

CLAIMS

WHAT IS CLAIMED IS:

1. A method for indicating a frequency band state, applicable to a base station, comprising:
detecting states of n sub frequency bands in a shared spectrum, $n \geq 1$;
in response that there is an idle sub frequency band in the n frequency bands, sending n pieces of preset state indication information to a terminal through the idle sub frequency band at a starting position of occupancy time when the idle sub frequency band is occupied, wherein the n pieces of state indication information are configured to indicate the states of the n sub frequency bands;
updating the n pieces of state indication information based on the states of n sub frequency bands; and
sending the updated n pieces of state indication information to the terminal at a position other than the starting position of the occupancy time when the idle sub frequency band is occupied.
2. The method of claim 1, wherein the n pieces of state indication information are arranged in a preset order, and the preset order is associated with the n sub frequency bands.
3. The method of claim 1, wherein sending the n pieces of preset state indication information to the terminal comprises:
sending information of a physical downlink control channel to the terminal, wherein the information of the physical downlink control channel is carried with the n pieces of state indication information.
4. The method of claim 3, wherein the state of the i -th sub frequency band in the n sub frequency bands indicated by the i -th indication information ($1 \leq i \leq n$) comprises one of: idle, or non-idle, or possibly idle.
5. The method of claim 4, wherein each of the n pieces of state indication information occupies one bit, or a plurality of bits.
6. The method of claim 5, wherein each in the n pieces of state indication information occupies one bit, and the information of the physical downlink control channel is also carried with position indication information, in which the position indication information is configured to indicate whether the information of the physical downlink control channel is located at the starting position of the occupancy time when the idle sub frequency band is occupied, or at a position other than the starting position of the occupancy time when the idle sub frequency band is occupied.

7. The method of claim 5, wherein each in the n pieces of state indication information occupies one bit, and scrambling information in the information of the physical downlink control channel is configured to indicate whether the information of the physical downlink control channel is located at the starting position of the occupancy time when the idle sub frequency band is occupied or at a position other than the starting position of the occupancy time when the idle sub frequency band is occupied.

8. The method of claim 3, wherein the physical downlink control channel is a group common physical downlink control channel.

9. The method of any one of claims 1 to 8, wherein the n sub frequency bands belong to the same carrier, or belong to different carriers, or at least one of the sub frequency bands corresponds to a frequency band of a preset carrier.

10. A method for determining a frequency band state, applicable to a terminal, comprising:
receiving n pieces of preset state indication information sent by the base station in an idle sub frequency band of a shared spectrum, $n \geq 1$;

determining states of n sub frequency bands in the shared spectrum based on the n pieces of preset state indication information;

receiving n pieces of state indication information that are updated based on states of n sub frequency bands and sent by the base station; and

determining the states of the n sub frequency bands based on the updated n pieces of state indication information.

11. The method of claim 9, wherein the n pieces of state indication information are arranged in a preset order, and determining the states of the n sub frequency bands based on the n pieces of state indication information comprises:

determining i -th indication information among the n pieces of state indication information located at an i -th order position based on an association relationship between the preset order and the n sub frequency bands, in which the i -th indication information is configured to indicate a state of an i -th sub frequency band in the n sub frequency bands corresponding to the i -th order position, $1 \leq i \leq n$.

12. The method of claim 9, wherein receiving the n pieces of preset state indication information sent by the base station in the idle sub frequency band of the shared spectrum

comprises:

receiving information of a physical downlink control channel sent by the base station in the shared spectrum; and

extracting the n pieces of state indication information from the information of the physical downlink control channel.

13. The method of claim 12, wherein a state of an i -th sub frequency band in the n sub frequency bands indicated by the i -th indication information ($1 \leq i \leq n$) comprises one of: idle, or non-idle, or possibly idle.

14. The method of claim 13, wherein each of the n pieces of state indication information occupies one bit, or a plurality of bits.

15. The method of claim 14, wherein each in the n pieces of state indication information occupies one bit, and determining the states of the n sub frequency bands based on the n pieces of state indication information comprises:

determining a position where the n pieces of state indication information are located in occupancy time when the idle sub frequency band is occupied;

querying the states of the n sub frequency bands indicated by the n pieces of state indication information corresponding to the position based on an association relationship between positions and states of the n sub frequency bands indicated by the n pieces of state indication information; and

determining the states of the n sub frequency bands based on the queried n pieces of preset state indication information .

16. The method of claim 15, wherein determining the position where the n pieces of state indication information are located in occupancy time when the idle sub frequency band is occupied comprises:

extracting position indication information from the information of the physical downlink control channel; and

determining whether the information of the physical downlink control channel is located at a starting position of the occupancy time when the idle sub frequency band is occupied or at a position other than the starting position of the occupancy time when the idle sub frequency band is occupied based on the position indication information.

17. The method of claim 15, wherein determining the position where the n pieces of state indication information are located in occupancy time when the idle sub frequency band is occupied comprises:

descrambling the information of the physical downlink control channel with descrambling information; and

determining whether the information of the physical downlink control channel is located at a starting position of the occupancy time when the idle sub frequency band is occupied or at a position other than the starting position of the occupancy time when the idle sub frequency band is occupied, based on scrambling information corresponding to the descrambling information.

18. The method of claim 12, wherein the physical downlink control channel is a group common physical downlink control channel.

19. The method of any one of claims 10 to 18, wherein the n sub frequency bands belong to the same carrier, or at least one of the sub frequency bands and other sub frequency bands belong to different carriers, or at least one of the sub frequency bands corresponds to a frequency band of a preset carrier.

20. The method of claim 13, further comprising:

in response to determining that the i -th sub frequency band in the n sub frequency bands is idle, monitoring the i -th sub frequency band; and/or, in response that there is a need to occupy the i -th sub frequency band within a preset duration without detecting the state of the i -th sub frequency band or detecting in a detection way other than a preset detection way that the i -th sub frequency band is idle, occupying the i -th sub frequency band, in which the preset detection way has a longer detection time and a more accurate detection result than other detection way.

21. The method of claim 13, further comprising:

in response to determining that the i -th sub frequency band in the n sub frequency bands is possibly idle, monitoring the i -th sub frequency band; and/or in response that there is a need to occupy the i -th sub frequency band and detecting that the i -th sub frequency band is idle, occupying the i -th sub frequency band.

22. The method of claim 13, further comprising:

in response to determining that the i -th sub frequency band in the n sub frequency bands is non-idle, stop monitoring the i -th sub frequency band; and/or in response that there is a need to

occupy the i-th sub frequency band and detecting that the i-th sub frequency band is idle, occupying the i-th sub frequency band.

23. The method of claim 13, further comprising:

in response to determining that the i-th sub frequency band in the n sub frequency bands is idle or possibly idle, monitoring the i-th sub frequency band; and/or in response that there is a need to occupy the i-th sub frequency band and detecting that the i-th sub frequency band is idle, occupying the i-th sub frequency band.

24. The method of any one of claims 21 to 23, wherein in response to detecting that the i-th sub frequency band is idle, occupying the i-th sub frequency band comprises:

in response to detecting in a preset detection way that the i-th sub frequency band is idle, occupying the i-th sub frequency band, wherein the preset detection way has a longer detection time and a more accurate detection result relative to a detection way other than the preset detection way.

25. An apparatus for indicating a frequency band state, applicable to a base station, comprising:

a state detection module, configured to detect states of n sub frequency bands in a shared spectrum, $n \geq 1$;

an information sending module, configured to in response that there is an idle sub frequency band in the n frequency bands, sending n pieces of preset state indication information to a terminal through the idle sub frequency band at a starting position of occupancy time when the idle sub frequency band is occupied, wherein the n pieces of state indication information are configured to indicate the states of the n sub frequency bands;

a state update module, configured to update the n pieces of state indication information based on the states of n sub frequency bands; and

wherein the information sending module is further configured to send the updated n pieces of state indication information to the terminal at a position other than the starting position of the occupancy time when the idle sub frequency band is occupied.

26. An apparatus for determining a frequency band state, applicable to a terminal, comprising:

an information receiving module, configured to receive n pieces of preset state indication information sent by the base station in an idle sub frequency band of a shared spectrum, $n \geq 1$, receive n pieces of state indication information that are updated based on states of n sub frequency

bands and sent by the base station, and determine the states of the n sub frequency bands based on the updated n pieces of state indication information; and

a state determination module, configured to determine states of n sub frequency bands in the shared spectrum based on the n pieces of state indication information.

27. An electronic device, comprising

a processor; and

a memory for storing instructions executable by the processor;

wherein the processor is configured to implement the method for indicating a frequency band state as claimed in any one of claims 1 to 9.

28. An electronic device, comprising

a processor; and

a memory for storing instructions executable by the processor;

wherein the processor is configured to implement the method for determining a frequency band state as claimed in any one of claims 10 to 24.