TRANSMISSION OF CONTROL INFORMATION ASSOCIATED WITH SIDELINK POSITIONING REFERENCE SIGNAL

FIELD

[0001] Example embodiments of the present disclosure generally relate to the field of telecommunication, and in particular, to a first terminal device, a second terminal device, a network device in a radio access network, methods, apparatuses and a computer readable storage medium for a transmission of control information associated with a sidelink positioning reference signal.

BACKGROUND

[0002] In 3GPP Release 18 Study Item, sidelink (SL) positioning is going to be studied to expand and improve New Radio (NR) positioning. One of the goals of the Release 18 Study Item is to reuse the existing SL physical layer design as much as possible. This is to enable backward compatibility to the best extend, and reduce efforts in the standardization. The current SL frame structure, however, has been designed only with SL communications in mind. Positioning signals, on the other hand, have special requirements, most notably in terms of bandwidth and latency. This is to enable accurate and timely measurements with the overall aim of satisfying the diverse Quality of Service (QoS) requirements of sidelink positioning use cases.

[0003] For SL positioning, it is needed to define a signal as SL positioning reference signal (SL PRS), and control information associated with SL PRS. Transmissions of the control information associated with SL PRS and SL PRS needs to be accommodated in the SL frame structure with minimum impact on legacy operation, while satisfying the need of positioning.

SUMMARY

[0004] In general, examples of the present disclosure provide a solution for transmission of control information associated with sidelink positioning reference signal.

[0005] In a first aspect, there is provided a first terminal device in a radio access network. The first terminal device in the radio access network comprises at least one processor; and at least one memory including computer program code; the at least one memory and the computer program code configured to, with the at least one processor, cause the first terminal device to: transmit, to a second terminal device in the radio access network, control information associated with a sidelink (SL) positioning reference signal (PRS) during a SL positioning session for positioning of the second terminal device, using a resource for the control information associated with the SL PRS in a Physical Sidelink Feedback Channel (PSFCH) symbol or in at least one symbol dedicated for the control information associated with the SL PRS.

[0006] In a second aspect, there is provided a second terminal device in a radio access network. The second terminal device in the radio access network comprises at least one processor; and at least one memory including computer program code; the at least one memory and the computer program code configured to, with the at least one processor, cause the second terminal device to: receive, from a first terminal device in the radio access network, control information associated with a sidelink (SL) positioning reference signal (PRS) during a SL positioning session for positioning of the second terminal device, using the resource for the control information associated with the SL PRS in a Physical Sidelink Feedback Channel (PSFCH) symbol or in at least one symbols dedicated for the control information associated with the SL PRS.

[0007] In a third aspect, there is provided a network device in a radio access network. The network device in the radio access network comprising: at least one processor; and at least one memory including computer program code; the at least one memory and the computer program code configured to, with the at least one processor, cause the network device to: transmit to at least one terminal device in the radio access network, configuration information associated with sidelink (SL) positioning sessions for positioning of at least one terminal device in the radio access network.

[0008] In a fourth aspect, there is provided a method performed by a first terminal device in a radio access network. The method comprises: transmitting, at a first terminal device in a radio access network to a second terminal device in the radio access network, control information associated with a sidelink (SL) positioning reference signal (PRS)

during a SL positioning session for positioning of the second terminal device, using a resource for the control information associated with the SL PRS in a Physical Sidelink Feedback Channel

(PSFCH) symbol or in at least one symbol dedicated for the control information associated with the SL PRS.

[0009] In a fifth aspect, there is provided a method performed by a second terminal device in a radio access network. The method comprises: receiving, at a second terminal device in a radio access network, from a first terminal device in the radio access network, control information associated with a sidelink (SL) positioning reference signal (PRS) during a SL positioning session for positioning of the second terminal device, using the resource for the control information associated with the SL PRS in a Physical Sidelink Feedback Channel (PSFCH) symbol or in at least one symbols dedicated for the control information associated with the SL PRS.

[0010] In a sixth aspect, there is provided a method performed by a network device in a radio access network. The method comprises: transmitting, at a network device in a radio access network to at least one terminal device in the radio access network, configuration information associated with sidelink (SL) positioning sessions for positioning of at least one terminal device in the radio access network.

[0011] In a seventh aspect, there is provided an apparatus. The apparatus comprising: means for transmitting, at a first terminal device in a radio access network to a second terminal device in the radio access network, control information associated with a sidelink (SL) positioning reference signal (PRS) during a SL positioning session for positioning of the second terminal device, using a resource for the control information associated with the SL PRS in a Physical Sidelink Feedback Channel (PSFCH) symbol or in at least one symbol dedicated for the control information.

[0012] In an eighth aspect, there is provided an apparatus. The apparatus comprising: means for receiving, at a second terminal device in a radio access network, from a first terminal device in the radio access network, control information associated with a sidelink (SL) positioning reference signal (PRS) during a SL positioning session for positioning of the second terminal device, using the resource for the control information associated with the SL PRS in a Physical Sidelink Feedback Channel (PSFCH) symbol or in at least one symbols dedicated for the control information.

[0013] In a ninth aspect, there is provided an apparatus. The apparatus comprising: means for transmitting, at a network device in a radio access network to at least one terminal device in the radio access network, configuration information associated with sidelink (SL)

positioning sessions for positioning of at least one terminal device in the radio access network.

[0014] In a tenth aspect, there is provided a non-transitory computer readable medium comprising program instructions for causing an apparatus to perform at least the method in the fourth, fifth, and sixth aspects.

[0015] It is to be understood that the summary section is not intended to identify key or essential features of examples 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

[0016] Some example embodiments will now be described with reference to the accompanying drawings, in which:

[0017] FIG. 1 illustrates an example of a network environment in which some example embodiments of the present disclosure may be implemented;

[0018] FIG. 2 illustrates an example of a process flow for transmissions of the control information associated with SL PRS;

[0019] FIG. 3A illustrates an example of a sidelink frame format in accordance with some example embodiments of the present disclosure;

[0020] FIG. 3B illustrates another example of a sidelink frame format in accordance with some example embodiments of the present disclosure;

[0021] FIG. 4 illustrates an example of a slot structure for SL PRS in accordance with some example embodiments of the present disclosure;

[0022] FIG. 5A illustrates another example of a slot structure for SL PRS in accordance with some example embodiments of the present disclosure;

[0023] FIG. 5B illustrates a further example of a slot structure for SL PRS in accordance with some example embodiments of the present disclosure;

[0024] FIG. 6 illustrates a still further example of a slot structure for SL PRS in accordance with some example embodiments of the present disclosure;