104 over a PC5 interface.

[0051] An NE 102 may support communications with the CN 106, or with another NE 102, or both. For example, an NE 102 may interface with other NE 102 or the CN 106 through one or more backhaul links (e.g., S1, N2, N6, or other network interface). In some implementations, the NE 102 may communicate with each other directly. In some other implementations, the NE 102 may communicate with each other indirectly (e.g., via the CN 106). In some implementations, one or more NE 102 may include subcomponents, such as an access network entity, which may be an example of an access node controller (ANC). An ANC may communicate with the one or more UEs 104 through one or more other access network transmission entities, which may be referred to as a radio heads, smart radio heads, or transmission-reception points (TRPs).

[0052] The CN 106 may support user authentication, access authorization, tracking, connectivity, and other access, routing, or mobility functions. The CN 106 may be an evolved packet core (EPC), or a 5G core (5GC), which may include a control plane entity that manages access and mobility (e.g., a mobility management entity (MME), an access and mobility

management functions (AMF)) and a user plane entity that routes packets or interconnects to external networks (e.g., a serving gateway (S-GW), a packet data network (PDN) gateway (P-GW), or a user plane function (UPF)). In some implementations, the control plane entity may manage non-access stratum (NAS) functions, such as mobility, authentication, and bearer management (e.g., data bearers, signal bearers, etc.) for the one or more UEs 104 served by the one or more NE 102 associated with the CN 106.

[0053] The CN 106 may communicate with a packet data network over one or more backhaul links (e.g., via an S1, N2, N6, or other network interface). The packet data network may include an application server. In some implementations, one or more UEs 104 may communicate with the application server. A UE 104 may establish a session (e.g., a protocol data unit (PDU) session, or the like) with the CN 106 via an NE 102. The CN 106 may route traffic (e.g., control information, data, and the like) between the UE 104 and the application server using the established session (e.g., the established PDU session). The PDU session may be an example of a logical connection between the UE 104 and the CN 106 (e.g., one or more network functions of the CN 106).

[0054] In the wireless communications system 100, the NEs 102 and the UEs 104 may use resources of the wireless communications system 100 (e.g., time resources (e.g., symbols, slots, subframes, frames, or the like) or frequency resources (e.g., subcarriers, carriers)) to perform various operations (e.g., wireless communications). In some implementations, the NEs 102 and the UEs 104 may support different resource structures. For example, the NEs 102 and the UEs 104 may support different frame structures. In some implementations, such as in 4G, the NEs 102 and the UEs 104 may support a single frame structure. In some other implementations, such as in 5G and among other suitable radio access technologies, the NEs 102 and the UEs 104 may support various frame structures (i.e., multiple frame structures). The NEs 102 and the UEs 104 may support various frame structures based on one or more numerologies.

[0055] One or more numerologies may be supported in the wireless communications system 100, and a numerology may include a subcarrier spacing and a cyclic prefix. A first numerology (e.g., μ=0) may be associated with a first subcarrier spacing (e.g., 15 kHz) and a normal cyclic prefix. In some implementations, the first numerology (e.g., μ=0) associated with the first subcarrier spacing (e.g., 15 kHz) may utilize one slot per subframe. A second numerology (e.g., μ=1) may be associated with a second subcarrier spacing (e.g., 30 kHz) and a normal cyclic

prefix. A third numerology (e.g., μ=2) may be associated with a third subcarrier spacing (e.g., 60 kHz) and a normal cyclic prefix or an extended cyclic prefix. A fourth numerology (e.g., μ=3) may be associated with a fourth subcarrier spacing (e.g., 120 kHz) and a normal cyclic prefix. A fifth numerology (e.g., μ=4) may be associated with a fifth subcarrier spacing (e.g., 240 kHz) and a normal cyclic prefix.

[0056] A time interval of a resource (e.g., a communication resource) may be organized according to frames (also referred to as radio frames). Each frame may have a duration, for example, a 10 millisecond (ms) duration. In some implementations, each frame may include multiple subframes. For example, each frame may include 10 subframes, and each subframe may have a duration, for example, a 1 ms duration. In some implementations, each frame may have the same duration. In some implementations, each subframe of a frame may have the same duration.

[0057] Additionally or alternatively, a time interval of a resource (e.g., a communication resource) may be organized according to slots. For example, a subframe may include a number (e.g., quantity) of slots. The number of slots in each subframe may also depend on the one or more numerologies supported in the wireless communications system 100. For instance, the first, second, third, fourth, and fifth numerologies (i.e., μ=0, μ=1, μ=2, μ=3, μ=4) associated with respective subcarrier spacings of 15 kHz, 30 kHz, 60 kHz, 120 kHz, and 240 kHz may utilize a single slot per subframe, two slots per subframe, four slots per subframe, eight slots per subframe, and 16 slots per subframe, respectively.#Each slot may include a number (e.g., quantity) of symbols (e.g., Orthogonal Frequency Division Multiplexing (OFDM) symbols). In some implementations, the number (e.g., quantity) of slots for a subframe may depend on a numerology. For a normal cyclic prefix, a slot may include 14 symbols. For an extended cyclic prefix (e.g., applicable for 60 kHz subcarrier spacing), a slot may include 12 symbols. The relationship between the number of symbols per slot, the number of slots per subframe, and the number of slots per frame for a normal cyclic prefix and an extended cyclic prefix may depend on a numerology. It should be understood that reference to a first numerology (e.g., μ=0) associated with a first subcarrier spacing (e.g., 15 kHz) may be used interchangeably between subframes and slots.

[0058] In the wireless communications system 100, an electromagnetic (EM) spectrum may be split, based on frequency or wavelength, into various classes, frequency bands, frequency channels, etc. By way of example, the wireless communications system 100 may support one or multiple

operating frequency bands, such as frequency range designations FR1 (410 MHz – 7.125 GHz), FR2 (24.25 GHz – 52.6 GHz), FR3 (7.125 GHz – 24.25 GHz), FR4 (52.6 GHz – 114.25 GHz), FR4a or FR4-1 (52.6 GHz – 71 GHz), and FR5 (114.25 GHz – 300 GHz). In some implementations, the NEs 102 and the UEs 104 may perform wireless communications over one or more of the operating frequency bands. In some implementations, FR1 may be used by the NEs 102 and the UEs 104, among other equipment or devices for cellular communications traffic (e.g., control information, data). In some implementations, FR2 may be used by the NEs 102 and the UEs 104, among other equipment or devices for short-range, high data rate capabilities.

[0059] FR1 may be associated with one or multiple numerologies (e.g., at least three numerologies). For example, FR1 may be associated with a first numerology (e.g., μ=0), which includes 15 kHz subcarrier spacing; a second numerology (e.g., μ=1), which includes 30 kHz subcarrier spacing; and a third numerology (e.g., μ=2), which includes 60 kHz subcarrier spacing. FR2 may be associated with one or multiple numerologies (e.g., at least 2 numerologies). For example, FR2 may be associated with a third numerology (e.g., μ=2), which includes 60 kHz subcarrier spacing; and a fourth numerology (e.g., μ=3), which includes 120 kHz subcarrier spacing.

[0060] According to implementations, one or more of the NEs 102 and the UEs 104 are operable to implement various aspects of the techniques described with reference to the present disclosure. For example, a UE 104 receives, from a NE 102, LP-WUS configuration at a first radio of the UE 104 (e.g., a low power radio) indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation of a second radio of the UE 104, e.g., a main radio. The UE 104 monitors, by the first radio of the UE 104 and based at least in part on the LP-WUS configuration, for LP-WUS during the one or more LP-WUS monitoring occasions. Further, the UE 104 controls, based at least in part on one or more LP-WUS received during the one or more LP-WUS monitoring occasions, PDCCH behavior of the second radio of the UE 104 during the active time of the connected mode DRX operation.

[0061] **Figure 2** illustrates an example of a LP-WUR system 200. The system 200 includes a UE 104 with a main radio 202 and a LP-WUR 204. A NE 102 (e.g., gNB) can transmit NR signal to

the main radio 202 and LP-WUS to the LP-WUR 204. In response to the LP-WUS the LP-WUR 204 can wake the main radio 202.

[0062] For waveform generation: Flat spectrum in frequency domain provides robustness against frequency selective fading compared to concentrated energy in frequency domain; For ON-OFF keying (OOK)-4, sequence before Discrete Fourier Transform (DFT)/LS with variation in phase via such as Zadoff–Chu (ZC), M-sequence or Quadrature Amplitude Modulation (QAM) sequence can achieve more flattened spectrum; and Knowledge of sequence(s) used in LP-WUS waveform generation may improve performance for at least a receiver with I/Q branches.

[0063] In scenarios for waveform-option-3, harmonized design can accommodate OOK-1/OOK-4 and OFDM waveform, e.g., specified overlayed OFDM sequences over OOK symbol. For Radio Resource Control (RRC) IDLE/INACTIVE, in addition to existing Primary Synchronization Signal (PSS)/ Secondary Synchronization Signal (SSS), Low Power Synchronization Signal (LP-SS) (e.g., OOK-1 and/or OOK-4 waveform with/without overlayed OFDM sequences with potential further down selection in WI phase) for LP-WUR that cannot receive existing PSS/SSS can be supported for synchronization and/or Radio Resource Management (RRM) for serving cell.

[0064] PDCCH monitoring adaptation and/or PDCCH skipping can be implemented which can be applicable for longer sleep duration, where PDCCH skipping for 10ms allows UE to enter light sleep state for 10ms. Further, search space switching with and without PDCCH skipping can be implemented which can be applicable for shorter duration allowing UE to microsleep. For instance, a UE can be configured to monitor a search space where a first slot the UE monitors for PDCCH and in a remaining 3 slots the UE enters microsleep due to data inactivity.

[0065] **Figure 3** illustrates example scenarios 300 for PDCCH monitoring adaptation enhancements for UE power saving in connected mode. The scenarios 300 include a scenario 302 for reduced PDCCH monitoring by PDCCH skipping, and a scenario 304 for reduced PDCCH monitoring by Search Space Set Group (SSSG) Switching. The scenarios 300 illustrate sections 306 where PDCCH monitoring occurs and sections 308 where PDCCH monitoring does not occur.

[0066] The present disclosure presents solutions where operation of PDCCH may be specified within the on-duration of connected mode DRX via LP-WUS signaling.

[0067] **Figure 4** illustrates a scenario 400 in accordance with aspects of the present disclosure. The scenario 400, for instance, illustrates LP-WUS monitoring during connected mode DRX active time when a PDCCH skipping duration is activated for a main radio. The scenario 400 includes operation of different radios of a UE 104 including a main radio 402 and a LP-WUR 404. Operation of the main radio 402 includes a connected mode DRX (C_DRX) active time and a PDCCH skipping duration configured by a NE 102. Further, operation of the LP-WUR 404 includes an LP-WUS block 406 where the LP-WUR 404 monitors for LP-WUS outside of the connected mode DRX active time of the main radio 402, and a LP-WUS block 408 where the LP-WUR 404 monitors for LP-WUS within the connected mode DRX active time of the main radio 402 and during the PDCCH skipping duration of the main radio 402.

[0068] Different activation options are presented as part of the scenario 400 including an activation option 410 where the NE 102 transmits an activation command via LP-WUS to the LP-WUR 404 outside of the connected mode DRX active time of the main radio 402, and an activation option 412 where the NE 102 transmits an activation command to the LP-WUR 404 within the connected mode DRX active time of the main radio 402. At 414 the LP-WUR 404 can wake the main radio 402 in a next connected mode DRX on-duration and/or active time period.

[0069] In implementations LP-WUS can be monitored outside of the active time of connected mode DRX, and the following presents some options in such scenarios where a LP-WUS may indicate:

[0070] Option 1-1: Wake up the main radio and indicate the monitoring occasions for the DCI format 2_6 – when LP-WUS and DCI with Cyclic Redundancy Check (CRC) scrambled by PS-Radio Network Temporary Identifier (RNTI) (DCP) (DCI format 2_6) are configured to be monitored, along with the indication of search space id and/or CORESET identifier to monitor the DCI format 2_6 and/or symbols within the slots to monitor PDCCH. In another implementation, the LP-WUS adapts the monitoring occasions of DCI format 2_6 monitoring outside the active time of next C_DRX cycle. In another implementation, single LP-WUS indicates the DCI format 2_6 monitoring occasions outside the active time for plurality of next DRX cycles, and such indication from single LP-WUS indicating the DCI format 2_6 monitoring occasions may be in consecutive next DRX cycles or provides a bitmap of next DRX cycles to monitor DCI format 2_6 outside active time.

[0071] Option 1-2: Wake up the main radio and indicate the C_DRX on-duration starting time slot offset and/or on-duration period in the next C_DRX and/or extension of the on-duration period by *x* time slots from the configured on-duration period in the next C_DRX cycle. In another implementation, wake up the main radio and activate the second DRX on-duration corresponding to the secondary DRX cycle. A single LP-WUS may be mapped to primary and/or secondary DRX cycles or separate LP-WUS occasions may be mapped to each primary and secondary DRX cycles. Alternatively or additionally the wake up of next primary and/or secondary DRX cycles may be indicated separately in different LP-WUS occasions or wake up of next primary and/or secondary DRX cycles in the same LP-WUS occasion.

[0072] Option 1-3: Wake up the main radio and indicate the SCell dormancy indication within the active time of C_DRX.

[0073] Option 1-4: Wake up the main radio and indicate the search space group index to monitor when the C_DRX on-duration starts in the next C_DRX cycle.

[0074] Option 1-5: Wake up the main radio to indicate the BWP id of the active serving cells (Pcell and/or Scells) to monitor within the start of the active time of the C_DRX.

[0075] Option 1-6: Wake up the main radio and indicate the PDCCH monitoring adaptation or PDCCH skipping duration activation including the starting time slot, duration, etc., when the C_DRX on-duration starts in the next C_DRX cycle.

[0076] Option 1-7: Wake up the main radio and indicate to a UE to enable reference signal transmission and/or reception of the environment and/or object for sensing, spatial beam information to be used for the sensing transmit beam and/or sensing receive beam when the C_DRX on-duration starts in the next C_DRX cycle. In an example, LP-WUS can provide the sensing slot starting offset and sensing duration within the on-duration or outside the C-DRX active of the UE. At least some implementations can also include combinations of the above options.

[0077] In at least some implementations, LP-WUS may be activated and/or deactivated to monitor LP-WUS within the active time of the C_DRX in a UE specific dedicated semi-static signaling, MAC-CE signaling, DCI signaling to MR, and/or using LP-WUS signaling to LP-WUR where LP-WUS may be configured by a NE to monitor in a monitoring occasion within the active time. Activation of the LP-WUS can occur in various ways, such as activated/deactivated explicitly,

based on entry/exit conditions determined according to a rule, and/or combinations thereof. The LP-SS measurement from LP-WUR may be transmitted to the NE when requested explicitly, periodically, and/or as part of the UE assistance information to assist the NE to determine the received signal strength of LP-WUS to activate it. LP-WUS may be activated and/or deactivated according to a rule such as where the PDCCH skipping duration for a main radio is activated within the active time and the LP-WUR measures signal quality above configured threshold, and/or MR measurement of SSB/CSI-RS above a configured threshold. The LP-WUS may be activated to perform RRM measurement within the active time and/or when the PDCCH skipping duration is activated for MR during the active time, such that RRM measurement during such time duration can be offloaded to LP-WUR to allow main radio sleep mode for power saving.

[0078] The LP-WUS could be activated to monitor LP-WUS within the active time of the C_DRX, by sending an activation/deactivation command outside the active time of the C_DRX. This could be based on the measurement performed outside the active time of the C_DRX such as SSB measurement/CSI measurement and CSI reporting performed by UE. The activation/deactivation command maybe transmitted by LP-WUS monitored outside the active time or DCI WUS format 2_6 monitored outside the active time.

[0079] In at least some implementations LP-WUS may be activated by DCI and/or by a MAC CE transmitted to the main radio within the active time of the C_DRX such as based on a CSI measurement report. In such scenarios the LP-WUS may be activated to be monitored by LP-WUR when a main radio is not monitoring PDCCH and activating the one or more monitoring occasions of LPWUR within the PDDCH skipping duration and the LP-WUS may indicate at least one or more of the following options:

[0080] Option 2-1: PDCCH monitoring can be resumed and monitoring occasions and search space group index to monitor can be indicated within the PDCCH skipping duration by an indication sent via LP-WUS. UE may resume PDCCH monitoring at least P_{switch} symbols after a slot where the indication sent to LPWUS slot. In implementations P_{switch} symbols considers the inter-processor communication delay between a LP-WUR and a main radio as well between processing latency at LP-WUR.

[0081] Option 2-2: The search space group index and/monitoring occasions to be monitored after the PDCCH skipping duration maybe indicated to the UE using LP-WUS.

[0082] Option 2-3: At the end of the PDCCH skipping duration, LP-WUS may indicate whether to continue PDCCH skipping duration and an extended duration in milliseconds, symbols, and/or slots for which to continue the PDCCH skipping.

[0083] Option 2-4: LP-WUS may activate PDCCH skipping duration and the duration value.

[0084] Option 2-5: LP-WUS may activate the second C_DRX active time duration. In another implementation, LP-WUS monitoring within the active time of the current DRX cycle may indicate to adapt the DCI 2_6 monitoring occasions before the next DRX cycle otherwise signal the presence or absence of DCI 2_6 before the next DRX cycle. In another implementation, LP-WUS monitoring within the active time of the current DRX cycle may indicate wakeup of the next DRX cycle.

[0085] Option 2-6: LP-WUS may activate the UE main radio to enable reference signal transmission and/or reception to be used for sensing and corresponding spatial beam information to be used for the sensing transmit beam and/or sensing receive beam. Implementations can also include combinations of the above options.

[0086] At least some implementations may support a plurality of LP-WUS formats and each LP-WUS format may have different payload. Further, when DCP is configured together with the LP-WUS, the RNTI of DCI format 2_6 may be used to determine the resource for the LP-WUS outside the active time of C_DRX. There may be a mapping between the LP-WUS resource occasion and the RNTI of DCI format 2_6. Further, a NE can configure and activate LP-WUS monitoring occasions for a group of UEs according to the group RNTIs. In some implementations, binary Golay spreading sequences having two phases and the sequence length may spread the LP-WUS payload modulated with the binary modulation, e.g., OOK, FSK etc., which can be suitable to multiplex plurality of LPWUS signals. Since the correlation properties of the Golay sequences are high, a plurality of LP-WUS signals may be multiplexed in the same time and/or frequency occasion but with different orthogonal spreading sequence to assist a LP-WUR to distinguish the LP-WUS from a plurality of signals without causing collision. The spreading sequence can be semi-statically configured to each of the LP-WUR and/or provided to a group of LP-WUR according to the group RNTI.

[0087] **Figure 5** illustrates an example of a UE 500 in accordance with aspects of the present disclosure. The UE 500 may include a processor 502, a memory 504, a controller 506, and a transceiver 508. The processor 502, the memory 504, the controller 506, or the transceiver 508, or

various combinations thereof or various components thereof may be examples of means for performing various aspects of the present disclosure as described herein. These components may be coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces.

[0088] The processor 502, the memory 504, the controller 506, or the transceiver 508, or various combinations or components thereof may be implemented in hardware (e.g., circuitry). The hardware may include a processor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), or other programmable logic device, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure.

[0089] The processor 502 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, or any combination thereof). In some implementations, the processor 502 may be configured to operate the memory 504. In some other implementations, the memory 504 may be integrated into the processor 502. The processor 502 may be configured to execute computer-readable instructions stored in the memory 504 to cause the UE 500 to perform various functions of the present disclosure.

[0090] The memory 504 may include volatile or non-volatile memory. The memory 504 may store computer-readable, computer-executable code including instructions when executed by the processor 502 cause the UE 500 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such as the memory 504 or another type of memory. Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A non-transitory storage medium may be any available medium that may be accessed by a general-purpose or special-purpose computer.

[0091] In some implementations, the processor 502 and the memory 504 coupled with the processor 502 may be configured to cause the UE 500 to perform one or more of the functions described herein (e.g., executing, by the processor 502, instructions stored in the memory 504). For example, the processor 502 may support wireless communication at the UE 500 in accordance with examples as disclosed herein. The UE 500 may be configured to or operable to support a means for receiving LP-WUS configuration at a first radio of the UE indicating one or more LP-WUS

monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation of a second radio of the UE; monitoring, by the first radio of the UE and based at least in part on the LP-WUS configuration, for LP-WUS during the one or more LP-WUS monitoring occasions; and controlling, based at least in part on one or more LP-WUS received during the one or more LP-WUS monitoring occasions, PDCCH behavior of the second radio of the UE during the active time of the connected mode DRX operation.

[0092] Additionally, the UE 500 may be configured to support any one or combination of receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake the second radio and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the one or more LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0093] Additionally, the UE 500 may be configured to support any one or combination of receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of the connected mode DRX; receiving the LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS

includes an indication to wake the second radio and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle; receiving the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0094] Additionally, the UE 500 may be configured to support any one or combination of where the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; one or more of: one or more of activating or deactivating LP-WUS monitoring within the active time of the connected mode DRX; one or more of activating or deactivating LP-WUS monitoring outside the active time of the connected mode DRX; one or more of activating or deactivating the LP-WUS monitoring based on an explicit indication; one or more of activating or deactivating the LP-WUS monitoring based on occurrence of at least one condition; one or more of activating or deactivating the LP-WUS monitoring based on at least one rule; or combinations thereof; receiving, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; receiving the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; activating LP-WUS monitoring within the active time of the connected mode DRX; and monitoring for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH.

[0095] Additionally, the UE 500 may be configured to support any one or combination of where the LP-WUS monitoring is activated by one or more of DCI or a MAC CE received by the second radio; activating LP-WUS monitoring within the active time of the connected mode DRX; monitoring for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; and resuming PDCCH monitoring within a PDCCH skipping duration based at least in part on an indication received via LP-WUS; the indication received via the one or more LP-WUS

further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; activating, based at least in part on the one or more LP-WUS, the second radio for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0096] Additionally, or alternatively, the UE 500 may support at least one memory (e.g., the memory 504) and at least one processor (e.g., the processor 502) coupled with the at least one memory and configured to cause the UE to receive LP-WUS configuration at a first radio of the UE indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation of a second radio of the UE; monitor, by the first radio of the UE and based at least in part on the LP-WUS configuration, for LP-WUS during the one or more LP-WUS monitoring occasions; and control, based at least in part on one or more LP-WUS received during the one or more LP-WUS monitoring occasions, PDCCH behavior of the second radio of the UE during the active time of the connected mode DRX operation.

[0097] Additionally, the UE 500 may be configured to support any one or combination of where the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake the second radio and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the one or more

LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a SCell dormancy indication with the active time of the connected mode DRX; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of the connected mode DRX.

[0098] Additionally, the UE 500 may be configured to support any one or combination of where the at least one processor is configured to cause the UE to receive the LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle; the at least one processor is configured to cause the UE to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle; the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration.

[0099] Additionally, the UE 500 may be configured to support any one or combination of where the at least one processor is configured to cause the UE to one or more of: one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; one or more of

activate or deactivate LP-WUS monitoring outside the active time of the connected mode DRX; one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof; the at least one processor is configured to cause the UE to receive, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; the at least one processor is configured to cause the UE to receive the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; the at least one processor is configured to cause the UE to: activate LP-WUS monitoring within the active time of the connected mode DRX; and monitor for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; the LP-WUS monitoring is activated by one or more of DCI or a MAC CE received by the second radio.

[0100] Additionally, the UE 500 may be configured to support any one or combination of where the at least one processor is configured to cause the UE to: activate LP-WUS monitoring within the active time of the connected mode DRX; monitor for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; and resume PDCCH monitoring within a PDCCH skipping duration based at least in part on an indication received via LP-WUS; the indication received via the one or more LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; the at least one processor is configured to cause the UE to activate, based at least in part on the one or more LP-WUS, the second radio for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0101] The controller 506 may manage input and output signals for the UE 500. The controller 506 may also manage peripherals not integrated into the UE 500. In some implementations, the controller 506 may utilize an operating system such as iOS®, ANDROID®, WINDOWS®, or other operating systems. In some implementations, the controller 506 may be implemented as part of the processor 502.

[0102] In some implementations, the UE 500 may include at least one transceiver 508. In some other implementations, the UE 500 may have more than one transceiver 508. The transceiver 508 may represent a wireless transceiver. The transceiver 508 may include one or more receiver chains 510, one or more transmitter chains 512, or a combination thereof.

[0103] A receiver chain 510 may be configured to receive signals (e.g., control information, data, packets) over a wireless medium. For example, the receiver chain 510 may include one or more antennas to receive a signal over the air or wireless medium. The receiver chain 510 may include at least one amplifier (e.g., a low-noise amplifier (LNA)) configured to amplify the received signal. The receiver chain 510 may include at least one demodulator configured to demodulate the receive signal and obtain the transmitted data by reversing the modulation technique applied during transmission of the signal. The receiver chain 510 may include at least one decoder for decoding the demodulated signal to receive the transmitted data.

[0104] A transmitter chain 512 may be configured to generate and transmit signals (e.g., control information, data, packets). The transmitter chain 512 may include at least one modulator for modulating data onto a carrier signal, preparing the signal for transmission over a wireless medium. The at least one modulator may be configured to support one or more techniques such as amplitude modulation (AM), frequency modulation (FM), or digital modulation schemes like phase-shift keying (PSK) or quadrature amplitude modulation (QAM). The transmitter chain 512 may also include at least one power amplifier configured to amplify the modulated signal to an appropriate power level suitable for transmission over the wireless medium. The transmitter chain 512 may also include one or more antennas for transmitting the amplified signal into the air or wireless medium.

[0105] **Figure 6** illustrates an example of a processor 600 in accordance with aspects of the present disclosure. The processor 600 may be an example of a processor configured to perform various operations in accordance with examples as described herein. The processor 600 may include a controller 602 configured to perform various operations in accordance with examples as described

herein. The processor 600 may optionally include at least one memory 604, which may be, for example, an L1/L2/L3 cache. Additionally, or alternatively, the processor 600 may optionally include one or more arithmetic-logic units (ALUs) 606. One or more of these components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces (e.g., buses).

[0106] The processor 600 may be a processor chipset and include a protocol stack (e.g., a software stack) executed by the processor chipset to perform various operations (e.g., receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) in accordance with examples as described herein. The processor chipset may include one or more cores, one or more caches (e.g., memory local to or included in the processor chipset (e.g., the processor 600) or other memory (e.g., random access memory (RAM), read-only memory (ROM), dynamic RAM (DRAM), synchronous dynamic RAM (SDRAM), static RAM (SRAM), ferroelectric RAM (FeRAM), magnetic RAM (MRAM), resistive RAM (RRAM), flash memory, phase change memory (PCM), and others).

[0107] The controller 602 may be configured to manage and coordinate various operations (e.g., signaling, receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) of the processor 600 to cause the processor 600 to support various operations in accordance with examples as described herein. For example, the controller 602 may operate as a control unit of the processor 600, generating control signals that manage the operation of various components of the processor 600. These control signals include enabling or disabling functional units, selecting data paths, initiating memory access, and coordinating timing of operations.

[0108] The controller 602 may be configured to fetch (e.g., obtain, retrieve, receive) instructions from the memory 604 and determine subsequent instruction(s) to be executed to cause the processor 600 to support various operations in accordance with examples as described herein. The controller 602 may be configured to track memory addresses of instructions associated with the memory 604. The controller 602 may be configured to decode instructions to determine the operation to be performed and the operands involved. For example, the controller 602 may be configured to interpret the instruction and determine control signals to be output to other components of the processor 600 to cause the processor 600 to support various operations in accordance with examples

as described herein. Additionally, or alternatively, the controller 602 may be configured to manage flow of data within the processor 600. The controller 602 may be configured to control transfer of data between registers, ALUs 606, and other functional units of the processor 600.

[0109] The memory 604 may include one or more caches (e.g., memory local to or included in the processor 600 or other memory, such as RAM, ROM, DRAM, SDRAM, SRAM, MRAM, flash memory, etc. In some implementations, the memory 604 may reside within or on a processor chipset (e.g., local to the processor 600). In some other implementations, the memory 604 may reside external to the processor chipset (e.g., remote to the processor 600).

[0110] The memory 604 may store computer-readable, computer-executable code including instructions that, when executed by the processor 600, cause the processor 600 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. The controller 602 and/or the processor 600 may be configured to execute computer-readable instructions stored in the memory 604 to cause the processor 600 to perform various functions. For example, the processor 600 and/or the controller 602 may be coupled with or to the memory 604, the processor 600, and the controller 602, and may be configured to perform various functions described herein. In some examples, the processor 600 may include multiple processors and the memory 604 may include multiple memories. One or more of the multiple processors may be coupled with one or more of the multiple memories, which may, individually or collectively, be configured to perform various functions herein.

[0111] The one or more ALUs 606 may be configured to support various operations in accordance with examples as described herein. In some implementations, the one or more ALUs 606 may reside within or on a processor chipset (e.g., the processor 600). In some other implementations, the one or more ALUs 606 may reside external to the processor chipset (e.g., the processor 600). One or more ALUs 606 may perform one or more computations such as addition, subtraction, multiplication, and division on data. For example, one or more ALUs 606 may receive input operands and an operation code, which determines an operation to be executed. One or more ALUs 606 may be configured with a variety of logical and arithmetic circuits, including adders, subtractors, shifters, and logic gates, to process and manipulate the data according to the operation. Additionally, or alternatively, the one or more ALUs 606 may support logical operations such as

AND, OR, exclusive-OR (XOR), not-OR (NOR), and not-AND (NAND), enabling the one or more ALUs 606 to handle conditional operations, comparisons, and bitwise operations.

[0112] The processor 600 may support wireless communication in accordance with examples as disclosed herein. The processor 600 may be configured to or operable to support at least one controller (e.g., the controller 602) coupled with at least one memory (e.g., the memory 604) and configured to cause the processor to receive LP-WUS configuration at a first radio of a UE indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation of a second radio of the UE; monitor, by the first radio of the UE and based at least in part on the LP-WUS configuration, for LP-WUS during the one or more LP-WUS monitoring occasions; and control, based at least in part on one or more LP-WUS received during the one or more LP-WUS monitoring occasions, PDCCH behavior of the second radio of the UE during the active time of the connected mode DRX operation.

[0113] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake the second radio and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the one or more LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0114] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of a connected mode DRX cycle; the at least one controller is configured to cause the processor to receive the LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0115] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to receive the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake the second radio and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle; the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; the at least one controller is configured to cause the processor to one or more of: one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; one or more of activate or deactivate LP-WUS monitoring outside the active time of the connected mode DRX; one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof.

[0116] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to receive, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; the at least one controller is configured to cause the processor to receive the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; the at least one controller is configured to cause the processor to: activate LP-WUS monitoring within the active time of the connected mode DRX; and monitor for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; the LP-WUS monitoring is activated by one or more of DCI or a MAC CE received by the second radio.

[0117] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to: activate LP-WUS monitoring within the active time of the connected mode DRX; monitor for the LP-WUS in one or more instances when the second radio is not monitoring PDCCH; and resume PDCCH monitoring within a PDCCH skipping duration based at least in part on an indication received via LP-WUS; the indication received via the one or more LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; the at least one controller is configured to cause the processor to activate, based at least in part on the one or more LP-WUS, the second radio for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0118] Additionally, or alternatively, the processor 600 may support wireless communication in accordance with examples as disclosed herein. The processor 600 may be configured to or operable to support at least one controller (e.g., the controller 602) coupled with at least one memory (e.g., the memory 604) and configured to cause the processor to transmit LP-WUS configuration

indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation; and transmit one or more LP-WUS during the one or more LP-WUS monitoring occasions, the LP-WUS indicating PDCCH behavior for a UE.

[0119] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; the at least one controller is configured to cause the processor to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; the at least one controller is configured to cause the processor to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0120] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of a connected mode DRX cycle; the at least one controller is configured to cause the processor to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; the at least one controller is configured to cause the processor to transmit the

one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0121] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle; the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; the LP-WUS configuration includes one or more of: an indication to one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; an indication to one or more of activate or deactivate LP-WUS monitoring outside of the active time of the connected mode DRX; an indication to one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; an indication to one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; an indication to one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof.

[0122] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the at least one controller is configured to cause the processor to transmit, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; the at least one controller is configured to cause the processor to transmit the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; the at least one controller is configured to cause the processor to transmit, to the UE, one or more of DCI or a MAC CE to activate LP-WUS monitoring; the at least one controller is configured to

cause the processor to transmit, to the UE and as part of the one or more LP-WUS, an indication to resume PDCCH monitoring within a PDCCH skipping duration.

[0123] Additionally, the processor 600 may be configured to or operable to support any one or combination of where the indication transmitted via the LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; the at least one controller is configured to cause the processor to transmit the one or more LP-WUS including an indication to activate a second radio of the UE for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0124] **Figure 7** illustrates an example of a NE 700 in accordance with aspects of the present disclosure. The NE 700 may include a processor 702, a memory 704, a controller 706, and a transceiver 708. The processor 702, the memory 704, the controller 706, or the transceiver 708, or various combinations thereof or various components thereof may be examples of means for performing various aspects of the present disclosure as described herein. These components may be coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces.

[0125] The processor 702, the memory 704, the controller 706, or the transceiver 708, or various combinations or components thereof may be implemented in hardware (e.g., circuitry). The hardware may include a processor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), or other programmable logic device, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure.

[0126] The processor 702 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, or any combination thereof). In some implementations, the processor 702 may be configured to operate the memory 704. In some other

implementations, the memory 704 may be integrated into the processor 702. The processor 702 may be configured to execute computer-readable instructions stored in the memory 704 to cause the NE 700 to perform various functions of the present disclosure.

[0127] The memory 704 may include volatile or non-volatile memory. The memory 704 may store computer-readable, computer-executable code including instructions when executed by the processor 702 cause the NE 700 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such as the memory 704 or another type of memory. Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A non-transitory storage medium may be any available medium that may be accessed by a general-purpose or special-purpose computer.

[0128] In some implementations, the processor 702 and the memory 704 coupled with the processor 702 may be configured to cause the NE 700 to perform one or more of the functions described herein (e.g., executing, by the processor 702, instructions stored in the memory 704). For example, the processor 702 may support wireless communication at the NE 700 in accordance with examples as disclosed herein. The NE 700 may be configured to or operable to support a means for transmitting LP-WUS configuration indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation; and transmitting one or more LP-WUS during the one or more LP-WUS monitoring occasions, the LP-WUS indicating PDCCH behavior for a UE.

[0129] Additionally, the NE 700 may be configured to or operable to support any one or combination of the method further comprising transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period

by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0130] Additionally, the NE 700 may be configured to or operable to support any one or combination of the method further comprising transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of a connected mode DRX cycle; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle; transmitting the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0131] Additionally, the NE 700 may be configured to or operable to support any one or combination of where the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; the LP-WUS configuration includes one or more of: an indication to one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; an indication to one or more of activate or deactivate LP-WUS monitoring

outside of the active time of the connected mode DRX; an indication to one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; an indication to one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; an indication to one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof; transmitting, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; transmitting the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; transmitting, to the UE, one or more of DCI or a MAC CE to activate LP-WUS monitoring; transmitting, to the UE and as part of the one or more LP-WUS, an indication to resume PDCCH monitoring within a PDCCH skipping duration.

[0132] Additionally, the NE 700 may be configured to or operable to support any one or combination of where the indication transmitted via the LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration; transmitting the one or more LP-WUS including an indication to activate a second radio of the UE for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0133] Additionally, or alternatively, the NE 700 may support at least one memory (e.g., the memory 704) and at least one processor (e.g., the processor 702) coupled with the at least one memory and configured to cause the NE to transmit LP-WUS configuration indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation; and transmit one or more LP-WUS during the one or more LP-WUS monitoring occasions, the LP-WUS indicating PDCCH behavior for a UE.

[0134] Additionally, the NE 700 may be configured to support any one or combination of where the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes monitoring occasions for DCI, and one or more of a search space identifier for monitoring DCI, a CORESET identifier for monitoring DCI, or symbols within slots for monitoring PDCCH; the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of an indication of a connected mode DRX on-duration starting time slot offset or an extension of a connected mode DRX on-duration period by a specified number of time slots from a configured on-duration period in a next connected mode DRX cycle; the LP-WUS further includes an indication to activate a second connected mode DRX on-duration corresponding to a next connected mode DRX cycle; the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes a SCell dormancy indication with the active time of the connected mode DRX.

[0135] Additionally, the NE 700 may be configured to support any one or combination of where the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes an indication of a search space group index to monitor in a next connected mode DRX active time of a connected mode DRX cycle; the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes a BWP identifier for one or more active serving cells to monitor within a start of the active time of the connected mode DRX; the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the one or more LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of a PDCCH monitoring adaptation of a PDCCH skipping duration activation including at least one of a starting time slot or a duration when a connected mode DRX on-duration starts in a next connected mode DRX cycle.

[0136] Additionally, the NE 700 may be configured to support any one or combination of where the at least one processor is configured to cause the NE to transmit the one or more LP-WUS outside of the active time of the connected mode DRX, and wherein the LP-WUS includes an indication to wake a second radio of the UE and further includes one or more of: an indication to enable one or more of reference signal transmission or reference beam signal reception for sensing; or spatial beam information to be used for one or more of the reference signal transmission or the reference beam signal reception when a connected mode DRX on-duration starts in a next connected mode DRX cycle; the one or more LP-WUS further includes a sensing slot starting offset and a sensing duration within one or more of a connected mode DRX on-duration or outside of the connected mode DRX on-duration; the LP-WUS configuration includes one or more of: an indication to one or more of activate or deactivate LP-WUS monitoring within the active time of the connected mode DRX; an indication to one or more of activate or deactivate LP-WUS monitoring outside of the active time of the connected mode DRX; an indication to one or more of activate or deactivate the LP-WUS monitoring based on an explicit indication; an indication to one or more of activate or deactivate the LP-WUS monitoring based on occurrence of at least one condition; an indication to one or more of activate or deactivate the LP-WUS monitoring based on at least one rule; or combinations thereof.

[0137] Additionally, the NE 700 may be configured to support any one or combination of where the at least one processor is configured to cause the NE to transmit, outside of the active time of the connected mode DRX, a command to monitor for LP-WUS within the active time of the connected mode DRX; the at least one processor is configured to cause the NE to transmit the command based at least in part on one or more measurements performed outside of the active time of the connected mode DRX, the one or more measurements including at least one of SSB measurement, CSI measurement, or measurement pertaining to CSI reporting; the at least one processor is configured to cause the NE to transmit, to the UE, one or more of DCI or a MAC CE to activate LP-WUS monitoring; the at least one processor is configured to cause the NE to transmit, to the UE and as part of the one or more LP-WUS, an indication to resume PDCCH monitoring within a PDCCH skipping duration.

[0138] Additionally, the NE 700 may be configured to support any one or combination of where the indication transmitted via the LP-WUS further includes a search space group index for the PDCCH monitoring, the search space group index occurring at least a specified number of symbols

after a slot where a timer expires; the one or more LP-WUS includes an indication of whether, at an end of the PDCCH skipping duration, to continue the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate the PDCCH skipping duration and a duration value for the PDCCH skipping duration; the one or more LP-WUS includes an indication to activate a second connected mode DRX active time duration. In some aspects, the techniques described herein relate to a NE, the at least one processor is configured to cause the NE to transmit the one or more LP-WUS including an indication to activate a second radio of the UE for one or more of reference signal transmission or reference signal reception for sensing; the one or more LP-WUS includes spatial beam information for the one or more of reference signal transmission or reference signal reception.

[0139] The controller 706 may manage input and output signals for the NE 700. The controller 706 may also manage peripherals not integrated into the NE 700. In some implementations, the controller 706 may utilize an operating system such as iOS®, ANDROID®, WINDOWS®, or other operating systems. In some implementations, the controller 706 may be implemented as part of the processor 702.

[0140] In some implementations, the NE 700 may include at least one transceiver 708. In some other implementations, the NE 700 may have more than one transceiver 708. The transceiver 708 may represent a wireless transceiver. The transceiver 708 may include one or more receiver chains 710, one or more transmitter chains 712, or a combination thereof.

[0141] A receiver chain 710 may be configured to receive signals (e.g., control information, data, packets) over a wireless medium. For example, the receiver chain 710 may include one or more antennas to receive a signal over the air or wireless medium. The receiver chain 710 may include at least one amplifier (e.g., a low-noise amplifier (LNA)) configured to amplify the received signal. The receiver chain 710 may include at least one demodulator configured to demodulate the receive signal and obtain the transmitted data by reversing the modulation technique applied during transmission of the signal. The receiver chain 710 may include at least one decoder for decoding the demodulated signal to receive the transmitted data.

[0142] A transmitter chain 712 may be configured to generate and transmit signals (e.g., control information, data, packets). The transmitter chain 712 may include at least one modulator for modulating data onto a carrier signal, preparing the signal for transmission over a wireless medium.

The at least one modulator may be configured to support one or more techniques such as amplitude modulation (AM), frequency modulation (FM), or digital modulation schemes like phase-shift keying (PSK) or quadrature amplitude modulation (QAM). The transmitter chain 712 may also include at least one power amplifier configured to amplify the modulated signal to an appropriate power level suitable for transmission over the wireless medium. The transmitter chain 712 may also include one or more antennas for transmitting the amplified signal into the air or wireless medium.

[0143] **Figure 8** illustrates a flowchart of a method 800 in accordance with aspects of the present disclosure. The operations of the method may be implemented by a UE as described herein. In some implementations, the UE may execute a set of instructions to control the function elements of the UE to perform the described functions. It should be noted that the method described herein describes a possible implementation, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible.

[0144] At 802, the method may include receiving LP-WUS configuration at a first radio of a UE indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation of a second radio of the UE. The operations of 802 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 802 may be performed by a UE as described with reference to Figure 5.

[0145] At 804, the method may include monitoring, by the first radio of the UE and based at least in part on the LP-WUS configuration, for LP-WUS during the one or more LP-WUS monitoring occasions. The operations of 804 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 804 may be performed by a UE as described with reference to Figure 5.

[0146] At 806, the method may include controlling, based at least in part on one or more LP-WUS received during the one or more LP-WUS monitoring occasions, PDCCH behavior of the second radio of the UE during the active time of the connected mode DRX operation. The operations of 806 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 806 may be performed a UE as described with reference to Figure 5.

[0147] **Figure 9** illustrates a flowchart of a method 900 in accordance with aspects of the present disclosure. The operations of the method may be implemented by a NE as described herein. In some implementations, the NE may execute a set of instructions to control the function elements of the NE to perform the described functions. It should be noted that the method described herein describes a possible implementation, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible.

[0148] At 902, the method may include transmitting LP-WUS configuration indicating one or more LP-WUS monitoring occasions for connected mode DRX operation outside of an active time of the connected mode DRX operation and within the active time of the connected mode DRX operation. The operations of 902 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 902 may be performed by a NE as described with reference to Figure 7.

[0149] At 904, the method may include transmitting one or more LP-WUS during the one or more LP-WUS monitoring occasions, the LP-WUS indicating PDCCH behavior for a UE. The operations of 904 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 904 may be performed by a NE as described with reference to Figure 7.

[0150] The description herein is provided to enable a person having ordinary skill in the art to make or use the disclosure. Various modifications to the disclosure will be apparent to a person having ordinary skill in the art, and the generic principles defined herein may be applied to other variations without departing from the scope of the disclosure. Thus, the disclosure is not limited to the examples and designs described herein but is to be accorded the broadest scope consistent with the principles and novel features disclosed herein.