

METHODS, DEVICES AND COMPUTER READABLE MEDIUM FOR NEW RADIO MANAGEMENT MEASUREMENT

FIELD

- 5 **[0001]** Embodiments of the present disclosure generally relate to communication techniques, and more particularly, to methods, devices and computer readable medium for new radio management (RRM) measurement.

BACKGROUND

- 10 **[0002]** In communication systems, such as Long Term Evolved (LTE) communication systems or the 5th generation wireless systems (5G), if a terminal device is to handover from a current serving cell to a target cell, the terminal device may measure a channel quality of the target cell. There are often two situations: (1) the target cell is at the same frequency as the current serving cell and (2) the target cell is at a
15 different frequency from the current serving cell. Further research is still needed regarding the above two situations.

SUMMARY

- 20 **[0003]** Generally, ~~embodiments of~~ the present disclosure relates to a method for a modulation of downlink transmission and the corresponding network device and terminal device.

- 25 **[0003a]** In an aspect, the present disclosure refers to a method implemented at a terminal device for communication. The method comprises: receiving, from a network device, a first configuration at least indicating first set of time slots for an intra-frequency measurement of the terminal device; receiving, from the network device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; receiving, from the network device, resource control information comprising an indication about whether to share overlapping time slots between the intra-frequency measurement and the measurement gap; and in
30 response to the first and second sets of time slots only partially overlapping,

determining, based on the resource control information, one or more time slots from the first set of time slots for the intra-frequency measurement of the terminal device that do not overlap with any time slots from the second set of time slots for the measurement gap of the terminal device.

5 [0003b] In another aspect, the present disclosure refers to a method implemented at a network device for communication. The method comprises: transmitting, to a terminal device, a first configuration at least indicating first set of time slots for an intra-frequency measurement of the terminal device; transmitting, to the terminal device, a second configuration at least indicating a second set of time slots for a
10 measurement gap of the terminal device; and transmitting, to the terminal device, resource control information comprising an indication about whether to share overlapped time slots between the intra-frequency measurement and the measurement gap, wherein, in an instance in which the first and second sets of time slots only partially overlap, one or more time slots from the first set of time slots for the
15 intra-frequency measurement of the terminal device that do not overlap with any time slots from the second set of time slots for the measurement gap of the terminal device are determinable by the terminal device based on the resource control information.

[0003c] In another aspect, the present disclosure refers to a terminal device, comprising: at least one processor; and a memory coupled to the at least one processor,
20 the memory storing instructions therein, the instructions, when executed by the at least one processor, causing the terminal device to perform acts including: receiving, from a network device, a first configuration at least indicating a first set of time slots for an intra-frequency measurement of the terminal device; receiving, from the network device, a second configuration at least indicating a second set of time slots
25 for a measurement gap of the terminal device; receiving, from the network device, resource control information comprising an indication about whether to share overlapping time slots between the intra-frequency measurement and the measurement gap; and in response to the first and second sets of time slots being only partially overlapped, determining, based on the resource control information, one or
30 more time slots from the first set of time slots for the intra-frequency measurement of the terminal device that do not overlap with any time slots from the second set of time slots for the measurement gap of the terminal device.

[0003d] In another aspect, the present disclosure refers to a network device, comprising: at least one processor; and a memory coupled to the at least one processor, the memory storing instructions therein, the instructions, when executed by the at least one processor, causing the network device to perform acts including: transmitting, to a terminal device, a first configuration at least indicating a first set of time slots for an intra-frequency measurement of the terminal device; transmitting, to the terminal device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; and transmitting, to the terminal device, resource control information for sharing overlapped time slots between the intra-frequency measurement and the measurement gap, wherein, in an instance in which the first and second sets of time slots only partially overlap, one or more time slots from the first set of time slots for the intra-frequency measurement of the terminal device that do not overlap with any time slots from the second set of time slots for the measurement gap of the terminal device are determinable by the terminal device based on the resource control information.

[0003e] In another aspect, the present disclosure refers to a computer readable medium storing instructions thereon, the instructions, when executed by at least one processing unit of a machine, causing the machine to perform the method according to any one of the above aspects.

[0004] In an ~~an example first aspect~~, ~~embodiments of~~ the present disclosure provides a method implemented at a terminal device for communication. The method comprises: receiving, from a network device, a first configuration at least indicating first set of time slots for an intra-frequency measurement of the terminal device; receiving, from the network device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; in response to the first and second sets of time slots being partially overlapped, determining one or more slots from the first set of time slots for the intra-frequency measurement of the terminal device based on resource control information for sharing overlapped time slots between the intra-frequency measurement and the measurement gap.

[0005] In an ~~an example second aspect~~, ~~embodiments of~~ the present disclosures provide a method implemented at a network device for communication. The method comprises: transmitting, to a terminal device, a first configuration at least indicating first set of time slots for an intra-frequency measurement of the terminal device; transmitting, to the terminal device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; and transmitting, to the terminal device, resource control information for sharing overlapped time slots between the intra-frequency measurement and the measurement gap.

[0006] In an ~~an example third aspect~~, ~~embodiments of~~ the disclosure provides a terminal device. The terminal device comprises: at least one processor; and a memory coupled to the at least one processor, the memory storing instructions therein, the instructions, when executed by the at least one processor, causing the network device to perform acts including: receiving, from a network device, a first configuration at least indicating a first set of time slots for an intra-frequency measurement of the terminal device; receiving, from the network device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; in response to the first and second sets of time slots being partially overlapped, determining one or more slots from the first set of time slots for the intra-frequency measurement of the terminal device based on resource control information for sharing overlapped time slots between the intra-frequency measurement and the measurement gap.

[0007] In an ~~an example fourth aspect~~, ~~embodiments of~~ the disclosure provides a network device. The network device comprises: at least one processor; and a memory coupled to the at least one processor, the memory storing instructions therein, the instructions, when executed by the at least one processor, causing the arbitrating terminal device to perform acts including: transmitting, to a terminal device, a first configuration at least indicating first set of time slots for an intra-frequency measurement of the terminal device; transmitting, to the terminal device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; and transmitting, to the terminal device, resource control information for sharing overlapped time slots between the intra-frequency measurement and the measurement gap.

[0008] In an ~~an example fifth aspect~~, ~~embodiments of~~ the disclosure provides a computer readable

medium. The computer readable medium stores instructions thereon, the instructions, when executed by at least one processing unit of a machine, causing the machine to implement: receiving, from a network device, a first configuration at least indicating first set of time slots for an intra-frequency measurement of the terminal device; receiving, from the network device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; in response to the first and second sets of time slots being partially overlapped, determining one or more slots from the first set of time slots for the intra-frequency measurement of the terminal device based on resource control information for sharing overlapped time slots between the intra-frequency measurement and the measurement gap.

[0009] In ~~an example sixth aspect, embodiments of~~ the disclosure provides a further computer readable medium. The further computer readable medium stores instructions thereon, the instructions, when executed by at least one processing unit of a machine, causing the machine to implement: transmitting, to a terminal device, a first configuration at least indicating first set of time slots for an intra-frequency measurement of the terminal device; transmitting, to the terminal device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; and transmitting, to the terminal device, resource control information for sharing overlapped time slots between the intra-frequency measurement and the measurement gap.

[0010] Other features and advantages of the embodiments of the present disclosure will also be apparent from the following description of specific embodiments when read in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of embodiments of the disclosure.

25

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Embodiments of the disclosure are presented in the sense of examples and their advantages are explained in greater detail below, with reference to the accompanying drawings, where

30 [0012] Fig. 1 illustrates a schematic diagram of a communication system according to embodiments of the present disclosure;

[0013] Fig. 2 illustrates a schematic diagram of fully overlapping in time slots

WHAT IS CLAIMED IS:

- 1-1. A method implemented at a terminal device for communication, comprising:
receiving, from a network device, a first configuration at least indicating a first set of time slots for an intra-frequency measurement of the terminal device;
receiving, from the network device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device;
receiving, from the network device, resource control information comprising an indication about whether to share overlapping time slots between the intra-frequency measurement and the measurement gap; and
in response to the first and second sets of time slots only partially overlapping, determining, based on the resource control information, one or more time slots from the first set of time slots for the intra-frequency measurement of the terminal device that do not overlap with any time slots from the second set of time slots for the measurement gap of the terminal device.
2. The method of claim 1, wherein the first configuration indicates a measuring window for the intra-frequency measurement, the information including at least one of:
duration of the measuring window,
a periodicity of the measuring window, and
a beginning position of the measuring window in time slots of the terminal device.
3. The method of claim 1, wherein the second configuration indicates at least one of:
duration of the measurement gap,
a periodicity of the measurement gap, and
a beginning position of the measurement gap in time slots of the terminal device.
4. The method of claim 1, wherein the resource control information comprises at least one of:
the number of frequencies at which the intra-frequency measurement is performed,
the number of frequencies at which an inter-frequency measurement is performed,
an overlapping ratio between the first set of time slots and the second set of time slots,

a value for sharing the overlapped time slots between the first set of time slots and the second time slots, and

information regarding whether the intra-frequency measurement is performed without interrupting data scheduling.

5. The method of claim 4, wherein determining the one or more time slots comprises:
determining a parameter for sharing the overlapped time slots based on the resource control
information; and
determining the one or more time slots based on the parameter.

6. The method of claim 1, wherein determining the one or more time slots comprises:
in response to the resource control information is free of a parameter for sharing the overlapped
time slots, choosing the one or more time slots non-overlapped with the second set of time slots.

7. The method of claim 1, wherein receiving the second configuration comprises:
receiving the second configuration together with the resource control information.

8. The method of claim 1, wherein at least one of the first configuration, the second configuration
and the resource control information is received via a radio resource control (RRC) signaling.

9. The method of claim 1, wherein the resource control information received from the network
device for the intra-frequency measurement indicates one or more of: a parameter for sharing time slots
which overlap between the first and second sets of time slots, a number of frequencies at which the
intra-frequency measurement should be performed, a number of frequencies at which an
inter-frequency measurement should be performed, an overlapping ratio between the first and second
sets of time slots, whether the intra-frequency measurement should be performed without interrupting
data scheduling, or whether the measurement gap is needed for inter-frequency measurement.

10. The method of claim 1, further comprising:

using the one or more time slots in the first set, which do not overlap with any time slot in the second set, for the intra-frequency measurement.

11. A method implemented at a network device for communication, comprising:
transmitting, to a terminal device, a first configuration at least indicating a first set of time slots for an intra-frequency measurement of the terminal device;
transmitting, to the terminal device, a second configuration at least indicating a second set of time slots for a measurement gap of the terminal device; and
transmitting, to the terminal device, resource control information comprising an indication about whether to share overlapped time slots between the intra-frequency measurement and the measurement gap,
wherein, in an instance in which the first and second sets of time slots only partially overlap, one or more time slots from the first set of time slots for the intra-frequency measurement of the terminal device that do not overlap with any time slots from the second set of time slots for the measurement gap of the terminal device are determinable by the terminal device based on the resource control information.

12. The method of claim 11, wherein the first configuration indicates a measuring window for the intra-frequency measurement, the information including at least one of:
duration of the measuring window,
a periodicity of the measuring window, and
a beginning position of the measuring window in time slots of the terminal device.

13. The method of claim 11, wherein the second configuration indicates at least one of:
duration of the measurement gap,
a periodicity of the measurement gap, and
a beginning position of the measurement gap in time slots of the terminal device.

14. The method of claim 11, wherein the resource control information comprises at least one of:
the number of frequencies at which the intra-frequency measurement is performed,

the number of frequencies at which an inter-frequency measurement is performed,
an overlapping ratio between the first set of time slots and the second set of time slots,
a value for sharing the overlapped time slots between the first set of time slots and the second
time slots, and

information regarding whether the intra-frequency measurement is performed without
interrupting data scheduling.

15. The method of claim 14, wherein the resource control information includes a parameter for
sharing the overlapped time slots.

16. The method of claim 11, wherein transmitting the second configuration comprise:
transmitting the second configuration together with the resource control information.

17. The method of claim 11, wherein at least one of the first configuration, the second configuration
and the resource control information is transmitted via a radio resource control (RRC) signaling.

18. The method of claim 11, wherein the resource control information received from the network
device for the intra-frequency measurement indicates one or more of: a parameter for sharing time slots
which overlap between the first and second sets of time slots, a number of frequencies at which the
intra-frequency measurement should be performed, a number of frequencies at which an
inter-frequency measurement should be performed, an overlapping ratio between the first and second
sets of time slots, whether the intra-frequency measurement should be performed without interrupting
data scheduling, or whether the measurement gap is needed for inter-frequency measurement.

19. The method of claim 11, wherein the one or more time slots in the first set of time slots that do
not overlap with any time slots in the second set of time slots are usable for the intra-frequency
measurement.

20. A terminal device, comprising:
at least one processor; and

a memory coupled to the at least one processor, the memory storing instructions therein, the instructions, when executed by the at least one processor, causing the terminal device ~~at least to: to~~ perform acts including:
~~receiving~~, from a network device, a first configuration at least indicating ~~at least~~ a first set of time slots for an intra-frequency measurement;

~~receive, from~~ of the terminal device;

receiving, from the network device, a second configuration at least indicating ~~at least~~ a second set of time slots for a measurement gap; ~~of the terminal device;~~

receiving, from the network device, resource control information comprising an indication about whether to share overlapping time slots between the intra-frequency measurement and the measurement gap; and

in response to the first and second sets of time slots being only partially overlapped, ~~use-~~ determining, based on the resource control information, one or more time slots ~~in~~ from the first set ~~which of time slots for the intra-frequency measurement of the terminal device that~~ do not overlap with any time slots from the second set of time slots for the measurement gap of the terminal device.

21. The terminal device of claim 20, wherein the first configuration indicates a measuring window for the intra-frequency measurement, the information including at least one of:

duration of the measuring window,

a periodicity of the measuring window, and

a beginning position of the measuring window in time slots of the terminal device.

22. The terminal device of claim 20, wherein the second configuration indicates at least one of:

duration of the measurement gap,

a periodicity of the measurement gap, and

a beginning position of the measurement gap in time slots of the terminal device.

23. The terminal device of claim 20, wherein the resource control information comprises at least one of:

the number of frequencies at which the intra-frequency measurement is performed,

the number of frequencies at which an inter-frequency measurement is performed,

an overlapping ratio between the first set of time slots and the second set of time slots,
a value for sharing the overlapped time slots between the first set of time slots and the second
time slots, and
information regarding whether the intra-frequency measurement is performed without
interrupting data scheduling.

24. The terminal device of claim 23, wherein determining the one or more time slots comprises:
determining a parameter for sharing the overlapped time slots based on the resource control
information; and
determining the one or more time slots based on the parameter.

25. The terminal device of claim 20, wherein determining the one or more time slots comprises:
in response to the resource control information is free of a parameter for sharing the overlapped
time slots, choosing the one or more time slots non-overlapped with the second set of time slots.

26. The terminal device of claim 20, wherein receiving the second configuration comprises:
receiving the second configuration together with the resource control information.

27. The terminal device of claim 20, wherein at least one of the first configuration, the second
configuration and the resource control information is received via a radio resource control (RRC)
signaling.

28. The terminal device of claim 20, wherein the resource control information received from the
network device for the intra-frequency measurement indicates one or more of: a parameter for sharing
time slots which overlap between the first and second sets of time slots, a number of frequencies at
which the intra-frequency measurement should be performed, a number of frequencies at which an
inter-frequency measurement should be performed, an overlapping ratio between the first and second
sets of time slots, whether the intra-frequency measurement should be performed without interrupting
data scheduling, or whether the measurement gap is needed for inter-frequency measurement.

29. The terminal device of claim 20, wherein the instructions, when executed by the at least one processor, cause the terminal device to:

use the one or more time slots in the first set which do not overlap with any time slot in the second set for the intra-frequency measurement.

~~2. The terminal device of claim 1, wherein the first configuration indicates at least one of:—
duration of a measuring window,—~~

~~a periodicity of the measuring window, and~~

~~a beginning position of the measuring window in time slots~~30. A =

~~3. The terminal device of claim 1, wherein the second configuration indicates at least one of:—
duration of the measurement gap,—~~

~~a periodicity of the measurement gap, and—~~

~~a beginning position of the measurement gap in time slots.~~

~~4. The terminal device of claim 1, wherein the first configuration is received via radio resource control (RRC) signaling.~~

~~5. The terminal device of claim 1, wherein the second configuration is received via radio resource control (RRC) signaling.~~

~~6. The terminal device of claim 1 being caused further to:~~

~~determine the one or more time slots based on resource control information signaled from the network device for the intra-frequency measurement.~~

~~7. The terminal device of claim 6 being caused further to:~~

~~receive the resource control information together with the first configuration or the second configuration.~~

~~8. A method implemented at a terminal device for communication, comprising:~~

~~receiving, from a~~ at least one processor; and

a memory coupled to the at least one processor, the memory storing instructions therein, the instructions, when executed by the at least one processor, causing the network device to perform acts including:

transmitting, to a terminal device, a first configuration at least indicating ~~at least~~ a first set of time slots for an intra-frequency measurement of the terminal device;

~~receiving, from~~transmitting, to the ~~network~~terminal device, a second configuration at least indicating ~~at least~~ a second set of time slots for a measurement gap; ~~of the terminal device~~; and

~~in response to~~transmitting, to the terminal device, resource control information for sharing overlapped time slots between the intra-frequency measurement and the measurement gap,

wherein, in an instance in which the first and second sets of time slots ~~being only~~ partially overlapped, using overlap, one or more time slots ~~in from~~ the first set ~~which do not overlap any of~~ time slot ~~in the second set~~ slots for the intra-frequency measurement of the terminal device that do not overlap with any time slots from the second set of time slots for the measurement gap of the terminal device are determinable by the terminal device based on the resource control information.

9-31. The ~~method~~network device of claim 830, wherein the first configuration indicates a measuring window for the intra-frequency measurement, the information including at least one of:–

duration of ~~a~~the measuring window,–

~~a periodicity of the measuring window, and~~

~~a beginning position of the measuring window in time slots~~a periodicity of the measuring window,

and

a beginning position of the measuring window in time slots of the terminal device.

32. _____ =

~~10-~~The ~~method~~network device of claim 830, wherein the second configuration indicates at least one of:–

a duration of the measurement gap,–

a periodicity of the measurement gap, and–

a beginning position of the measurement gap in time slots of the terminal device.

~~11-~~33. The ~~method~~network device of claim 830, wherein the parameter comprises at least one of:

the number of frequencies at which the intra-frequency measurement is performed,

the number of frequencies at which an inter-frequency measurement is performed,

an overlapping ratio between the first set of time slots and the second set of time slots,
a value for sharing the overlapped time slots between the first set of time slots and the second
time slots, and
information regarding whether the intra-frequency measurement is performed without
interrupting data scheduling.

34. The network device of claim 33, wherein the resource control information includes a parameter
for sharing the overlapped time slots.

35. The network device of claim 30, wherein transmitting the second configuration is received
via comprise:
transmitting the second configuration together with the resource control information.

36. The network device of claim 30, wherein at least one of the first configuration, the second
configuration and the resource control information is transmitted via a radio resource control (RRC)
signaling.

~~12-37.~~ The method-network device of claim 830, wherein the second configuration is received via radio
resource control (RRC) signaling.

13. ~~The method of claim 8, further comprising:~~
~~determining the one or more time slots based on~~ resource control information ~~signaled~~ received from
the network device for the intra-frequency measurement indicates one or more of: a parameter for
sharing time slots which overlap between =

~~14. The method of claim 13 further comprising:~~
~~receiving the resource control information together with the first configuration or the~~ and second sets of time
slots, a number of frequencies at which the intra-frequency measurement should be performed, a
number of frequencies at which an inter-frequency measurement should be performed, an overlapping
ratio between the first and second configuration sets of time slots, whether the intra-frequency
measurement should be performed without interrupting data scheduling, or whether the measurement
gap is needed for inter-frequency measurement.

15-38. The network device of claim 30, wherein the one or more time slots in the first set of time slots that do not overlap with any time slots in the second set of time slots are usable for the intra-frequency measurement.

39. A computer readable medium storing instructions thereon, the instructions, when executed by at least one processing unit of a machine, causing the machine to perform the method according to any one of claims ~~8-14~~1-10.

40. A computer readable medium storing instructions thereon, the instructions, when executed by at least one processing unit of a machine, causing the machine to perform the method according to any one of claims 11-19.