

WHAT IS CLAIMED IS:

1. A method comprising:

receiving, at a first device and from a second device, information indicating one or more occasions configured for detection of physical downlink control channel (PDCCH) transmission carrying a wake-up indication;

determining, based on transmission information available at a first time point, whether a predetermined number of the one or more occasions overlap with active time of the first device, wherein the predetermined number of the one or more occasions are after the first time point;

generating a configuration for transmitting uplink information based on the determination; and

transmitting the uplink information to the second device based on the configuration.

2. The method of claim 1, wherein the transmission information available at the first time point comprises at least one of the following: a grant, an assignment, a discontinuous reception (DRX) command medium access control (MAC) control element (CE), a long DRX command MAC CE, and a scheduling request.

3. The method of claim 1, wherein the PDCCH transmission is addressed to a power saving radio network temporary identifier.

4. The method of claim 1, further comprising:

determining at the first time point whether the first device is/will be in active time at the time of the predetermined number of the one or more occasions;

in accordance with a determination that the first device is/will be in active time, determining to skip monitoring the predetermined number of the one or more occasions; or

in accordance with a determination that the first device will not be/is not in active time, determining to monitor the predetermined number of the one or more occasions.

5. The method of claim 1, wherein transmitting the uplink information to the second device comprises:

in accordance with the determination that the predetermined number of the one or more occasions overlap with the active time of the first device,

~~—transmitting the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running.~~

6. The method of claim 1, wherein transmitting the uplink information to the second device comprises:

~~in accordance with the determination that the predetermined number of the one or more occasions are not overlapping with the active time of the first device, transmitting the uplink information based on a second configuration associated with a discontinuous reception on duration timer not being running.~~

7. The method of claim 1, wherein transmitting the uplink information to the second device comprises:

~~in accordance with the determination that the predetermined number of the one or more occasions are not overlapping with the active time of the first device,~~

~~—monitoring the PDCCH transmission during the predetermined number of the one or more occasions;~~

~~—in accordance with a determination that the first device does not detect the PDCCH transmission, transmitting the uplink information based on a second configuration associated with a discontinuous reception on duration timer not being running; and~~

~~—in accordance with a determination that the first device detects the PDCCH transmission, transmitting the uplink information based on the detected PDCCH transmission.~~

8. The method of claim 1, wherein transmitting the uplink information to the second device comprises:

~~in accordance with the determination that the predetermined number of the one or more occasions are not overlapping with the active time of the first device,~~

~~—monitoring the PDCCH transmission during the predetermined number of the one or more occasions;~~

~~—in accordance with a determination that the first device does not detect the PDCCH transmission,~~

~~determining to start a discontinuous reception on duration timer;~~

~~transmitting the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running; and~~

~~——in accordance with a determination that the first device detects the PDCCH transmission, transmitting the uplink information based on the detected PDCCH transmission.~~

9. The method of claim 1, wherein transmitting the uplink information to the second
5 device comprises:

~~in accordance with a determination that information transmitted in the one or more occasions is the same and that at least one of the one or more occasions does not overlap with the active time of the first device,~~

~~detecting at least one PDCCH transmission during the at least one non-overlapping
10 occasion; and~~

~~transmitting the uplink information to the second device based on the detected at least one PDCCH transmission.~~

10. The method of claim 1, wherein transmitting the uplink information to the second
15 device comprises:

~~in accordance with a determination that the information transmitted in the one or more occasions is allowed to be different and that the predetermined number of the one or more occasions overlap with the active time of the first device, transmitting the uplink information based on a first configuration associated with a discontinuous reception on duration timer
20 being running.~~

11. The method of claim 1, wherein the predetermined number of the one or more occasions is based on at least one of the following: a configuration from the network second, whether the information in the one or more occasions is the same, whether it is allowed to be
25 different, or a pre-determined value.

12. The method of claim 1, wherein the active time comprises at least one of: Active Time associated a discontinuous reception (DRX) cycle, a bandwidth part switch gap, or a measurement gap.
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13. The method of any one of claims 1-12, wherein the first device comprises a terminal device and the second device comprises a network device.

~~14. —A method comprising:~~

~~determining, at a second device, one or more occasions configured for detection of physical downlink control channel (PDCCH) transmission carrying a wake up indication;~~

~~transmitting to a first device information indicating the one or more occasions;~~

~~determining whether the first device is expected to monitor a predetermined number of the one or more occasions based on transmission information available at the first device at a first time point, wherein the predetermined number of the one or more occasions are after the first time point; and~~

~~receiving uplink information from the first device based on a configuration which is determined based on whether the first device is expected to monitor the predetermined number of the at least one occasion.~~

~~15. The method of claim 14, wherein receiving the uplink information from the first device comprises:~~

~~in accordance with a determination that the predetermined number of the one or more occasions overlap with the active time of the first device, receiving the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running.~~

~~16. The method of claim 14, wherein receiving the uplink information from the first device comprises:~~

~~in accordance with a determination that the predetermined number of the one or more occasions are not overlapping with the active time of the first device, receiving the uplink information from the first device based on the non-overlapping occasions.~~

~~17. The method of claim 14, wherein receiving the uplink information from the first device comprises:~~

~~in accordance with a determination that information transmitted in the one or more occasions is the same and that at least one of the one or more occasions are not overlapping with the active time of the first device, receiving the uplink information from the first device based on the non-overlapping at least one occasion.~~

~~18. The method of claim 14, wherein receiving the uplink information from the first device comprises:~~

~~in accordance with a determination that information transmitted in the one or more occasions is allowed to be different and that the predetermined number of the one or more occasions overlap with the active time of the first device, receiving the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running.~~

~~19. The method of claim 14, wherein receiving the uplink information comprises:
in accordance with the determination that the predetermined number of the one or more occasions are not overlapping with the active time of the first device, receiving the uplink information based on a second configuration associated with a discontinuous reception on duration timer not being running.~~

~~20. The method of claim 14, wherein receiving the uplink information comprises:
in accordance with the determination that the predetermined number of the one or more occasions are not overlapping with the active time of the first device and a determination that the first device does not detect the PDCCH transmission on the non-overlapping occasions, receiving the uplink information based on a second configuration associated with a discontinuous reception on duration timer not being running; and
— in accordance with a determination that the first device detects at least one PDCCH transmission on the non-overlapping occasions, receiving the uplink information based on the detected at least one PDCCH transmission.~~

~~21. The method of any one of claims 14-20, wherein the active time comprises at least one of: Active Time associated a discontinuous reception (DRX) cycle, a bandwidth part switch gap, or a measurement gap.~~

~~22. The method of any one of claims 14-20, wherein the first device comprises a terminal device and the second device comprises a network device.~~

~~23. — A first device comprising:
at least one processor; and
at least one memory including computer program codes;
the at least one memory and the computer program codes are configured to, with the~~

at least one processor, cause the first device to perform the method of any one of claims 1-13.

24. — A second device comprising:

at least one processor; and

at least one memory including computer program codes;

the at least one memory and the computer program codes are configured to, with the at least one processor, cause the second device to perform the method of any one of claims 14-22.

25. — An apparatus comprising means for performing a method according to any of claims 1-13.

26. — An apparatus comprising means for performing a method according to any of claims 14-22.

27. A computer program product that is stored on a computer readable medium and includes machine executable instructions, wherein the machine executable instructions, when being executed, cause the machine to perform the method of any one of claims 1-13.

28. A computer program product that is stored on a computer readable medium and includes machine executable instructions, wherein the machine executable instructions, when being executed, cause the machine to perform the method of any one of claims 14-22.

29. — A computer readable storage medium comprising program instructions stored thereon, the instructions, when executed by an apparatus, causing the apparatus to perform the method of any one of claims 1-13.

30. A computer readable storage medium comprising program instructions stored thereon the instructions, when executed by an apparatus, causing the apparatus to perform the method of any one of claims 14-22.

1. An apparatus, comprising:

at least one processor; and

at least one memory including computer program code;

the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least to:

receive, from a network, information indicating one or more occasions for detection of physical downlink control channel (PDCCH) transmission carrying a wake-up indication;

determine, based on reception of signaling indicating the apparatus to end active time, to start a predetermined time duration, wherein the apparatus does not monitor for any of the one or more occasions until after the end of the predetermined time duration;

determine, depending on whether at least one of the one or more occasions occurs after the predetermined time duration, a configuration for transmitting uplink information; and

transmit the uplink information to the network based on the configuration.

2. The apparatus of claim 1, wherein the signaling indicating to end the active time comprises at least one of the following: a discontinuous reception (DRX) command medium access control (MAC) control element (CE) or a long DRX command MAC CE.

3. The apparatus of claim 1, wherein the PDCCH transmission is addressed to a power saving radio network temporary identifier.

4. The apparatus of claim 1, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus further to:

determine whether the apparatus is/will be in active time at the time of the one or more occasions; and

in accordance with a determination that the apparatus is/will be in active time, determining to skip monitoring the one or more occasions; or

in accordance with a determination that the apparatus will not be/is not in active time, determining to monitor the one or more occasions.

5. The apparatus of claim 1, wherein transmitting the uplink information to the network comprises:

in accordance with the determination that all of the one or more occasions overlap the predetermined time duration.

transmitting the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running.

6. The apparatus of claim 1, wherein transmitting the uplink information to the network comprises:

in accordance with the determination that at least one of the one or more occasions is not overlapping the predetermined time duration,

monitoring the PDCCH transmission during the at least one non-overlapping occasion of the one or more occasions; and

in accordance with a determination that the apparatus does not detect the PDCCH transmission carrying the wake-up indication to the apparatus during the at least one non-overlapping occasion, transmitting the uplink information based on a second configuration associated with a discontinuous reception on duration timer not being running; or

in accordance with a determination that the apparatus detects the PDCCH transmission carrying the wake-up indication to the apparatus during the at least one non-overlapping occasion, transmitting the uplink information based on the detected PDCCH transmission.

7. The apparatus of claim 1, wherein transmitting the uplink information to the network comprises:

in accordance with the determination that all of the one or more occasions are not overlapping with the predetermined time duration,

monitoring the PDCCH transmission during the at least one non-overlapping occasion of the one or more occasions; and

in accordance with a determination that the apparatus does not detect the PDCCH transmission carrying the wake-up indication to the apparatus, determining to start a discontinuous reception on duration timer, and transmitting the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running; or

in accordance with a determination that the apparatus detects the PDCCH transmission carrying the wake-up indication to the apparatus during the at least one non-overlapping occasion, transmitting the uplink information based on the detected PDCCH transmission.

8. The apparatus of claim 1, wherein transmitting the uplink information to network comprises:

in accordance with a determination that information transmitted in the one or more occasions is the same and that at least one of the one or more occasions does not overlap the predetermined time duration,

detecting at least one PDCCH transmission carrying the wake-up indication to the apparatus during the at least one non-overlapping occasion; and

transmitting the uplink information to the network based on the detected at least one PDCCH transmission.

9. The apparatus of claim 1, wherein transmitting the uplink information to the network comprises:

in accordance with a determination that the information transmitted in the one or more occasions is allowed to be different and that at least one of the one or more occasions overlaps with the predetermined time duration, transmitting the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running.

10. The apparatus of claim 1, wherein the active time comprises at least one of: Active Time associated a discontinuous reception cycle, a bandwidth part switch gap, or a measurement gap.

11. The apparatus of any of claims 1 to 10, wherein the predetermined time duration overlaps active time of the apparatus.

12. The apparatus of any of claims 1 to 11, wherein the predetermined time duration corresponds to ambiguity time between the apparatus and the network, the ambiguity being related to the network not knowing the exact time when the apparatus has decoded the signaling.

13. The apparatus of any of claims 1 to 12, wherein the predetermined time duration corresponds to 4 milliseconds.

14. The apparatus of claim 1, wherein transmitting the uplink information to the network comprises: in accordance with a determination that all of the one or more occasions

in time domain occur in active time, which is overlapping with the predetermined time duration, considering grants, assignments, DRX Command MAC CE, Long DRX Command MAC CE received and scheduling request sent until 4ms prior to start of the last of the one or more occasions, or within bandwidth part switching interruption length, or during a measurement gap, transmitting the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running.

15. The apparatus of any one of claims 1 to 14, wherein the apparatus comprises a terminal device.

16. An apparatus, comprising:
at least one processor; and
at least one memory including computer program code;
the at least one memory and the computer program code are configured to, with the
at least one processor, cause the apparatus at least to:
determine one or more occasions configured for detection of physical downlink control channel (PDCCH) transmission carrying a wake-up indication;
transmit to a user equipment information indicating the one or more occasions;
determine whether the user equipment is expected to monitor any of the one or more occasions based on signaling indicating the user equipment to end active time, the signaling starting a predetermined time duration, wherein any of the one or more occasions are not monitored until after the end of the predetermined time duration; and
receive uplink information from the user equipment based on a configuration which is determined based on whether the user equipment is expected to monitor any of the at least one occasion.

17. The apparatus of claim 16, wherein receiving the uplink information from the user equipment comprises:

in accordance with a determination that all of the one or more occasions overlap the predetermined time duration, receive the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running.

18. The apparatus of claim 16, wherein receiving the uplink information from the user equipment comprises:

in accordance with a determination that at least one of the one or more occasions is not overlapping the predetermined time duration, receive the uplink information from the user equipment based on the non-overlapping at least one occasion.

5 19. The apparatus of claim 16, wherein receiving the uplink information from the user equipment comprises:

in accordance with a determination that information transmitted in the one or more occasions is the same and that at least one of the one or more occasions is not overlapping with the predetermined time duration, receive the uplink information from the user equipment
10 based on the non-overlapping at least one occasion.

20. The apparatus of claim 16, wherein receiving the uplink information from the user equipment comprises:

in accordance with a determination that information transmitted in the one or more
15 occasions is allowed to be different and that at least one of the one or more occasions overlaps with the predetermined time duration, receive the uplink information based on a first configuration associated with a discontinuous reception on duration timer being running.

21. The apparatus of claim 16, wherein receiving the uplink information from the user
20 equipment comprises:

in accordance with the determination that at least one of the one or more occasions is not overlapping with the predetermined time duration, receive the uplink information based on a second configuration associated with a discontinuous reception on duration timer not
25 being running.

22. The apparatus of claim 16, wherein receiving the uplink information from the user equipment comprises:

in accordance with the determination that at least one of the one or more occasions is not overlapping with the predetermined time duration; and

30 in accordance with a determination that the user equipment does not detect the PDCCH transmission carrying the wake-up indication to the user equipment on the non-overlapping at least one occasion, receive the uplink information based on a second configuration associated with a discontinuous reception on duration timer not being running;
or

in accordance with a determination that the user equipment detects at least one PDCCH transmission carrying the wake-up indication to the user equipment on the non-overlapping at least one occasion, receive the uplink information based on the detected at least one PDCCH transmission.

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23. The apparatus of any one of claims 16 to 22, wherein the active time comprises at least one of: Active Time associated a discontinuous reception (DRX) cycle, a bandwidth part switch gap, or a measurement gap.

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24. The apparatus of any of claims 16 to 23, wherein the predetermined time duration overlaps active time of the user equipment.

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25. The apparatus of any of claims 16 to 24, wherein the predetermined time duration corresponds to ambiguity time between the apparatus and the user equipment, the ambiguity being related to the apparatus not knowing the exact time when the user equipment has decoded the signaling.

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26. The apparatus of any of claims 16 to 25, wherein the predetermined time duration corresponds to 4 milliseconds.

27. The apparatus of any one of claims 16 to 26, wherein the apparatus comprises a network device.

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28. A method at a user equipment, comprising:
receiving, from a network, information indicating one or more occasions for detection of physical downlink control channel (PDCCH) transmission carrying a wake-up indication;
determining, based on reception of signaling indicating the apparatus to end active time, to start a predetermined time duration, wherein the apparatus does not monitor for any of the one or more occasions until after the end of the predetermined time duration;

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determining, depending on whether at least one of the one or more occasions occurs after the predetermined time duration, a configuration for transmitting uplink information;
and

transmitting the uplink information to the network based on the configuration.

29. A method at a network device, comprising:
determining one or more occasions configured for detection of physical downlink
control channel (PDCCH) transmission carrying a wake-up indication;
transmitting to a user equipment information indicating the one or more occasions;
5 determining whether the user equipment is expected to monitor any of the one or more
occasions based on signaling indicating the user equipment to end active time, the signaling
starting a predetermined time duration, wherein any of the one or more occasions are not
monitored until after the end of the predetermined time duration; and
receiving uplink information from the user equipment based on a configuration which
10 is determined based on whether the user equipment is expected to monitor any of the at least
one occasion.

30. An apparatus comprising means for performing a method according to claim 28
or 29.

31. A computer program product that is stored on a computer readable medium and
includes machine-executable instructions, wherein the machine-executable instructions,
when being executed, cause the machine to perform the method of claim 28 or 29.

32. A computer program product that is stored on a computer readable medium and
includes machine-executable instructions, wherein the machine-executable instructions,
when being executed, cause the machine to perform the method of claim 28 or 29.

33. A computer readable storage medium comprising program instructions stored
25 thereon, the instructions, when executed by an apparatus, causing the apparatus to perform
the method of claims 28 or 29.

34. A computer readable storage medium comprising program instructions stored
thereon the instructions, when executed by an apparatus, causing the apparatus to perform
30 the method of claim 28 or 29.