CLAIMS

What is claimed is:

1. A multi-link communication method, comprising:

sending (S101), by a first multi-link device, a first physical layer protocol data unit (PPDU) to a second multi-link device over a first link through channel contention; ~~and~~

sending (S102), by the first multi-link device, a second PPDU to the second multi-link device over a second link through channel contention, wherein an end time of the second PPDU is aligned with an end time of the first PPDU;

receiving (S103), by the first multi-link device over the first link, first information from the second multi-link device in response to the first PPDU;

receiving (S104), by the first multi-link device over the second link, second information from the second multi-link device in response to the second PPDU; and,

wherein a duration time of the first information is the same as a duration time of the second information.

2. The method according to claim 1, wherein the second multi-link device does not support simultaneous transmission and reception.

3. The method according to claim 1 or 2, wherein that the end time of the second PPDU is aligned with the end time of the first PPDU comprises: the end time of the second PPDU is not later than the end time of the first PPDU.

4. The method according to claim 3, wherein that the end time of the second PPDU is not later than the end time of the first PPDU comprises: the end time of the second PPDU is the same as the end time of the first PPDU.

5. The method according to any one of claims 1 to 4, wherein a sending time of the second PPDU is not earlier than a sending time of the first PPDU.

6. The method according to any one of claims 1 to 5, wherein at least one of the first PPDU and the second PPDU is a multi-user PPDU.

~~7. The method according to any one of claims 1 to 6, wherein the method further comprises:~~

~~receiving, by the first multi-link device over the first link, first information that is sent by the second multi-link device in response to the first PPDU; and~~

~~receiving, by the first multi-link device over the second link, second information that is sent by the second multi-link device in response to the second PPDU.~~

~~8~~7. The method according to any one of claims ~~7~~1-6, wherein an interval between a time at which the first information is sent and a time at which the first PPDU is received is a preset time interval, and an interval between a time at which the second information is sent and a time at which the second PPDU is received is the preset time

interval.

~~9. The method according to claim 7 or 8, wherein a transmission time of the first information is the same as a transmission time of the second information.~~

~~10~~8. The method according to any one of claims 1 to ~~9~~7, wherein the first PPDU comprises an uplink-downlink indication, the uplink-downlink indication is used to indicate a transmission direction of the first PPDU, and the transmission direction comprises uplink or downlink.

~~11~~9. The method according to any one of claims 1 to ~~9~~8, wherein the first PPDU comprises first TXOP duration information, and the first TXOP duration information indicates first TXOP duration; the second PPDU comprises second TXOP duration information, and the second TXOP duration information indicates second TXOP duration; and the first TXOP duration is the same as the second TXOP duration.

10. The method according to any one of claims 1 to 9, wherein: the first information and the second information is a block acknowledgement, BA, respectively; or, the first information and the second information is an ACK, respectively.

~~12~~11. The method according to any one of claims 1 to ~~9~~10, wherein the first multi-link device is a multi-link AP, and the second multi-link device is a multi-link STA.

~~13. A multi-link communication method, wherein the method comprises:~~

~~sending, by a first multi-link device, a first physical layer protocol data unit (PPDU) over a first link;~~

~~after a preset time interval, receiving, by the first multi-link device over the first link, a second PPDU that is sent by a second multi-link device in response to the first PPDU; and~~

~~receiving, by the first multi-link device over a second link, a third PPDU sent by the second multi-link device over the second link, wherein an end time of the third PPDU is aligned with an end time of the second PPDU.~~

~~14. A multi-link communication method, wherein the method comprises:~~

~~obtaining, by a second multi-link device, a first PPDU transmitted by a first multi-link device over a first link;~~

~~sending, by the second multi-link device over the first link, a second PPDU in response to the first PPDU; and~~

~~sending, by the second multi-link device, a third PPDU over a second link, wherein an end time of the third PPDU is aligned with an end time of the second PPDU.~~

~~15. The method according to claim 13 or 14, wherein the second multi-link device does not support simultaneous transmission and reception.~~

~~16. The method according to any one of claims 13 to 15, wherein that the end time of the third PPDU is aligned with the end time of the second PPDU comprises: the end time of the third PPDU is not later than the end time of the second PPDU.~~

~~17. The method according to any one of claims 13 to 16, wherein that the end time of the third PPDU is not later than the end time of the second PPDU comprises: the end time of the third PPDU is the same as the end time of the second PPDU.~~

~~18. The method according to any one of claims 13 to 17, wherein the first PPDU comprises transmission duration information, and the transmission duration information is used to indicate transmission duration of the second PPDU; or~~

~~a physical layer preamble of the second PPDU comprises transmission duration information, and the transmission duration information is used to indicate transmission duration of the second PPDU.~~

~~19. The method according to any one of claims 13 to 18, wherein the third PPDU comprises third TXOP duration information indicating third TXOP duration, and the third TXOP duration does not exceed a smaller time value or an earlier end time value of first TXOP duration indicated by first TXOP duration information in the first PPDU and second duration; and~~

~~the second duration is the transmission duration of the second PPDU or a sum of the transmission duration of the second PPDU, a SIFS, and transmission duration of acknowledgment information in response to the second PPDU.~~

~~20. The method according to any one of claims 13 to 19, wherein the first multi-link device is a multi-link AP, and the second multi-link device is a multi-link STA.~~

~~21~~12. A multi-link communication apparatus, comprising:

a first ~~sending~~transceiver module (902a), configured to send a first physical layer protocol data unit (PPDU) to a second multi-link device over a first link through channel contention; ~~and~~

a second ~~sending~~transceiver module (902b), configured to send a second PPDU to the second multi-link device over a second link through channel contention, wherein an end time of the second PPDU is aligned with an end time of the first PPDU;

the first transceiver module (902a) is further configured to receive, over the first link, first information from the second multi-link device in response to the first PPDU; and

the second transceiver module (902b) is further configured to receive, over the second link, second information from the second multi-link device in response to the second PPDU.

~~22~~13. The apparatus according to claim ~~21~~12, wherein the second multi-link device does not support simultaneous transmission and reception.

~~23~~14. The apparatus according to claim ~~11~~ 12 or ~~12~~13, wherein that the end time of the second PPDU is aligned with the end time of the first PPDU comprises: the end time of the second PPDU is not later than the end time of the first PPDU.

~~24~~15. The apparatus according to claim ~~23~~14, wherein that the end time of the second PPDU is not later than the end time of the first PPDU comprises: the end time of the second PPDU is the same as the end time of the first PPDU.

~~25~~16. The apparatus according to any one of claims ~~21~~ 12 to ~~24~~15, wherein a sending time of the second PPDU is not earlier than a sending time of the first PPDU.

~~26~~17. The apparatus according to any one of claims ~~21~~ 12 to ~~25~~16, wherein at least one of the first PPDU and the second PPDU is a multi-user PPDU.

~~27. The apparatus according to any one of claims 21 to 25, wherein~~

~~the first sending module is further configured to receive, over the first link, first information that is sent by the second multi-link device in response to the first PPDU; and~~

~~the second sending module is further configured to receive, over the second link, second information that is sent by the second multi-link device in response to the second PPDU.~~

~~28~~18. The apparatus according to any one of claim ~~27~~12-17, wherein an interval between a time at which the first information is sent and a time at which the first PPDU is received is a preset time interval, and an interval between a time at which the second information is sent and a time at which the second PPDU is received is the preset time interval.

~~29. The apparatus according to claim 27 or 28, wherein a transmission time of the first information is the same as a transmission time of the second information.~~

~~30~~19. The apparatus according to any one of claims ~~21~~ 12 to ~~29~~18, wherein the first PPDU comprises an uplink-downlink indication, the uplink-downlink indication is used to indicate a transmission direction of the first PPDU, and the transmission direction comprises uplink or downlink.

~~31~~20. The apparatus according to any one of claims ~~21~~ 12 to ~~30~~19, wherein the first PPDU comprises first TXOP duration information, and the first TXOP duration information indicates first TXOP duration; the second PPDU comprises second TXOP duration information, and the second TXOP duration information indicates second TXOP duration; and the first TXOP duration is the same as the second TXOP duration.

21. The apparatus according to any one of claims 12 to 20, wherein the first information and the second information is a block acknowledgement, BA, respectively; or, the first information and the second information is an ACK, respectively.

~~32~~22. The apparatus according to any one of claims ~~21~~ 12 to ~~31~~21, wherein the apparatus is a multi-link AP, and the second multi-link device is a multi-link STA.

~~33. A multi-link communication apparatus, applied to a first multi-link device, wherein the apparatus comprises:~~

~~a first sending module, configured to send a first physical layer protocol data unit (PPDU) over a first link;~~

a first receiving module, configured to receive, over the first link after a preset time interval, a second PPDU that is sent by a second multi-link device in response to the first PPDU; and

a second receiving module, configured to receive, over a second link, a third PPDU sent by the second multi-link device over the second link, wherein an end time of the third PPDU is aligned with an end time of the second PPDU.

34. A multi-link communication apparatus, applied to a second multi-link device, wherein the apparatus comprises:

a first transceiver module, configured to obtain a first PPDU transmitted by a first multi-link device over a first link, wherein

the first transceiver module is further configured to send, over the first link, a second PPDU in response to the first PPDU; and

a second transceiver module, configured to send a third PPDU over a second link, wherein an end time of the third PPDU is aligned with an end time of the second PPDU.

35. The apparatus according to claim 33 or 34, wherein the second multi-link device does not support simultaneous transmission and reception.

36. The apparatus according to any one of claims 33 to 35, wherein that the end time of the third PPDU is aligned with the end time of the second PPDU comprises: the end time of the third PPDU is not later than the end time of the second PPDU.

37. The apparatus according to claim 36, wherein that the end time of the third PPDU is not later than the end time of the second PPDU comprises: the end time of the third PPDU is the same as the end time of the second PPDU.

38. The apparatus according to any one of claims 33 to 37, wherein the first PPDU comprises transmission duration information, and the transmission duration information is used to indicate transmission duration of the second PPDU; or

a physical layer preamble of the second PPDU comprises transmission duration information, and the transmission duration information is used to indicate transmission duration of the second PPDU.

39. The apparatus according to any one of claims 33 to 38, wherein the third PPDU comprises third TXOP duration information indicating third TXOP duration, and the third TXOP duration does not exceed a smaller time value or an earlier end time value of first TXOP duration indicated by first TXOP duration information in the first PPDU and second duration; and

the second duration is the transmission duration of the second PPDU or a sum of the transmission duration of the second PPDU, a SIFS, and transmission duration of acknowledgment information in response to the second PPDU.

40. The apparatus according to any one of claims 33 to 39, wherein the first multi-link device is a multi-link AP,

~~and the second multi-link device is a multi-link STA.~~

~~41~~23. An apparatus, comprising a processor and a memory, wherein the memory is configured to store instructions; and when the instructions are run by the processor, the apparatus is enabled to perform the method according to any one of claims 1 to ~~20~~11.

~~42~~24. A computer program product comprising instructions, wherein when the computer program product is run on a computer, the computer is enabled to perform the method according to any one of claims 1 to ~~20~~11.

~~43~~25. A computer-readable storage medium, wherein the computer-readable storage medium comprises instructions used to implement the method according to any one of claims 1 to ~~20~~11.

~~44~~26. An apparatus, configured to implement the method according to any one of claims 1 to ~~20~~11.

27. A chipset for an access point multi-link device (AP MLD), configured to implement the method according to any one of claims 1 to 11.