CLAIMS

What is claimed is:

1. A communication method, comprising:

determining a first transmission manner from a plurality of transmission manners; and;

when second indication information is present, and the first transmission manner is a second non-frequency hopping transmission manner, determining, based on the second indication information, a rule used to determine a resource block, RB, index of a physical uplink control channel, PUCCH, from a second rule and a third rule, wherein,

X PUCCH resources are on one side of a bandwidth part, BWP, according to the second rule;

X PUCCH resources are on the other side of the BWP according to the third rule; wherein X is an integer; and;

sending the PUCCH to a network device in the first transmission manner, wherein

the plurality of transmission manners include the second non-frequency hopping transmission manner and an intra-time unit frequency hopping transmission manner;

the non-frequency hopping transmission manner is that the PUCCH is transmitted without frequency hopping in a time unit, wherein uplink control information, UCI, on the PUCCH is sent by using an orthogonal sequence whose length is L5 symbols, a demodulation reference signal, DMRS, on the PUCCH is sent by using an orthogonal sequence whose length is L6 symbols, and L5 and L6 are integers; and

the intra-time unit frequency hopping transmission manner is that the PUCCH is transmitted with frequency hopping in a time unit.

2. The method according to claim 1, wherein,

the second rule is: $0 \leq r_{PUCCH} \leq$ X–1, and an RB index value of the PUCCH is equal to $RB_{\mathrm{BWP}}^{\mathrm{offset}} + \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$; and

the third rule is: $0 \leq r_{PUCCH} \leq$ X–1, and the RB index value of the PUCCH is equal to $N_{\mathrm{BWP}}^{\mathrm{size}} - 1 - RB_{\mathrm{BWP}}^{\mathrm{offset}} - \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$, wherein

r_{PUCCH} is a PUCCH resource index, N_{CS} is a quantity of cyclic shifts of a PUCCH resource set, RB_{BWP}^{offset} is a frequency domain offset value of the PUCCH resource set, N_{BWP}^{Size} is a size of a bandwidth part BWP on which the PUCCH resource is configured.

3. The method according to claim 1 or 2, wherein the method further comprises:

receiving a higher layer signaling, wherein the higher layer signaling comprises the second indication information, and the second indication information indicate determining the RB index of the PUCCH according to the second rule or the third rule.

4. The method according to any one of claims 1 to 3, comprising:

the second indication information is indicated by one bit; and

when a bit value of the second indication information is 0, the second indication information indicates that the RB index of the PUCCH is determined according to the second rule; or

when a bit value of the second indication information is 1, the third rule is used to determine the RB index of the PUCCH based on the second indication information.

5. The method according to any one of claims 1 to 4, wherein the method further comprises:

when second indication information is absent, an RB index of the PUCCH is determined according to a default rule.

6. The method according to claim 5, wherein,

X/2 PUCCH resources are on one side of a BWP, and X/2 PUCCH resources are on the other side of the BWP, according to the default rule; wherein X is an integer.

7. The method according to claim 5 or 6, wherein the default rule is:

$0 \le r_{PUCCH} \le (X/2) - 1$, and an RB index value of the PUCCH is equal to $RB_{BWP}^{offset} + \lfloor r_{PUCCH} / N_{CS} \rfloor$; and

$X/2 \le r_{PUCCH} \le X - 1$, and the RB index value of the PUCCH is equal to $N_{BWP}^{size} - 1 - RB_{BWP}^{offset} - \lfloor (r_{PUCCH} - 8) / N_{CS} \rfloor$, wherein

r_{PUCCH} is a PUCCH resource index, N_{CS} is a quantity of cyclic shifts of a PUCCH resource set, RB_{BWP}^{offset} is a frequency domain offset value of the PUCCH resource set, N_{BWP}^{Size} is a size of a bandwidth part BWP on which the PUCCH resource is configured.

8. The method according to claim any one of claims 1 to 7, wherein X=16.

9. The method according to claim any one of claims 1 to 8, wherein whether the second indication information is present is determined based on an identification information.

10. The method according to claim any one of claims 1 to 9, further comprising:

obtaining first indication information, wherein the first indication information indicates the first transmission manner.

11. The method according to claim 10, wherein,

when a bit value of the first indication information is 0, the first indication information indicates that the first transmission manner is the non-frequency hopping transmission manner;

when a bit value of the first indication information is 1, the first indication information indicates that the first transmission manner is the intra-slot frequency hopping transmission manner.

12. The method according to claim any one of claims 1 to 11, wherein

the one side of the BWP indicates starting from a lowest frequency location of the BWP;

the on the other side of the BWP indicates starting from a highest frequency location of the

BWP.

13. A communication method, comprising:

determining a first transmission manner from a plurality of transmission manners; and;

when the first transmission manner is a second non-frequency hopping transmission manner, sending second indication information, wherein the second indication information is used to indicate that a resource block RB index of a physical uplink control channel PUCCH is determined by using a second rule or a third rule; and,

X PUCCH resources are on one side of a bandwidth part, BWP, according to the second rule;

X PUCCH resources are on the other side of the BWP according to the third rule; wherein X is an integer; and;

receiving the PUCCH from a terminal device in the first transmission manner; wherein

the plurality of transmission manners include the second non-frequency hopping transmission manner and an intra-time unit frequency hopping transmission manner;

the non-frequency hopping transmission manner is that the PUCCH is transmitted without frequency hopping in a time unit, wherein uplink control information, UCI, on the PUCCH is sent by using an orthogonal sequence whose length is L5 symbols, a demodulation reference signal, DMRS, on the PUCCH is sent by using an orthogonal sequence whose length is L6 symbols, and L5 and L6 are integers; and

the intra-time unit frequency hopping transmission manner is that the PUCCH is transmitted with frequency hopping in a time unit.

14. The method according to claim 13, wherein,

the second rule is: $0 \leq r_{PUCCH} \leq$ X–1, and an RB index value of the PUCCH is equal to $RB_{\mathrm{BWP}}^{\mathrm{offset}} + \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$; and

the third rule is: $0 \leq r_{PUCCH} \leq$ X–1, and the RB index value of the PUCCH is equal to $N_{\mathrm{BWP}}^{\mathrm{size}} - 1 - RB_{\mathrm{BWP}}^{\mathrm{offset}} - \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$, wherein

r_{PUCCH} is a PUCCH resource index, N_{CS} is a quantity of cyclic shifts of a PUCCH resource set, RB_{BWP}^{offset} is a frequency domain offset value of the PUCCH resource set, N_{BWP}^{Size} is a size of a bandwidth part BWP on which the PUCCH resource is configured.

15. The method according to claim 13 or 14, wherein the method further comprises:

sending a higher layer signaling, wherein the higher layer signaling comprises the second indication information.

16. The method according to any one of claims 13 to 15, comprising:

the second indication information is indicated by one bit; and

when a bit value of the second indication information is 0, the second indication information

indicates that the RB index of the PUCCH is determined according to the second rule; or

when a bit value of the second indication information is 1, the third rule is used to determine the RB index of the PUCCH based on the second indication information.

17. The method according to any one of claims 13 to 16, wherein the method further comprises:

indicating, by not sending the second indication information, that determining the RB index of the PUCCH according to a default rule; and

the default rule is that in the X PUCCH resources, X/2 PUCCH resources are on one side of a BWP, and X/2 PUCCH resources are on the other side of the BWP; wherein X is an integer.

18. The method according to claim 17, wherein the default rule is:

$0 \leq r_{PUCCH} \leq (X/2) - 1$, and an RB index value of the PUCCH is equal to $RB_{\mathrm{BWP}}^{\mathrm{offset}} + \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$; and

$X/2 \leq r_{PUCCH} \leq X - 1$, and the RB index value of the PUCCH is equal to $N_{\mathrm{BWP}}^{\mathrm{size}} - 1 - RB_{\mathrm{BWP}}^{\mathrm{offset}} - \lfloor (r_{\mathrm{PUCCH}} - 8) / N_{\mathrm{CS}} \rfloor$, wherein

r_{PUCCH} is a PUCCH resource index, N_{CS} is a quantity of cyclic shifts of a PUCCH resource set, RB_{BWP}^{offset} is a frequency domain offset value of the PUCCH resource set, N_{BWP}^{Size} is a size of a bandwidth part BWP on which the PUCCH resource is configured.

19. The method according to any one of claims 13 to 18, wherein X=16.

20. The method according to any one of claims 13 to 19, wherein the method further comprises:

sending identification information, wherein the identification information is used to indicate whether the second indication information is present.

21. The method according to any one of claims 13 to 20, wherein the method further comprises:

sending first indication information, wherein the first indication information is used to indicate the first transmission manner.

22. The method according to claim 21, wherein,

when a bit value of the first indication information is 0, the first indication information indicates that the first transmission manner is the non-frequency hopping transmission manner;

when a bit value of the first indication information is 1, the first indication information indicates that the first transmission manner is the intra-slot frequency hopping transmission manner.

23. The method according to any one of claims 13 to 22, wherein

the one side of the BWP indicates starting from a lowest frequency location of the BWP;

the on the other side of the BWP indicates starting from a highest frequency location of the

BWP.

24. A communications apparatus, comprising a transceiver module and a processing module, wherein,

the processing module is configured to determine a first transmission manner from a plurality of transmission manners; and;

when second indication information is present, and the first transmission manner is a second non-frequency hopping transmission manner, determining, based on the second indication information, a rule used to determine a resource block, RB, index of a physical uplink control channel, PUCCH, from a second rule and a third rule, wherein,

X PUCCH resources are on one side of a bandwidth part, BWP, according to the second rule;

X PUCCH resources are on the other side of the BWP according to the third rule; wherein X is an integer; and;

the transceiver module is configured to send the PUCCH to a network device in the first transmission manner, wherein

the plurality of transmission manners include the second non-frequency hopping transmission manner and an intra-time unit frequency hopping transmission manner;

the non-frequency hopping transmission manner is that the PUCCH is transmitted without frequency hopping in a time unit, wherein uplink control information, UCI, on the PUCCH is sent by using an orthogonal sequence whose length is L5 symbols, a demodulation reference signal, DMRS, on the PUCCH is sent by using an orthogonal sequence whose length is L6 symbols, and L5 and L6 are integers; and

the intra-time unit frequency hopping transmission manner is that the PUCCH is transmitted with frequency hopping in a time unit.

25. The apparatus according to claim 24, wherein,

the second rule is: $0 \le r_{PUCCH} \le$ X–1, and an RB index value of the PUCCH is equal to $RB_{\mathrm{BWP}}^{\mathrm{offset}} + \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$; and

the third rule is: $0 \le r_{PUCCH} \le$ X–1, and the RB index value of the PUCCH is equal to $N_{\mathrm{BWP}}^{\mathrm{size}} - 1 - RB_{\mathrm{BWP}}^{\mathrm{offset}} - \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$, wherein

r_{PUCCH} is a PUCCH resource index, N_{CS} is a quantity of cyclic shifts of a PUCCH resource set, RB_{BWP}^{offset} is a frequency domain offset value of the PUCCH resource set, N_{BWP}^{Size} is a size of a bandwidth part BWP on which the PUCCH resource is configured.

26. The apparatus according to claim 24 or 25, wherein,

the transceiver module is further configured to receive a higher layer signaling, wherein the higher layer signaling comprises the second indication information, and the second indication

information indicate determining the RB index of the PUCCH according to the second rule or the third rule.

27. The apparatus according to any one of claims 24 to 26, comprising:

the second indication information is indicated by one bit; and

when a bit value of the second indication information is 0, the second indication information indicates that the RB index of the PUCCH is determined according to the second rule; or

when a bit value of the second indication information is 1, the third rule is used to determine the RB index of the PUCCH based on the second indication information.

28. The apparatus according to any one of claims 24 to 27, wherein,

when second indication information is absent, an RB index of the PUCCH is determined according to a default rule.

29. The apparatus according to claim 28, wherein,

X/2 PUCCH resources are on one side of a BWP, and X/2 PUCCH resources are on the other side of the BWP, according to the default rule; wherein X is an integer.

30. The apparatus according to claim 28 or 29, wherein the default rule is:

$0 \leq r_{PUCCH} \leq (X/2) - 1$, and an RB index value of the PUCCH is equal to $RB_{\mathrm{BWP}}^{\mathrm{offset}} + \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$; and

$X/2 \leq r_{PUCCH} \leq X - 1$, and the RB index value of the PUCCH is equal to $N_{\mathrm{BWP}}^{\mathrm{size}} - 1 - RB_{\mathrm{BWP}}^{\mathrm{offset}} - \lfloor (r_{\mathrm{PUCCH}} - 8) / N_{\mathrm{CS}} \rfloor$, wherein

r_{PUCCH} is a PUCCH resource index, N_{CS} is a quantity of cyclic shifts of a PUCCH resource set, RB_{BWP}^{offset} is a frequency domain offset value of the PUCCH resource set, N_{BWP}^{Size} is a size of a bandwidth part BWP on which the PUCCH resource is configured.

31. The apparatus according to any one of claims 24 to 30, wherein X=16.

32. The apparatus according to any one of claims 24 to 31, wherein whether the second indication information is present is determined based on an identification information.

33. The apparatus according to any one of claims 24 to 32, wherein the processing module is further configured to obtain first indication information, wherein the first indication information indicates the first transmission manner.

34. The apparatus according to claim 33, wherein,

when a bit value of the first indication information is 0, the first indication information indicates that the first transmission manner is the non-frequency hopping transmission manner;

when a bit value of the first indication information is 1, the first indication information indicates that the first transmission manner is the intra-slot frequency hopping transmission manner.

35. The apparatus according to any one of claims 24 to 34, wherein

the one side of the BWP indicates starting from a lowest frequency location of the BWP;

the on the other side of the BWP indicates starting from a highest frequency location of the BWP.

36. A communications apparatus, comprising a transceiver module and a processing module, wherein,

the processing module is configured to determine a first transmission manner from a plurality of transmission manners; and;

when the first transmission manner is a second non-frequency hopping transmission manner, sending second indication information, wherein the second indication information is used to indicate that a resource block RB index of a physical uplink control channel PUCCH is determined by using a second rule or a third rule; and,

X PUCCH resources are on one side of a bandwidth part, BWP, according to the second rule;

X PUCCH resources are on the other side of the BWP according to the third rule; wherein X is an integer; and;

the transceiver module is configured to receive the PUCCH from a terminal device in the first transmission manner; wherein

the plurality of transmission manners include the second non-frequency hopping transmission manner and an intra-time unit frequency hopping transmission manner;

the non-frequency hopping transmission manner is that the PUCCH is transmitted without frequency hopping in a time unit, wherein uplink control information, UCI, on the PUCCH is sent by using an orthogonal sequence whose length is L5 symbols, a demodulation reference signal, DMRS, on the PUCCH is sent by using an orthogonal sequence whose length is L6 symbols, and L5 and L6 are integers; and

the intra-time unit frequency hopping transmission manner is that the PUCCH is transmitted with frequency hopping in a time unit.

37. The apparatus according to claim 36, wherein,

the second rule is: $0 \leq r_{PUCCH} \leq$ X–1, and an RB index value of the PUCCH is equal to $RB_{\mathrm{BWP}}^{\mathrm{offset}} + \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$; and

the third rule is: $0 \leq r_{PUCCH} \leq$ X–1, and the RB index value of the PUCCH is equal to $N_{\mathrm{BWP}}^{\mathrm{size}} - 1 - RB_{\mathrm{BWP}}^{\mathrm{offset}} - \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$, wherein

r_{PUCCH} is a PUCCH resource index, N_{CS} is a quantity of cyclic shifts of a PUCCH resource set, RB_{BWP}^{offset} is a frequency domain offset value of the PUCCH resource set, N_{BWP}^{Size} is a size of a bandwidth part BWP on which the PUCCH resource is configured.

38. The apparatus according to claim 36 or 37, wherein,

sending a higher layer signaling, wherein the higher layer signaling comprises the second indication information.

39. The apparatus according to any one of claims 36 to 38, comprising:

the second indication information is indicated by one bit; and

when a bit value of the second indication information is 0, the second indication information indicates that the RB index of the PUCCH is determined according to the second rule; or

when a bit value of the second indication information is 1, the third rule is used to determine the RB index of the PUCCH based on the second indication information.

40. The apparatus according to any one of claims 36 to 39, wherein the processing module is further configured to indicate, by not sending the second indication information, that determining the RB index of the PUCCH according to the default rule; and

the default rule is that in the X PUCCH resources, X/2 PUCCH resources are on one side of a BWP, and X/2 PUCCH resources are on the other side of the BWP; wherein X is an integer.

41. The apparatus according to claim 40, wherein the default rule is:

$0 \leq r_{PUCCH} \leq (X/2) - 1$, and an RB index value of the PUCCH is equal to $RB_{\mathrm{BWP}}^{\mathrm{offset}} + \lfloor r_{\mathrm{PUCCH}} / N_{\mathrm{CS}} \rfloor$; and

$X/2 \leq r_{PUCCH} \leq X - 1$, and the RB index value of the PUCCH is equal to $N_{\mathrm{BWP}}^{\mathrm{size}} - 1 - RB_{\mathrm{BWP}}^{\mathrm{offset}} - \lfloor (r_{\mathrm{PUCCH}} - 8) / N_{\mathrm{CS}} \rfloor$, wherein

r_{PUCCH} is a PUCCH resource index, N_{CS} is a quantity of cyclic shifts of a PUCCH resource set, RB_{BWP}^{offset} is a frequency domain offset value of the PUCCH resource set, N_{BWP}^{Size} is a size of a bandwidth part BWP on which the PUCCH resource is configured.

42. The apparatus according to any one of claims 36 to 41, wherein X=16.

43. The apparatus according to any one of claims 36 to 42, wherein the processing module is further configured to send first indication information, wherein the first indication information is used to indicate the first transmission manner.

44. The apparatus according to claim 43, wherein,

when a bit value of the first indication information is 0, the first indication information indicates that the first transmission manner is the non-frequency hopping transmission manner;

when a bit value of the first indication information is 1, the first indication information indicates that the first transmission manner is the intra-slot frequency hopping transmission manner.

45. The apparatus according to any one of claims 36 to 44, wherein

the one side of the BWP indicates starting from a lowest frequency location of the BWP;

the on the other side of the BWP indicates starting from a highest frequency location of the BWP.

46. A computer readable storage medium, wherein the computer readable storage medium stores a computer instruction, and when the computer instruction is executed, the method according to any one of claims 1 to 12 is implemented; and or the method according to any one of claims 13 to 23 is implemented.