CLAIMS

1. A method of transmitting a reference signal, comprising:

determining, by a vehicle user equipment (UE), transmission configuration information of a synchronization signal block in~~of~~ a new radio-vehicle-to-everything (NR-V2X) system (VSSB), wherein the transmission configuration information comprisinges a transmission period of the VSSB, and a time domain position of a VSSB transmission time window within the transmission period;

transmitting, by the vehicle UE and according to the transmission configuration information, ~~N~~one or more VSSBs within the VSSB transmission time window that occurs periodically, ~~where N is an integer greater than or equal to 1~~ and the one or more VSSBs comprises the VSSB;

wherein each of the one or more VSSBs comprises a primary sidelink synchronization signal (PSSS), a secondary sidelink synchronization signal (SSSS), a physical sidelink broadcast channel (PSBCH) signal, and a demodulation reference signal (DMRS);

wherein transmitting the one or more VSSBs within the VSSB transmission time window that occurs periodically comprises:

transmitting the PSBCH signal and the DMRS of each of the one or more VSSBs in a frequency division multiplexing (FDM) manner;

in response to N greater than l, determining VSSB index information for each of the one or more VSSBs, wherein N is a number of the one or more VSSBs and N is a positive integer; and

generating a target VSSB carrying the VSSB index information by loading the VSSB index information into a setting signal of a VSSB to be transmitted, wherein the setting signal comprises the PSBCH signal, the DMRS, or the PSBCH signal and the DMRS.

2. The method according to claim 1, wherein transmitting the ~~N~~ one or more VSSBs within the VSSB transmission time window that occurs periodically comprises:

determining target carrier frequency information for transmitting the one or more VSSBs;

for each VSSB to be transmitted,

determining, according to the target carrier frequency information and current speed information of the vehicle UE, a target reference signal time domain density for the VSSB to be transmitted;

determining transmission information for the VSSB to be transmitted according to the target reference signal time domain density, wherein the transmission information comprises a target subcarrier spacing for transmitting the VSSB and a structure of the VSSB to be transmitted, and the structure of the VSSB to be transmitted ~~involves~~ comprises ~~the~~a number of symbols occupied by each signal and a position of the occupied symbols; and

transmitting, according to the transmission information for the VSSB to be transmitted, the VSSB within the VSSB transmission time window.

3. The method according to claim 2, wherein determining the target carrier frequency information for transmitting the one or more VSSBs comprises:

receiving resource configuration information from a base station, wherein the resource configuration information is configured to instruct the vehicle UE to transmit the one or more VSSBs with configured resource; and

determining the target carrier frequency information according to the resource configuration information; or~~,~~

determining the target carrier frequency information according to preset resource configuration information.

4. The method according to claim 2, wherein

the current speed information comprises a relative speed between the vehicle UE and a preset receiving terminal;

determining, according to the target carrier frequency information and the current speed information of the vehicle UE, the target reference signal time domain density for each VSSB to be transmitted, comprises:

obtaining a comparison result by comparing the relative speed with a preset speed threshold; and

determining the target reference signal time domain density according to the target carrier frequency information and the comparison result.

5. The method according to claim 4, wherein determining the target reference signal time domain density according to the target carrier frequency information and the comparison result comprises:

in response to ~~that~~ the comparison result indicating~~es~~ that the relative speed is greater than or equal to the preset speed threshold, increasing a reference signal time domain density at the target carrier frequency to a target reference signal time domain density corresponding to the comparison result.

6. The method according to claim 5, wherein increasing the reference signal time domain density at the target carrier frequency to the target reference signal time domain density corresponding to the comparison result is implemented through at least one of followings:

using a target VSSB structure, wherein a reference signal proportion in the target VSSB structure is greater than a reference signal proportion in an original VSSB structure, and the reference signal proportion is a ratio of a number of symbols occupied by the reference signal to a duration occupied by the VSSB; and

increasing a subcarrier spacing for transmitting the one or more VSSBs at the target carrier frequency.

7. The method according to claim 1, wherein transmitting ~~N~~the one or more VSSBs within the VSSB transmission time window that occurs periodically further comprises:

~~in response to that N is an integer greater than 1, determining a VSSB index information for each of the N VSSBs;~~

~~generating a target VSSB carrying the index information by loading the VSSB index information into a setting signal of each of the VSSBs to be transmitted; and~~

transmitting one or more~~the~~ target VSSBs through a plurality of beams within the VSSB transmission time window that occurs periodically, wherein the one or more target VSSBs

comprise the target VSSB.

8. The method according to claim ~~7~~1, wherein loading the VSSB index information into the setting signal of the ~~corresponding to~~ VSSB to be transmitted is implemented through ~~any~~ one of following acts:

indicating the VSSB index information by a corresponding DMRS target sequence;

loading the VSSB index information into a first bit of the PSBCH signal; and

indicating a part of bit values of the VSSB index information by the corresponding DMRS target sequence, and loading remaining of the bit values into a second bit of the preset PSBCH signal.

9. The method according to claim 1, wherein transmitting the ~~N~~ one or more VSSBs within the VSSB transmission time window that occurs periodically further comprises:

transmitting the PSBCH signal and the DMRS ~~signal~~ of each of the one or more VSSBs in ~~at least one of a frequency division multiplexing (FDM) manner and~~ a time division multiplexing (TDM) manner.

10. A method of receiving a reference signal, comprising:

detecting, by a receiving terminal, a synchronization signal block ~~of~~ in a new radio-vehicle-to-everything (NR-V2X) system (VSSB) transmitted from a vehicle user equipment (UE), wherein the VSSB comprises a primary sidelink synchronization signal (PSSS), a secondary sidelink synchronization signal (SSSS), a physical sidelink broadcast channel (PSBCH) signal, and a demodulation reference signal (DMRS), and the PSBCH signal and the DMRS of the VSSB are transmitted in a frequency division multiplexing (FDM) manner;

obtaining, by the receiving terminal, VSSB index information from a target VSSB ~~that is~~ detected;

determining, by the receiving terminal, a time domain position of the target VSSB according to the VSSB index information; and

performing, by the receiving terminal, a time domain synchronization with the vehicle UE

according to the time domain position;

wherein obtaining the VSSB index information from the target VSSB detected comprises:

obtaining the PSSS, the SSSS, the PSBCH signal and the DMRS by analyzing the target VSSB; and

obtaining the VSSB index information from a setting signal, wherein the setting signal comprises at least one of the PSBCH signal and the DMRS.

11. The method according to claim 10, wherein detecting the VSSB transmitted from the vehicle UE comprises:

receiving resource configuration information from a base station, wherein the resource configuration information is configured to instruct the receiving terminal to receive the VSSB through configured resource;

determining, according to the resource configuration information, target carrier frequency information for receiving the VSSB;

determining a detecting subcarrier spacing according to the target carrier frequency information; and

detecting the VSSB at a target frequency band with each detecting subcarrier spacing.

~~12. The method according to claim 10, wherein obtaining the VSSB index information from the detected target VSSB comprises:~~

~~obtaining respective signals by analyzing the target VSSB, wherein the respective signals comprise a primary sidelink synchronization signal (PSSS), a secondary sidelink synchronization signal (SSSS), a physical sidelink broadcast channel (PSBCH) signal, and a demodulation reference signal (DMRS); and~~

~~obtaining the VSSB index information from a setting signal, wherein the setting signal comprises at least one of the PSBCH signal and the DMRS signal.~~

~~13~~12. The method according to claim 10~~2~~, wherein obtaining the VSSB index information

from the setting signal comprises ~~any~~ one of following acts:

obtaining the VSSB index information from information carried by a setting DMRS sequence; and

obtaining the VSSB index information by analyzing bits of a setting PSBCH signal.

~~14~~13. The method according to claim 1~~02~~, wherein obtaining the VSSB index information from the setting signal comprises:

obtaining a part of bit values of the VSSB index information from information carried by a setting DMRS sequence;

obtaining remaining of the bit values of the VSSB index information from bits of a setting PSBCH signal; and

determining the VSSB index information according to complete bit values composed of the part of the bit values and the remaining of the bit values.

~~15~~14. The method according to claim ~~10~~11, wherein determining the time domain position of the VSSB according to the VSSB index information comprises:

determining the time domain position of the target VSSB according to the VSSB index information, the target carrier frequency information, and a target subcarrier spacing; wherein the target subcarrier spacing indicates a detecting subcarrier spacing used to detect the target VSSB.

~~16. A device for transmitting a reference signal, comprising:~~

~~a configuration information determining module, configured to determine transmission configuration information of a synchronization signal block of a new radio-vehicle-to-everything (NR-V2X) system (VSSB), the transmission configuration information comprising a transmission period of the VSSB, and a time domain position of a VSSB transmission time window within the transmission period; and~~

~~a transmitting module, configured to transmit N VSSBs within a VSSB transmission time window that occurs periodically according to the transmission configuration information,~~

where N is an integer greater than or equal to 1;

wherein each of the N VSSBs comprises a primary sidelink synchronization signal (PSSS), a secondary sidelink synchronization signal (SSSS), a physical sidelink broadcast channel (PSBCH) signal, and a demodulation reference signal (DMRS).

17. The device according to claim 16, wherein the transmitting module comprises:

a carrier frequency determining sub-module, configured to determine target carrier frequency information for transmitting the VSSBs;

a time domain density determining sub-module, configured to determine a target reference signal time domain density for each of the VSSBs to be transmitted according to both the target carrier frequency information and a current speed information of vehicle user equipment (UE);

a transmission information determining sub-module, configured to determine transmission information of the VSSBs to be transmitted according to the target reference signal time domain density, the transmission information comprising a target subcarrier spacing for transmitting the VSSBs and a structure of the VSSBs to be transmitted, wherein the structure of the VSSBs to be transmitted involves the number of symbols occupied by each signal and positions of the occupied symbols; and

a transmitting sub-module, configured to transmit the VSSBs according to the transmission information of the VSSBs to be transmitted within the VSSB transmission time window.

18. The device according to claim 17, wherein the carrier frequency determining sub-module comprises:

a configuration information receiving unit, configured to receive resource configuration information from a base station, where the resource configuration information is configured to instruct the vehicle UE to transmit the VSSB with configured resource;

a first carrier frequency determining unit, configured to determine target carrier frequency information according to the resource configuration information; or,

a second carrier frequency determining unit, configured to determine the target carrier

~~frequency information according to preset resource configuration information.~~

~~19. The apparatus according to claim 17, wherein the current speed information comprises: a relative speed between the vehicle UE and a preset receiving terminal;~~

~~the time domain density determination sub-module comprises:~~

~~a comparing unit, configured to obtain a comparison result by comparing the relative speed with a preset speed threshold; and~~

~~a time domain density determining unit, configured to determine the target reference signal time domain density according to both the target carrier frequency information and the comparison result.~~

~~20. The device according to claim 19, wherein the time domain density determining unit is configured to increase the target reference signal time domain density at a target carrier frequency to a target reference signal time domain density corresponding to the comparison result in response to that the comparison result indicates the relative speed is greater than or equal to the preset speed threshold.~~

~~21. The device according to claim 20, wherein the time domain density determining unit is configured to increase the target reference signal time domain density at the target carrier frequency to the target reference signal time domain density corresponding to the comparison result through at least one of:~~

~~using a target VSSB structure, wherein the reference signal proportion of the target VSSB structure is greater than a reference signal proportion of an original VSSB structure, and the reference signal proportion is a ratio between the number of symbols occupied by the reference signal and a duration occupied by the VSSB; and/or~~

~~increasing the subcarrier spacing for transmitting VSSB at the target carrier frequency.~~

~~22. The device according to claim 16, wherein the transmitting module comprises:~~

~~an index information determining sub-module, configured to determine a VSSB index~~

~~information for each VSSB in response to that N is an integer greater than 1;~~

~~a target VSSB generating sub-module, configured to generate a target VSSB carrying index information by loading the VSSB index information into a setting signal of the VSSB to be transmitted; and~~

~~a target VSSB transmitting sub-module, configured to transmit the target VSSB through a plurality of beams within the VSSB transmission time window that occurs periodically.~~

~~23. The device according to claim 22, wherein the target VSSB generating sub-module is configured to load the VSSB index information into the setting signal of the VSSB to be transmitted through any one of:~~

~~indicating the VSSB index information by a corresponding DMRS target sequence;~~

~~loading the VSSB index information into a first bit of a preset PSBCH signal; and~~

~~indicating a part of bit values of the VSSB index information by the corresponding DMRS target sequence, and loading remaining of the bit values into a second bit of the preset PSBCH signal.~~

~~24. The device according to claim 16, wherein the transmitting module is configured to transmit the PSBCH signal and the DMRS signal of each of the VSSBs through at least one of a frequency division multiplexing (FDM) manner and a time division multiplexing (TDM) manner.~~

~~25. A device for receiving a reference signal, comprising:~~

~~a detecting module, configured to detect a synchronization signal block of a new radio-vehicle-to-everything (NR-V2X) system (VSSB) transmitted by vehicle user equipment (UE);~~

~~an index information obtaining module, configured to obtain VSSB index information from a detected target VSSB;~~

~~a position determining module, configured to determine a time domain position of the target VSSB according to the VSSB index information;~~

a synchronizing module, configured to perform a time domain synchronization with the vehicle UE according to the time domain position.

26. The device according to claim 25, wherein the detecting module comprises:

a configuration information receiving sub-module, configured to receive resource configuration information from a the base station, where the resource configuration information is configured to instruct the receiving terminal to receive the VSSB with configured resource;

a carrier frequency determining sub-module, configured to determine target carrier frequency information for receiving the VSSB according to the resource configuration information;

a subcarrier spacing determining sub-module, configured to determine a detecting subcarrier spacing according to the target carrier frequency information; and

a detecting sub-module, configured to detect the VSSB on a target resource with each detecting subcarrier spacing.

27. The device according to claim 25, wherein the index information obtaining module comprises:

an analyzing sub-module, configured to obtain respective signals by analyzing the target VSSB, the respective signals comprising: a primary sidelink synchronization signal (PSSS), a secondary sidelink synchronization signal (SSSS), a physical sidelink broadcast channel (PSBCH) signal and a demodulation reference signal (DMRS); and

an index information obtaining sub-module, configured to obtain the VSSB index information from a setting signal, where the setting signal comprises at least one of the PSBCH signal and the DMRS signal.

28. The device according to claim 27, wherein the index information obtaining sub-module comprises:

a first index obtaining unit, configured to obtain the VSSB index information according

~~to the information carried in the setting DMRS sequence; or,~~

~~a second index obtaining unit, configured to obtain the VSSB index information by analyzing a first bit of the setting PSBCH signal.~~

~~29. The device according to claim 27, wherein the index information obtaining sub-module comprises:~~

~~a first bit value determining unit, configured to obtain a part of bit values of the VSSB index information from information carried by the setting DMRS sequence;~~

~~a second bit value determining unit, configured to obtain remaining of the bit values of the VSSB index information from a second bit of the setting PSBCH signal;~~

~~a third index obtaining unit, configured to determine the VSSB index information according to complete bit values composed of the part of the bit values and the remaining of the bit values.~~

~~30. The device according to claim 25, wherein the position determining module is configured to determine a time domain position of the target VSSB according to the VSSB index information, the target carrier frequency information and the target subcarrier spacing, the target subcarrier spacing indicating a detecting subcarrier spacing used to detect the target VSSB.~~

~~31. A non-transitory computer-readable storage medium having stored therein computer instructions that, when executed by a processor, cause the processor to implement operations of the method according to any one of claims 1 to 9.~~

~~32. A non-transitory computer-readable storage medium having stored therein computer instructions that, when executed by a processor, cause the processor to implement operations of the method according to any one of claims 10 to 15.~~

~~33~~15. A ~~V~~vehicle user equipment (UE), comprising:

a processor;

a memory, configured to store instructions executable by the processor;

wherein, the processor is configured to:

determine transmission configuration information of a synchronization signal block VSSB ofin a new radio-vehicle-to-everything (NR-V2X) system (VSSB), wherein the transmission configuration information comprisesing: a transmission period of the VSSB, and a time domain position of a VSSB transmission time window within the transmission period;

transmit N one or more VSSBs within the VSSB transmission time window that occurs periodically according to the transmission configuration information, where N is an integer greater than or equal to 1 where the one or more VSSBs comprise the VSSB;

wherein each VSSB comprises: a primary sidelink synchronization signal (PSSS), a secondary sidelink synchronization signal (SSSS), a physical sidelink broadcast channel (PSBCH) signal, and a demodulation reference signal (DMRS);

wherein transmitting the one or more VSSBs within the VSSB transmission time window that occurs periodically comprises:

transmitting the PSBCH signal and the DMRS of each of the one or more VSSBs in a frequency division multiplexing (FDM) manner;

in response to N greater than l, determining VSSB index information for each of the one or more VSSBs, wherein N is a number of the one or more VSSBs and N is a positive integer; and

generating a target VSSB carrying the VSSB index information by loading the VSSB index information into a setting signal of a VSSB to be transmitted, wherein the setting signal comprises the PSBCH signal, the DMRS, or the PSBCH signal and the DMRS.

3416. A terminal, comprising:

a processor;

a memory, configured to store instructions executable by the processor;

wherein, when the instructions are executed, the processor is configured to:

detect a synchronization signal block of a new radio-vehicle-to-everything (NR-V2X) system (VSSB) transmitted by from a vehicle user equipment (UE), wherein the VSSB

comprises a primary sidelink synchronization signal (PSSS), a secondary sidelink synchronization signal (SSSS), a physical sidelink broadcast channel (PSBCH) signal, and a demodulation reference signal (DMRS), and the PSBCH signal and the DMRS of the VSSB are transmitted in a frequency division multiplexing (FDM) manner;

obtain VSSB index information from a ~~detected~~ target VSSB detected;

determine a time domain position of the target VSSB according to the VSSB index information; and

perform a time domain synchronization with the vehicle UE according to the time domain position;

wherein obtaining the VSSB index information from the target VSSB detected comprises:

obtaining the PSSS, the SSSS, the PSBCH signal and the DMRS by analyzing the target VSSB; and

obtaining the VSSB index information from a setting signal, wherein the setting signal comprises at least one of the PSBCH signal and the DMRS.