

CELL OFF INDICATION VIA DOWNLINK CONTROL INFORMATION

FIELDS

5 [0001] Various example embodiments of the present disclosure generally relate to the field of telecommunication and in particular, to methods, devices, apparatuses and computer readable storage medium for cell off indication via downlink control information (DCI).

BACKGROUND

10 [0002] Network energy saving (NES) is a hot topic in communication field. For example, cell DTX/DRX is proposed at network device side in order to save power at the network device. Cell DTX/DRX configuration can be activated/deactivated by a group-common Downlink Control Information (DCI) message or via higher layer configurations. Furthermore, a cell off for entering NES mode with triggering of conditional handover
15 (CHO) is also proposed to save power at the network side. Thus, how to activate or deactivate the cell off for entering NES mode with triggering of CHO needs to be studied.

SUMMARY

[0003] In a first aspect of the present disclosure, there is provided a first apparatus. The first apparatus comprises at least one processor; and at least one memory comprising
20 instructions stored thereon that, when executed by the at least one processor, cause the first apparatus to perform as least: receiving, from a second apparatus, first downlink control information in a predefined downlink control information format, wherein the first downlink control information comprises a first indication regarding whether a cell off for entering a network energy saving mode is activated; receiving, from the second apparatus,
25 second downlink control information in the predefined downlink control information format, wherein the second downlink control information comprises a second indication regarding whether a cell discontinuous operation is activated, the cell discontinuous operation comprises at least one of: a cell discontinuous

transmission or a cell discontinuous reception, wherein the first downlink control information and the second downlink control information are comprised in the same downlink control information message of the predefined downlink control information format, and wherein the downlink control information message has a bit block for each
5 serving cell of the first apparatus, wherein a bit block for a primary cell has different bit fields in the predefined downlink control information format for the first indication and for the

second indication, and wherein a bit block for a secondary cell in the downlink control information format has the second indication but not the first indication.

[0004] In a second aspect of the present disclosure, there is provided a second apparatus.

The second apparatus comprises at least one processor; and at least one memory

5 comprising instructions stored thereon that, when executed by the at least one processor, cause the second apparatus to perform at least: transmitting, to a first apparatus, first downlink control information in a predefined downlink control information format, wherein the first downlink control information comprises a first indication regarding whether a cell off for entering a network energy saving mode is activated; transmit, to the
10 first apparatus, second downlink control information in the predefined downlink control information format, wherein the second downlink control information comprises a second indication regarding whether a cell discontinuous operation is activated, and transmitting, to the first apparatus, second downlink control information in the predefined downlink control information format, wherein the second downlink control information comprises
15 a second indication regarding whether a cell discontinuous operation is activated, the cell discontinuous operation comprises at least one of: a cell discontinuous transmission or a cell discontinuous reception, wherein the first downlink control information and the second downlink control information are comprised in the same downlink control information message of the predefined downlink control information format, and wherein
20 the downlink control information message has a bit block for each serving cell of the first apparatus, wherein a bit block for a primary cell has different bit fields in the predefined downlink control information format for the first indication and for the second indication, and wherein a bit block for a secondary cell in the downlink control information format has the second indication but not the first indication.

[0005] In a third aspect of the present disclosure, there is provided a method. The method comprises: receiving, from a second apparatus, first downlink control information in a predefined downlink control information format, wherein the first downlink control
5 information comprises a first indication regarding whether a cell off for entering a network energy saving mode is activated; receiving, from the second apparatus, second downlink control information in the predefined downlink control information format, wherein the second downlink control information comprises a second indication regarding whether a cell discontinuous operation is activated, the cell discontinuous operation comprises at
10 least one of: a cell discontinuous transmission or a cell discontinuous reception, wherein the first downlink control information and the second downlink control information are comprised in the same downlink control information message of the predefined downlink control information format, and wherein the downlink control information message has a bit block for each serving cell of the first apparatus, wherein a bit block for a primary
15 cell has different bit fields in the predefined downlink control information format for the first indication and for the second indication, and wherein a bit block for a secondary cell in the downlink control information format has the second indication but not the first indication.

[0006] In an example of the present disclosure, there is provided a method. The

method comprises: transmitting, to a first apparatus, first downlink control information in a predefined downlink control information format, wherein the first downlink control information comprises a first indication regarding whether a cell off for entering a network energy saving mode is activated; transmitting, to the first apparatus, second downlink control information in the predefined downlink control information format, wherein the second downlink control information comprises a second indication regarding whether a cell discontinuous operation is activated, the cell discontinuous operation comprises at least one of: a cell discontinuous transmission or a cell discontinuous reception, and wherein different bit fields in the predefined downlink control information format are used for the first indication and for the second indication, or wherein the same bit field is in the predefined downlink control information format is used for the first indication and for the second indication with a flag indicating whether the bit field comprises the first indication or the second indication.

[0007] In an example of the present disclosure, there is provided a first apparatus. The first apparatus comprises means for receiving, from a second apparatus, first downlink control information in a predefined downlink control information format, wherein the first downlink control information comprises a first indication regarding whether a cell off for entering a network energy saving mode is activated; means for receiving, from the second apparatus, second downlink control information in the predefined downlink control information format, wherein the second downlink control information comprises a second indication regarding whether a cell discontinuous operation is activated, the cell discontinuous operation comprises at least one of: a cell discontinuous transmission or a cell discontinuous reception, and wherein different bit fields in the predefined downlink control information format are used for the first indication and for the second indication, or wherein the same bit field is in the predefined downlink control information format is used for the first indication and for the second indication with a flag indicating whether the bit field comprises the first indication or the second indication.

[0008] In an example of the present disclosure, there is provided a second apparatus. The second apparatus comprises means for transmitting, to a first apparatus, first downlink control information in a predefined downlink control information format, wherein the first downlink control information comprises a first indication regarding whether a cell off for entering a network energy saving mode is activated; means for transmitting, to the first apparatus, second downlink control information in the predefined downlink control

information format, wherein the second downlink control information comprises a second indication regarding whether a cell discontinuous operation is activated, the cell discontinuous operation comprises at least one of: a cell discontinuous transmission or a cell discontinuous reception, and wherein different bit fields in the predefined downlink control information format are used for the first indication and for the second indication, or wherein the same bit field in the predefined downlink control information format is used for the first indication and for the second indication with a flag indicating whether the bit field comprises the first indication or the second indication.

[0009] In an example of the present disclosure, there is provided a computer readable medium. The computer readable medium comprises instructions stored thereon for causing an apparatus to perform at least the method according to the third aspect.

[0010] In an example of the present disclosure, there is provided a computer readable medium. The computer readable medium comprises instructions stored thereon for causing an apparatus to perform at least the method according to the fourth aspect.

[0011] It is to be understood that the Summary section is not intended to identify key or essential features of embodiments of the present disclosure, nor is it intended to be used to limit the scope of the present disclosure. Other features of the present disclosure will become easily comprehensible through the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Some example embodiments will now be described with reference to the accompanying drawings, where:

[0013] FIG. 1 illustrates an example communication environment in which example embodiments of the present disclosure can be implemented;

[0014] FIG. 2 illustrates a signaling chart for cell off for entering NES according to example embodiments of the present disclosure;

[0015] FIG. 3A to FIG. 3H illustrate schematic diagrams of downlink control information (DCI) formats according to example embodiments of the present disclosure, respectively;

[0016] FIG. 4 illustrates a flowchart of a method implemented at a first device according to some example embodiments of the present disclosure;