ENHANCED CSI REPORTING ACTIVATION/DEACTIVATION OPERATION

FIELD

[0001] Example embodiments of the present disclosure generally relate to the field of communication, and in particular, to a terminal device, a network device, methods, apparatuses, and a computer readable medium for enhanced channel state information (CSI) activation/deactivation operation.

BACKGROUND

[0002] Network energy saving is of great importance for environmental sustainability, to reduce environmental impact (greenhouse gas emissions), and for operational cost saving. As new radio (NR), also known as fifth-generation technology standard for broadband cellular networks (5G), is becoming pervasive across industries and geographical areas, handling more advanced services and applications requiring very high data rates, networks are being denser, use more antennas, larger bandwidths and more frequency bands, which means an increasing energy consumption.

[0003] Therefore, the environmental impact of 5G and the operational operating expense need to stay under control, and improved solutions for energy saving in 5G need to be further investigated and studied.

SUMMARY

[0004] In general, example embodiments of the present disclosure provide solutions for enhanced channel state information (CSI) activation/deactivation operation.

[0005] In a first aspect, there is provided a terminal device. The terminal device comprises at least one processor and at least one memory storing instructions that, when executed by the at least one processor, cause the terminal device at least to: receive a medium access control (MAC) control element (MAC CE) comprising an octet including multiple fields, wherein the multiple fields indicate a respective activation or deactivation status of multiple channel state information (CSI) report configurations, wherein each CSI report configuration comprises a respective plurality of sub-configurations, and wherein, if a respective CSI report configuration of the multiple

CSI report configurations has an activation status, the MAC CE comprises a respective further octet including at least one further field, wherein the at least one further field indicates an activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration; and if the respective CSI report configuration of the multiple CSI report configurations has a deactivation status, the MAC CE does not comprise the respective further octet; and determine, if the respective CSI report configuration of the multiple CSI report configurations has an activation status, the activation or deactivation status of the at least one of the plurality of sub-configurations of the respective CSI report configuration at least based on the at least one further field of the MAC CE.

[0006] In a second aspect, there is provided a network device. The network device comprises at least one processor and at least one memory storing instructions that, when executed by the at least one processor, cause the network device at least to: generate a medium access control (MAC) control element (MAC CE) comprising an octet including multiple fields, wherein the multiple fields indicate a respective activation status or deactivation status of multiple field for a channel state information (CSI) report configurations, wherein each CSI report configuration of the multiple CSI report configurations comprises a respective plurality of sub-configurations; and wherein, if a respective CSI report configuration of the multiple CSI report configurations has an activation status, the MAC CE comprises a respective further octet including at least one further field, wherein the at least one further field indicates an activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration; and if the respective CSI report configuration of the multiple CSI report configurations has a deactivation status, the MAC CE does not comprise the respective further octet; and transmit the MAC CE to a terminal device.

[0007] In a third aspect, there is provided a method. The method comprises: receiving, at a terminal device, a medium access control (MAC) control element (MAC CE) comprising an octet including multiple fields, wherein the multiple fields indicate a respective activation or deactivation status of multiple channel state information (CSI) report configurations, wherein each CSI report configuration of the multiple CSI report configurations comprises a respective plurality of sub-configurations and wherein, if a respective CSI report configuration of the multiple CSI report configurations has an activation status, the MAC CE comprises a respective further octet including at least one further field, wherein the at least one further field indicates an activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration; and if the respective CSI report configuration of the multiple CSI report configurations has a deactivation status, the MAC CE does not comprise the respective further octet; and determining, if the respective CSI report configuration of the multiple CSI report configurations has an activation status, activation or deactivation of at least one of the plurality of sub-configurations of the respective CSI report configuration at least based on the at least one field in the MAC CE.

[0008] In a fourth aspect, there is provided a method. The method comprises: generating, at a network device, a medium access control (MAC) control element (MAC CE)

comprising an octet including multiple fields, wherein the multiple fields indicate a respective activation status of deactivation status of multiple channel state information (CSI) report configurations wherein each CSI report configuration of the multiple CSI report configurations comprises a respective plurality of sub-configurations; and wherein, if a respective CSI report configuration of the multiple CSI report configurations has an activation status, the MAC CE comprises a respective further octet including at least one further field, wherein the at least one further field indicates an activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration; and if the respective CSI report configuration of the multiple CSI report configurations has a deactivation status, the MAC CE does not comprise the respective further octet; and transmitting the MAC CE to a terminal device.

[0009] In a fifth aspect, there is provided an apparatus. The apparatus comprises: means for receiving, at a terminal device, a medium access control (MAC) control element (MAC CE) comprising an octet including multiple fields, wherein the multiple fields indicate an respective activation or deactivation status of multiple channel state information (CSI) report configurations, wherein each CSI report configuration of the multiple CSI report configurations comprises a respective plurality of sub-configurations; wherein, if a respective CSI report configuration of the multiple CSI report configurations has an activation status, the MAC CE comprises a respective further octet including at least one further field, wherein the at least one further field indicates an activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration; and if the respective CSI report configuration of the multiple CSI report configurations has a deactivation status, the MAC CE does not comprise the respective further octet; and means for determining, if the respective CSI report configuration of the multiple CSI report configurations has an activation status, the activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration at least based on the at least one field in the MAC CE.

[0010] In a sixth aspect, there is provided an apparatus. The apparatus comprises: means for generating, at a network device, a medium access control (MAC) control element (MAC CE) comprising an octet including multiple fields, wherein the multiple fields indicate a respective activation status of deactivation status of multiple channel state information (CSI) report configurations; and wherein, if a respective CSI report configuration of the multiple CSI report configurations has an activation status, the MAC CE comprises a respective

further octet including at least one further field, wherein the at least one further field indicates an activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration; and if the respective CSI report configuration of the multiple CSI report configurations has a deactivation status, the MAC CE does not comprise the respective further octet; and means for transmitting the MAC CE to a terminal device.

[0011] In a seventh aspect, there is provided a non-transitory computer-readable storage medium comprising program instructions. The program instructions, when executed by an apparatus, cause the apparatus to perform at least the following: receiving, at a terminal

device, a medium access control (MAC) control element (MAC CE) comprising an octet including multiple fields, wherein the multiple fields indicate an respective activation or deactivation status of multiple channel state information (CSI) report configurations, wherein each CSI report configuration of the multiple CSI report configurations comprises a respective plurality of sub-configurations; and wherein, if a respective CSI report configuration of the multiple CSI report configurations has an activation status, the MAC CE comprises a respective further octet including at least one further field, wherein the at least one further field indicates an activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration; and if the respective CSI report configuration of the multiple CSI report configurations has a deactivation status, the MAC CE does not comprise the respective further octet; and determining, if the respective CSI report configuration of the multiple CSI report configurations has an activation status, the activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration at least based on the at least one field in the MAC CE.

[0012] In an eighth aspect, there is provided a non-transitory computer-readable storage medium comprising program instructions. The program instructions, when executed by an apparatus, cause the apparatus to perform at least the following: generating, at a network device, a medium access control (MAC) control element (MAC CE) comprising an octet including multiple fields, wherein the multiple fields indicate a respective activation status of deactivation status of multiple channel state information (CSI) report configurations; and wherein, if a respective CSI report configuration of the multiple CSI report configurations has an activation status, the MAC CE comprises a respective further octet including at least one further field, wherein the at least one further field indicates an activation or deactivation status of at least one of the plurality of sub-configurations of the respective CSI report configuration; and if the respective CSI report configuration of the multiple CSI report configurations has a deactivation status, the MAC CE does not comprise the respective further octet; and transmitting the MAC CE to a terminal device.

[0013] In a ninth aspect, there is provided a computer program comprising instructions, which, when executed by an apparatus, cause the apparatus at least to: receive, at a terminal device, a medium access control (MAC) control element (MAC CE) comprising at least one field for a channel state information (CSI) report configuration, wherein the CSI report

configuration comprises a plurality of sub-configurations; and determine activation or deactivation of at least one of the plurality of sub-configurations at least based on the at least one field in the MAC CE.

[0014] In a tenth aspect, there is provided a computer program comprising instructions, which, when executed by an apparatus, cause the apparatus at least to: generate, at a network device, a medium access control (MAC) control element (MAC CE) comprising at least one field for a channel state information (CSI) report configuration based on activation or deactivation of at least one of a plurality of sub-configurations of the CSI report configuration; and transmit the MAC CE to a terminal device.

[0015] In an eleventh aspect, there is provided a terminal device. The terminal device comprises: a receiving circuitry configured to: receive a medium access control (MAC) control element (MAC CE) comprising at least one field for a channel state information (CSI) report configuration, wherein the CSI report configuration comprises a plurality of sub-configurations; and determine activation or deactivation of at least one of the plurality of sub-configurations at least based on the at least one field in the MAC CE.