WHAT IS CLAIMED IS:

1. A method for reporting a power headroom report (PHR), performed by a user equipment (UE), comprising:

receiving configuration information transmitted by a base station, wherein the configuration information instructs the UE to support PHR reporting of at least one transmission and reception point TRP on each carrier of at least one carrier;

receiving a power control parameter of at least one TRP corresponding to the at least one carrier transmitted by the base station;

receiving a trigger condition for PHR reporting of at least one TRP transmitted by the base station; and

triggering PHR reporting of at least two TRPs corresponding to each carrier based on the power control parameter and the trigger condition for reporting,

wherein triggering the PHR reporting of the at least two TRPs corresponding to each carrier based on the power control parameter and the trigger condition for reporting, comprises:

reporting a PHR of each TRP of the at least two TRPs on the carrier to the base station, in response to determining, based on the power control parameter and the trigger condition for reporting, that the UE satisfies the trigger condition for reporting,

wherein reporting the PHR of each TRP of the at least two TRPs on the carrier to the base station comprises:

sorting the TRPs;

sorting the PHRs of the TRPs according to an order of the sorted TRPs; and

transmitting the PHR of each TRP sorted in order to the base station,

wherein sorting the TRPs comprises at least one of:

sorting the TRPs according to a predefined sorting rule;

sorting the TRPs according to a sorting rule provided by a protocol; or

sorting the TRPs according to a sorting rule configured or indicated by a network.

2. The method according to claim 1, wherein reporting the PHR of each TRP on the carrier to the base station comprises at least one of:

in response to the carrier being configured with power back-off, reporting maximum transmit power of each TRP on the carrier after the power back-off in order;

in response to the carrier being configured with a physical uplink shared channel

(PUSCH) and the UE having a real PUSCH transmission, reporting a power headroom of each TRP after the real PUSCH transmission in order;

in response to the carrier being configured with a PUSCH and the UE having a real PUSCH transmission, reporting a power headroom of each TRP after reference PUSCH transmission in order;

in response to the carrier being configured with a PUSCH and the UE not having a real PUSCH transmission, reporting a power headroom of each TRP after reference PUSCH transmission in order;

in response to the carrier being configured with a physical uplink control channel (PUCCH) and the UE having a real PUCCH transmission, reporting a power headroom of each TRP after the real PUCCH transmission in order;

in response to the carrier being configured with a PUCCH and the UE having a real PUCCH transmission, reporting a power headroom of each TRP after reference PUCCH transmission in order;

in response to the carrier being configured with a PUCCH and the UE not having a real PUCCH transmission, reporting a power headroom of each TRP after reference PUCCH transmission in order;

in response to the carrier being configured with a sounding reference signal (SRS) and the UE having a real SRS transmission, reporting a power headroom of each TRP after the real SRS transmission in order;

in response to the carrier being configured with an SRS and the UE having a real SRS transmission, reporting a power headroom of each TRP after reference SRS transmission in order;

in response to the carrier being configured with an SRS and the UE not having a real SRS transmission, reporting a power headroom of each TRP after reference SRS transmission in order;

in response to the carrier being configured with a physical random access channel (PRACH) and the UE having a real PRACH transmission, reporting a power headroom of each TRP after the real PRACH transmission in order;

in response to the carrier being configured with a PRACH and the UE having a real PRACH transmission, reporting a power headroom of each TRP after reference PRACH transmission in order;

in response to the carrier being configured with a PRACH and the UE not having a real PRACH transmission, reporting a power headroom of each TRP after reference

PRACH transmission in order;

reporting a power back-off value of each TRP in order; or

reporting a power back-off value of the UE.

3. The method according to claim 2, wherein reporting the PHR of each TRP on the carrier to the base station further comprises:

reporting an identity of each TRP in order.

4. The method according to claim 1, wherein the power control parameter comprises at least one of:

first information corresponding to a TRP on the carrier; or

second information corresponding to the carrier.

5. The method according to claim 4, wherein the first information corresponding to the TRP on the carrier comprises at least one of:

identity information corresponding to the TRP on the carrier;

identity information of a downlink path loss reference carrier corresponding to the TRP on the carrier;

a downlink change corresponding to the TRP on the carrier;

an uplink power back-off change corresponding to the TRP on the carrier;

a PHR periodic reporting timer corresponding to the TRP on the carrier;

a PHR reporting prohibition timer corresponding to the TRP on the carrier;

a maximum permissible exposure (MPE) power threshold corresponding to the TRP on the carrier;

an MPE reporting prohibition timer corresponding to the TRP on the carrier;

an uplink MPE power back-off change corresponding to the TRP on the carrier; or

MPE millimeter wave (FR2) reporting corresponding to the TRP on the carrier,

wherein the identity information corresponding to the TRP on the carrier comprises at least one of:

an uplink physical channel identity of the TRP on the carrier;

a beam information identity of the TRP on the carrier;

a sounding reference signal SRS resource set identity of the TRP on the carrier; or

a power control parameter set identity of the TRP on the carrier,

wherein the uplink physical channel comprises at least one of:

a PUCCH;

a PUSCH;

an SRS; or

a PRACH.

6. The method according to claim 4, wherein the second information corresponding to the carrier comprises at least one of:

identity information of a downlink path loss reference carrier corresponding to the carrier;

a downlink path loss change corresponding to the carrier;

an uplink power back-off change corresponding to the carrier;

a PHR periodic reporting timer corresponding to the carrier;

a PHR reporting prohibition timer corresponding to the carrier;

an MPE power threshold corresponding to the carrier;

an MPE reporting prohibition timer corresponding to the carrier;

an uplink MPE power back-off change corresponding to the carrier; or

MPE FR2 reporting corresponding to the carrier.

7. The method according to claim 1, wherein the trigger condition for reporting comprises at least one of:

changing identity information corresponding to a TRP on the carrier;

changing a downlink path loss reference carrier corresponding to a TRP on the carrier;

changing a carrier for uplink physical channel transmission of a TRP on the carrier;

a timeout of a PHR periodic reporting timer corresponding to a TRP on the carrier;

a timeout of a PHR reporting prohibition timer corresponding to a TRP on the carrier, and an actual downlink path loss change corresponding to the TRP exceeding a downlink path loss change corresponding to the TRP on the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to a TRP on the carrier, and an actual uplink power back-off change corresponding to the TRP exceeding an uplink power back-off change corresponding to the TRP on the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to a TRP on the

carrier, and an actual downlink path loss change corresponding to the TRP exceeding a downlink path loss change corresponding to the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to a TRP on the carrier, and an actual uplink power back-off change corresponding to the TRP exceeding an uplink power back-off change corresponding to the carrier in the power control parameter;

a timeout of a PHR periodic reporting timer corresponding to the carrier;

a timeout of a PHR reporting prohibition timer corresponding to the carrier, and an actual downlink path loss change corresponding to the TRP exceeding a downlink path loss change corresponding to a TRP on the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to the carrier, and an actual uplink power back-off change corresponding to the TRP exceeding an uplink power back-off change corresponding to a TRP on the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to the carrier, and an actual downlink path loss change corresponding to the TRP exceeding a downlink path loss change corresponding to the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to the carrier, and an actual uplink power back-off change corresponding to the TRP exceeding an uplink power back-off change corresponding to the carrier in the power control parameter;

changing a downlink path loss reference carrier corresponding to the carrier;

configuring MPE FR2 reporting corresponding to the TRP on the carrier, and an MPE power back-off change corresponding to the TRP exceeding an MPE power threshold corresponding to the TRP on the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the TRP on the carrier, and an MPE power back-off change corresponding to the TRP exceeding an uplink MPE power back-off change corresponding to the TRP on the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the TRP on the carrier, and an MPE power back-off change corresponding to the TRP exceeding an MPE power threshold corresponding to the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the TRP on the carrier, and an MPE power back-off change corresponding to the TRP exceeding an uplink MPE power back-off change corresponding to the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the carrier, and an MPE power back-off change corresponding to the TRP exceeding an MPE power threshold corresponding to the TRP on the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the carrier, and an MPE power back-off change corresponding to the TRP exceeding an uplink MPE power back-off change corresponding to the TRP on the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the carrier, and an MPE power back-off change corresponding to the TRP exceeding an MPE power threshold corresponding to the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the carrier, and an MPE power back-off change corresponding to the TRP exceeding an uplink MPE power back-off change corresponding to the carrier in the power control parameter;

a timeout of an MPE reporting prohibition timer corresponding to the TRP on the carrier; or

a timeout of an MPE reporting prohibition timer corresponding to the carrier.

8. A method for reporting a power headroom report (PHR), performed by a base station, comprising:

transmitting configuration information to a user equipment (UE), wherein the configuration information instructs the UE to support PHR reporting of at least one transmission and reception point (TRP) on each carrier of at least one carrier;

transmitting a power control parameter of at least one TRP corresponding to the at least one carrier to the UE;

transmitting a trigger condition for PHR reporting of at least one TRP to the UE; and

receiving PHRs of at least two TRPs corresponding to each carrier transmitted by the UE,

wherein receiving the PHRs of at least two TRPs corresponding to each carrier transmitted by the UE, comprises:

receiving a PHR of each TRP of the at least two TRPs on each carrier transmitted by the UE,

wherein the method further comprises:

configuring or indicating a sorting rule to the UE for sorting the TRPs.

9. The method according to claim 8, wherein receiving the PHR of each TRP on each carrier transmitted by the UE comprises at least one of:

in response to the carrier being configured with power back-off, receiving maximum transmit power of each TRP on the carrier after the power back-off in order;

in response to the carrier being configured with a physical uplink shared channel (PUSCH) and the UE having a real PUSCH transmission, receiving a power headroom of each TRP after the real PUSCH transmission in order;

in response to the carrier being configured with a PUSCH and the UE having a real PUSCH transmission, receiving a power headroom of each TRP after reference PUSCH transmission in order;

in response to the carrier being configured with a PUSCH and the UE not having a real PUSCH transmission, receiving a power headroom of each TRP after reference PUSCH transmission in order;

in response to the carrier being configured with a physical uplink control channel (PUCCH) and the UE having a real PUCCH transmission, receiving a power headroom of each TRP after the real PUCCH transmission in order;

in response to the carrier being configured with a PUCCH and the UE having a real PUCCH transmission, receiving a power headroom of each TRP after reference PUCCH transmission in order;

in response to the carrier being configured with a PUCCH and the UE not having a real PUCCH transmission, receiving a power headroom of each TRP after reference PUCCH transmission in order;

in response to the carrier being configured with a sounding reference signal (SRS) and the UE having a real SRS transmission, receiving a power headroom of each TRP after the real SRS transmission in order;

in response to the carrier being configured with an SRS and the UE having a real SRS transmission, receiving a power headroom of each TRP after reference SRS transmission in order;

in response to the carrier being configured with an SRS and the UE not having a real SRS transmission, receiving a power headroom of each TRP after reference SRS transmission in order;

in response to the carrier being configured with a physical random access channel (PRACH) and the UE having a real PRACH transmission, receiving a power headroom

of each TRP after the real PRACH transmission in order;

in response to the carrier being configured with a PRACH and the UE having a real PRACH transmission, receiving a power headroom of each TRP after reference PRACH transmission in order;

in response to the carrier being configured with a PRACH and the UE not having a real PRACH transmission, receiving a power headroom of each TRP after reference PRACH transmission in order;

receiving a power back-off value of each TRP in order; or

reporting a power back-off value of the UE.

10. The method according to claim 9, wherein receiving the PHR of each TRP on each carrier transmitted by the UE further comprises:

receiving an identity of each TRP in order.

11. The method according to claim 8, wherein the power control parameter comprises at least one of:

first information corresponding to a TRP on the carrier; or

second information corresponding to the carrier.

12. The method according to claim 11, wherein the first information corresponding to the TRP on the carrier comprises at least one of:

identity information corresponding to the TRP on the carrier;

identity information of a downlink path loss reference carrier corresponding to the TRP on the carrier;

a downlink path loss change corresponding to the TRP on the carrier;

an uplink power back-off change corresponding to the TRP on the carrier;

a PHR periodic reporting timer corresponding to the TRP on the carrier;

a PHR reporting prohibition timer corresponding to the TRP on the carrier;

a maximum permissible exposure (MPE) power threshold corresponding to the TRP on the carrier;

an MPE reporting prohibition timer corresponding to the TRP on the carrier;

an uplink MPE power back-off change corresponding to the TRP on the carrier; or

MPE millimeter wave (FR2) reporting corresponding to the TRP on the carrier,

wherein the identity information corresponding to the TRP on the carrier

comprises at least one of:

an uplink physical channel identity of the TRP on the carrier;

a beam information identity of the TRP on the carrier;

an SRS resource set identity of the TRP on the carrier; or

a power control parameter set identity of the TRP on the carrier,

wherein the uplink physical channel comprises at least one of:

a PUCCH;

a PUSCH;

an SRS; or

a PRACH.

13. The method according to claim 12, wherein the second information corresponding to the carrier comprises at least one of:

identity information of a downlink path loss reference carrier corresponding to the carrier;

a downlink path loss change corresponding to the carrier;

an uplink power back-off change corresponding to the carrier;

a PHR periodic reporting timer corresponding to the carrier;

a PHR reporting prohibition timer corresponding to the carrier;

an MPE power threshold corresponding to the carrier;

an MPE reporting prohibition timer corresponding to the carrier;

an uplink MPE power back-off change corresponding to the carrier; or

MPE FR2 reporting corresponding to the carrier.

14. The method according to claim 8, wherein the trigger condition for reporting comprises at least one of:

changing identity information corresponding to a TRP on the carrier;

changing a downlink path loss reference carrier corresponding to a TRP on the carrier;

changing a carrier for uplink physical channel transmission of a TRP on the carrier;

a timeout of a PHR periodic reporting timer corresponding to a TRP on the carrier;

a timeout of a PHR reporting prohibition timer corresponding to a TRP on the carrier, and an actual downlink path loss change corresponding to the TRP exceeding a downlink path loss change corresponding to the TRP on the carrier in the power control

parameter;

a timeout of a PHR reporting prohibition timer corresponding to a TRP on the carrier, and an actual uplink power back-off change corresponding to the TRP exceeding an uplink power back-off change corresponding to the TRP on the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to a TRP on the carrier, and an actual downlink path loss change corresponding to the TRP exceeding a downlink path loss change corresponding to the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to a TRP on the carrier, and an actual uplink power back-off change corresponding to the TRP exceeding an uplink power back-off change corresponding to the carrier in the power control parameter;

a timeout of a PHR periodic reporting timer corresponding to the carrier;

a timeout of a PHR reporting prohibition timer corresponding to the carrier, and an actual downlink path loss change corresponding to the TRP exceeding a downlink path loss change corresponding to a TRP on the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to the carrier, and an actual uplink power back-off change corresponding to the TRP exceeding an uplink power back-off change corresponding to a TRP on the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to the carrier, and an actual downlink path loss change corresponding to the TRP exceeding a downlink path loss change corresponding to the carrier in the power control parameter;

a timeout of a PHR reporting prohibition timer corresponding to the carrier, and an actual uplink power back-off change corresponding to the TRP exceeding an uplink power back-off change corresponding to the carrier in the power control parameter;

changing a downlink path loss reference carrier corresponding to the carrier;

configuring MPE FR2 reporting corresponding to the TRP on the carrier, and an MPE power back-off change corresponding to the TRP exceeding an MPE power threshold corresponding to the TRP on the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the TRP on the carrier, and an MPE power back-off change corresponding to the TRP exceeding an uplink MPE power back-off change corresponding to the TRP on the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the TRP on the carrier, and an MPE power back-off change corresponding to the TRP exceeding an MPE power threshold corresponding to the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the TRP on the carrier, and an MPE power back-off change corresponding to the TRP exceeding an uplink MPE power back-off change corresponding to the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the carrier, and an MPE power back-off change corresponding to the TRP exceeding an MPE power threshold corresponding to the TRP on the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the carrier, and an MPE power back-off change corresponding to the TRP exceeding an uplink MPE power back-off change corresponding to the TRP on the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the carrier, and an MPE power back-off change corresponding to the TRP exceeding an MPE power threshold corresponding to the carrier in the power control parameter;

configuring MPE FR2 reporting corresponding to the carrier, and an MPE power back-off change corresponding to the TRP exceeding an uplink MPE power back-off change corresponding to the carrier in the power control parameter;

a timeout of an MPE reporting prohibition timer corresponding to the TRP on the carrier; or

a timeout of an MPE reporting prohibition timer corresponding to the carrier.

15. A user equipment (UE), comprising:

a transceiver;

a memory; and

a processor connected to the transceiver and the memory respectively, wherein,

the processor is configured to control wireless signal transmission and reception of the transceiver, and to enable implementing of the method for reporting a power headroom report (PHR) of any one of claims 1 to 7, by executing computer-executable instructions on the memory.

16. A base station, comprising:

a transceiver;

a memory; and

a processor connected to the transceiver and the memory respectively, wherein,

the processor is configured to control wireless signal transmission and reception of the transceiver, and to enable implementing the method for reporting a power headroom report (PHR) of any one of claims 8 to 14, by executing computer-executable instructions on the memory.