CLAIMS

What is claimed is:

1. an uplink full-power transmission method, applied to a terminal device and comprising:

performing uplink transmission based on an uplink transmit power obtained through scaling by a power scaling coefficient, wherein the power scaling coefficient is determined based on a power control factor; wherein

the power control factor comprises at least one of the following: a working mode reported by the terminal device, and the number of antenna ports for each SRS resource in a sounding reference signal (SRS) resource set that is configured by the network device based on the working mode;

wherein the working mode comprises the number of antenna ports for each SRS resource in the SRS resource set configured by the network device is the same or different;

wherein the power scaling coefficient is determined in at least one of the following manners:

manner A:

if the power control factor satisfies the following first condition, determining the power scaling coefficient to be 1:

all radio frequency branches of the terminal device support full-power transmission; or

part of radio frequency branches of the terminal device supports full-power transmission, the number of antenna ports for each SRS resource in the SRS resource set is different, and a transmission precoding matrix indicator (TPMI) delivered by the network device falls within a TPMI reported by the terminal device; wherein

the full-power transmission is transmission based on a maximum transmit power of the terminal device;

manner B:

if the power control factor satisfies the following second condition, determining the power scaling coefficient to be a ratio of the number of non-zero antenna ports to the maximum number of antenna ports that is supported by a single SRS resource and reported by the terminal device:

none of radio frequency branches of the terminal device supports full-power transmission, and the number of antenna ports for each SRS resource in the SRS resource set is the same; or

part of radio frequency branches of the terminal device supports full-power transmission, and the number of antenna ports for each SRS resource in the SRS resource set is the same; or

part of radio frequency branches of the terminal device supports full-power transmission, the number of antenna ports for each SRS resource in the SRS resource set is different, and the TPMI delivered by the network device does not fall within a full-power transmission TPMI reported by the terminal device; wherein

the non-zero antenna port means that row values of a precoding codebook corresponding to the antenna port are all non-zero;

manner C:

if the power control factor satisfies the following third condition, determining the power scaling coefficient to be a ratio of the number of non-zero antenna ports to the maximum number of antenna ports supported by the SRS resource that is configured by the network device:

none of radio frequency branches of the terminal device supports full-power sending, and the number of antenna ports for each SRS resource in the SRS resource set is different; or

part of radio frequency branches of the terminal device supports full-power sending, the number of antenna ports for each SRS resource in the SRS resource set is different, and no full-power transmission TPMI is reported by the terminal device.

2. The method according to claim 1, wherein the power control factor comprises an uplink full-power transmission capability of the terminal device, and the uplink full-power transmission capability is determined in any one of the following manners:

reporting the uplink full-power transmission capability; or

reporting the uplink full-power transmission capability, and receiving an uplink full-power transmission indication delivered by the network device, wherein the uplink full-power transmission indication is used to indicate that the terminal device is to use an uplink full-power transmission mode for uplink transmission.

3. The method according to claim 1, wherein the power control factor comprises an uplink full-power transmission capability of the terminal device, and the performing uplink transmission based on an uplink transmit power obtained through scaling by a power scaling coefficient comprises:

if the uplink full-power transmission capability of the terminal device is that none of radio frequency branches supports full-power transmission or part of radio frequency branches supports full-power transmission, and an uplink transmission rank of the terminal device is equal to the number of uplink transmission antenna ports of the terminal device, performing uplink transmission based on the uplink transmit power according to a precoding codebook delivered by the network device; wherein

the precoding codebook is determined based on the number of uplink transmission antenna ports of the terminal device, the uplink transmission rank, and the number of antenna ports for each SRS resource in the SRS resource set.

4. The method according to claim 1, wherein the performing uplink transmission based on an uplink transmit power obtained through scaling by a power scaling coefficient comprises:

if the number of antenna ports for each SRS resource in the SRS resource set configured by the network device is different, and an uplink transmission rank of the terminal device is less than the number of uplink transmission antenna ports of the terminal device, performing uplink transmission based on the uplink transmit power in an SRS resource transmission mode corresponding to the number of antenna ports of an SRS resource that is the same as the uplink transmission rank.

5. An uplink full-power transmission method, applied to a network device and comprising:

receiving uplink data sent by a terminal device, wherein the uplink data is transmitted on uplink by the terminal device based on an uplink transmit power obtained through scaling by a power scaling coefficient, and the power scaling coefficient is determined based on a power control factor; wherein

the power control factor comprises at least one of the following: a working mode reported by the terminal device, and the number of antenna ports for each SRS resource in a sounding reference signal (SRS) resource set that is configured by the network device based on the working mode;

wherein the working mode comprises the number of antenna ports for each SRS resource in the SRS resource set configured by the network device is the same or different;

wherein the power scaling coefficient is determined in at least one of the following manners:

manner A:

if the power control factor satisfies the following first condition, the power scaling coefficient is determined to be 1:

all radio frequency branches of the terminal device support full-power transmission; or

part of radio frequency branches of the terminal device supports full-power transmission, the number of antenna ports for each SRS resource in the SRS resource set is different, and a transmission precoding matrix indicator (TPMI) delivered by the network device falls within a TPMI reported by the terminal device; wherein

the full-power transmission is transmission based on a maximum transmit power of the terminal device;

manner B:

if the power control factor satisfies the following second condition, the power scaling coefficient is determined to be a ratio of the number of non-zero antenna ports to the maximum number of antenna ports that is supported by a single SRS resource and reported by the terminal device:

none of radio frequency branches of the terminal device supports full-power transmission, and the number of antenna ports for each SRS resource in the SRS resource set is the same; or

part of radio frequency branches of the terminal device supports full-power transmission, and the number of antenna ports for each SRS resource in the SRS resource set is the same; or

part of radio frequency branches of the terminal device supports full-power transmission, the number of antenna ports for each SRS resource in the SRS resource set is different, and the TPMI delivered by the network device does not fall within a full-power transmission TPMI reported by the terminal device; wherein

the non-zero antenna port means that row values of a precoding codebook corresponding to the antenna port are all non-zero;

manner C:

if the power control factor satisfies the following third condition, the power scaling coefficient is determined to be a ratio of the number of non-zero antenna ports to the maximum number of antenna ports supported by the SRS resource that is configured by the network device:

none of radio frequency branches of the terminal device supports full-power sending, and the number of antenna ports for each SRS resource in the SRS resource set is different; or

part of radio frequency branches of the terminal device supports full-power sending, the number of antenna ports for each SRS resource in the SRS resource set is different, and no full-power transmission TPMI is reported by the terminal device.

6. The method according to claim 5, before the receiving uplink data sent by a terminal device, further comprising:

if none of radio frequency branches of the terminal device supports full-power transmission or part of radio frequency branches supports full-power transmission, delivering a TPMI to the terminal device, wherein the delivered TPMI is used to indicate that the terminal device is to perform uplink transmission based on a precoding codebook that is determined based on an uplink transmission parameter; wherein

the uplink transmission parameter comprises the number of uplink transmission antenna ports of the terminal device, an uplink transmission rank, and the number of antenna ports for each SRS resource in the SRS resource set configured by the network device; and the full-power transmission indicates transmission performed based on a maximum transmit power of the terminal device.

7. The method according to claim 6, wherein the precoding codebook is determined in the following manner:

if the number of antenna ports for each SRS resource in the SRS resource set is the same, the number of uplink transmission antenna ports is 2, and the uplink transmission rank is 1, determining the precoding codebook to be:

$\frac{1}{\sqrt{2}}\begin{bmatrix}1\\1\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the precoding codebook is determined in the following manner:

if the number of antenna ports for each SRS resource in the SRS resource set is the same, the number of uplink transmission antenna ports is 4, and the uplink transmission rank is 1, determining the precoding codebook to be:

$\frac{1}{2}\begin{bmatrix}1\\1\\1\\-1\end{bmatrix}$ or $\frac{1}{2}\begin{bmatrix}1\\1\\1\\1\end{bmatrix}$; or

$\frac{1}{2}\begin{bmatrix}0\\1\\0\\1\end{bmatrix}$; or

$\frac{1}{2}\begin{bmatrix}1\\0\\1\\0\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the precoding codebook is determined in the following manner:

if the number of antenna ports for each SRS resource in the SRS resource set is the same, the number of uplink transmission antenna ports is 4, and the uplink transmission rank is 2, determining the precoding codebook to be:

$\frac{1}{2}\begin{bmatrix}1&0\\0&1\\1&0\\0&-j\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the precoding codebook is determined in the following manner:

if the number of antenna ports for each SRS resource in the SRS resource set is the same, the number of uplink transmission antenna ports is 4, and the uplink transmission rank is 3, determining the precoding codebook to be:

$\frac{1}{2}\begin{bmatrix}1&0&0\\0&1&0\\1&0&0\\0&0&1\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the precoding codebook is determined in the following manner:

if the number of antenna ports for each SRS resource in the SRS resource set is different, the number of uplink transmission antenna ports is 4, and the SRS resource set comprises two SRS resources, with one SRS resource comprising one antenna port and the other SRS resource comprising four antenna ports, then:

if the uplink transmission rank is 2, determining the precoding codebook to be: $\frac{1}{2}\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 0 \\ 0 & -\mathrm{j} \end{bmatrix}$;

or a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook; or

if the uplink transmission rank is 3, determining the precoding codebook to be: $\frac{1}{2}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$;

or a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the precoding codebook is determined in the following manner:

if the number of antenna ports for each SRS resource in the SRS resource set is different, the number of uplink transmission antenna ports is 4, the uplink transmission rank is 3, and the SRS resource set comprises three SRS resources, with one SRS resource comprising one antenna port, a second SRS resource comprising two antenna ports, and a third SRS resource comprising four antenna ports, determining the precoding codebook to be:

$\frac{1}{2}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook.

8. The method according to claim 6, further comprising:

when the uplink full-power transmission capability reported by the terminal device is received, delivering an uplink full-power transmission indication to the terminal device, wherein the uplink full-power transmission indication is used to indicate that the terminal device is to use an uplink full-power transmission mode for uplink transmission.

9. The method according to claim 8, wherein the delivering an uplink full-power transmission indication to the terminal device comprises:

delivering the uplink full-power transmission indication through radio resource control RRC, medium access control MAC, or downlink control information DCI; or

delivering a full-power transmission TPMI; or

configuring, for the terminal device, an SRS resource corresponding to the precoding codebook, wherein the number of antenna ports of the configured SRS resource is the same as the number of non-zero antenna ports indicated by the precoding codebook; wherein

the non-zero antenna port means that row values of a precoding codebook corresponding to the antenna port are all non-zero.

10. A terminal device, comprising:

a transmission module, configured to: perform uplink transmission based on an uplink transmit power obtained through scaling by a power scaling coefficient, wherein the power scaling coefficient is determined based on a power control factor; wherein

the power control factor comprises at least one of the following: a working mode reported by the terminal device, and the number of antenna ports for each SRS resource in a sounding reference signal (SRS) resource set that is configured by the network device based on the working mode;

wherein the working mode comprises the number of antenna ports for each SRS resource in the SRS resource set configured by the network device is the same or different;

wherein the transmission module is further configured to determine the power scaling coefficient in at least one of the following manners:

manner A:

if the power control factor satisfies the following first condition, the transmission module is further configured to determine the power scaling coefficient to be 1:

all radio frequency branches of the terminal device support full-power transmission; or

part of radio frequency branches of the terminal device supports full-power transmission, the number of antenna ports for each SRS resource in the SRS resource set is different, and a transmission precoding matrix indicator (TPMI) delivered by the network device falls within a TPMI reported by the terminal device; wherein

the full-power transmission is transmission based on a maximum transmit power of the terminal device.

manner B:

if the power control factor satisfies the following second condition, the transmission module is further configured to determine the power scaling coefficient to be a ratio of the number of non-zero antenna ports to the maximum number of antenna ports that is supported by a single SRS resource and reported by the terminal device:

none of radio frequency branches of the terminal device supports full-power transmission, and the number of antenna ports for each SRS resource in the SRS resource set is the same; or

part of radio frequency branches of the terminal device supports full-power transmission, and the number of antenna ports for each SRS resource in the SRS resource set is the same; or

part of radio frequency branches of the terminal device supports full-power transmission, the number of antenna ports for each SRS resource in the SRS resource set is different, and the TPMI delivered by the network device does not fall within a full-power transmission TPMI reported by the terminal device; wherein

the non-zero antenna port means that row values of a precoding codebook corresponding to the antenna port are all non-zero;

manner C:

if the power control factor satisfies the following third condition, the transmission module is further configured to determine the power scaling coefficient to be a ratio of the number of non-zero antenna ports to the maximum number of antenna ports supported by the SRS resource that is configured by the network device:

none of radio frequency branches of the terminal device supports full-power sending, and the number of antenna ports for each SRS resource in the SRS resource set is different; or

part of radio frequency branches of the terminal device supports full-power sending, the number of antenna ports for each SRS resource in the SRS resource set is different, and no full-power transmission TPMI is reported by the terminal device.

11. The terminal device according to claim 10, wherein the power control factor comprises an uplink full-power transmission capability of the terminal device, and the transmission module is further configured to:

report the uplink full-power transmission capability; or

report the uplink full-power transmission capability, and receive an uplink full-power transmission indication delivered by the network device, wherein the uplink full-power transmission indication is used to indicate that the terminal device is to use an uplink full-power transmission mode for uplink transmission.

12. The terminal device according to claim 10, wherein the power control factor comprises an uplink full-power transmission capability of the terminal device, and the transmission module is further configured to:

if the uplink full-power transmission capability of the terminal device is that none of radio frequency branches supports full-power transmission or part of radio frequency branches supports full-power transmission, and an uplink transmission rank of the terminal device is equal to the number of uplink transmission antenna ports of the terminal device, perform uplink transmission based on the uplink transmit power according to a precoding codebook delivered by the network device; wherein

the precoding codebook is determined based on the number of uplink transmission antenna ports of the terminal device, the uplink transmission rank, and the number of antenna ports for each SRS resource in the SRS resource set.

13. The terminal device according to claim 10, wherein the transmission module is further configured to:

if the number of antenna ports for each SRS resource in the SRS resource set configured by the network device is different, and an uplink transmission rank of the terminal device is less than the number of uplink transmission antenna ports of the terminal device, perform uplink transmission based on the uplink transmit power in an SRS resource transmission mode corresponding to the number of antenna ports of an SRS resource that is the same as the uplink transmission rank.

14. A network device, comprising:

a receiving module, configured to receive uplink data sent by a terminal device, wherein the uplink data is transmitted on uplink by the terminal device based on an uplink transmit power obtained through scaling by a power scaling coefficient, and the power scaling coefficient is determined based on a power control factor; wherein

the power control factor comprises at least one of the following: a working mode reported by the terminal device, and the number of antenna ports for each SRS resource in a sounding reference signal (SRS) resource set that is configured by the network device based on the working mode;

wherein the working mode comprises the number of antenna ports for each SRS resource in the SRS resource set configured by the network device is the same or different;

wherein the power scaling coefficient is determined in at least one of the following manners:

manner A:

if the power control factor satisfies the following first condition, the power scaling coefficient is determined to be 1:

part of radio frequency branches of the terminal device supports full-power transmission, the number of antenna ports for each SRS resource in the SRS resource set is different, and a transmission precoding matrix indicator (TPMI) delivered by the network device falls within a TPMI reported by the terminal device; wherein

the full-power transmission is transmission based on a maximum transmit power of the terminal device;

manner B:

if the power control factor satisfies the following second condition, the power scaling coefficient is determined to be a ratio of the number of non-zero antenna ports to the maximum

number of antenna ports that is supported by a single SRS resource and reported by the terminal device:

none of radio frequency branches of the terminal device supports full-power transmission, and the number of antenna ports for each SRS resource in the SRS resource set is the same; or

part of radio frequency branches of the terminal device supports full-power transmission, and the number of antenna ports for each SRS resource in the SRS resource set is the same; or

part of radio frequency branches of the terminal device supports full-power transmission, the number of antenna ports for each SRS resource in the SRS resource set is different, and the TPMI delivered by the network device does not fall within a full-power transmission TPMI reported by the terminal device; wherein

the non-zero antenna port means that row values of a precoding codebook corresponding to the antenna port are all non-zero;

manner C:

if the power control factor satisfies the following third condition, the power scaling coefficient is determined to be a ratio of the number of non-zero antenna ports to the maximum number of antenna ports supported by the SRS resource that is configured by the network device:

none of radio frequency branches of the terminal device supports full-power sending, and the number of antenna ports for each SRS resource in the SRS resource set is different; or

part of radio frequency branches of the terminal device supports full-power sending, the number of antenna ports for each SRS resource in the SRS resource set is different, and no full-power transmission TPMI is reported by the terminal device.

15. The network device according to claim 14, further comprising:

a first delivery module, configured to: before the uplink data sent by the terminal device is received, if none of radio frequency branches of the terminal device supports full-power transmission or part of radio frequency branches supports full-power transmission, deliver a TPMI to the terminal device, wherein the delivered TPMI is used to indicate that the terminal device is to perform uplink transmission based on a precoding codebook that is determined based on an uplink transmission parameter; wherein

the uplink transmission parameter comprises the number of uplink transmission antenna ports of the terminal device, an uplink transmission rank, and the number of antenna ports for each SRS resource in the SRS resource set configured by the network device; and the full-power transmission indicates transmission performed based on a maximum transmit power of the terminal device.

16. The network device according to claim 15, wherein the first delivery module is further configured to:

if the number of antenna ports for each SRS resource in the SRS resource set is the same, the number of uplink transmission antenna ports is 2, and the uplink transmission rank is 1, determine the precoding codebook to be:

$\frac{1}{\sqrt{2}}\begin{bmatrix}1\\1\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the first delivery module is further configured to:

if the number of antenna ports for each SRS resource in the SRS resource set is the same, the number of uplink transmission antenna ports is 4, and the uplink transmission rank is 1, determine the precoding codebook to be:

$\frac{1}{2}\begin{bmatrix}1\\1\\1\\-1\end{bmatrix}$ or $\frac{1}{2}\begin{bmatrix}1\\1\\1\\1\end{bmatrix}$; or

$\frac{1}{2}\begin{bmatrix}0\\1\\0\\1\end{bmatrix}$; or

$\frac{1}{2}\begin{bmatrix}1\\0\\1\\0\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the first delivery module is further configured to:

if the number of antenna ports for each SRS resource in the SRS resource set is the same, the number of uplink transmission antenna ports is 4, and the uplink transmission rank is 2, determine the precoding codebook to be:

$\frac{1}{2}\begin{bmatrix}1&0\\0&1\\1&0\\0&-j\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the first delivery module is further configured to:

if the number of antenna ports for each SRS resource in the SRS resource set is the same, the number of uplink transmission antenna ports is 4, and the uplink transmission rank is 3, determine the precoding codebook to be:

$\frac{1}{2}\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 1 & 0 & 0\\ 0 & 0 & 1\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the first delivery module is further configured to:

if the number of antenna ports for each SRS resource in the SRS resource set is different, the number of uplink transmission antenna ports is 4, and the SRS resource set comprises two SRS resources, with one SRS resource comprising one antenna port and the other SRS resource comprising four antenna ports, then:

if the uplink transmission rank is 2, determine the precoding codebook to be: $\frac{1}{2}\begin{bmatrix}1 & 0\\ 0 & 1\\ 1 & 0\\ 0 & -\mathrm{j}\end{bmatrix}$;

or a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook; or

if the uplink transmission rank is 3, determine the precoding codebook to be: $\frac{1}{2}\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 1 & 0 & 0\\ 0 & 0 & 1\end{bmatrix}$;

or a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook;

or,

wherein the first delivery module is further configured to:

if the number of antenna ports for each SRS resource in the SRS resource set is different, the number of uplink transmission antenna ports is 4, the uplink transmission rank is 3, and the SRS resource set comprises three SRS resources, with one SRS resource comprising one antenna port, a second SRS resource comprising two antenna ports, and a third SRS resource comprising four antenna ports, determine the precoding codebook to be:

$\frac{1}{2}\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 1 & 0 & 0\\ 0 & 0 & 1\end{bmatrix}$; or

a fully coherent codebook, a partially coherent codebook, and a non-coherent codebook.

17. The network device according to claim 16, further comprising:

a second delivery module, configured to: when the uplink full-power transmission capability reported by the terminal device is received, deliver an uplink full-power transmission indication to the terminal device, wherein the uplink full-power transmission indication is used to indicate that the terminal device is to use an uplink full-power transmission mode for uplink transmission.

18. The network device according to claim 17, wherein the second delivery module is further configured to:

deliver the uplink full-power transmission indication through radio resource control RRC, medium access control MAC, or downlink control information DCI; or

deliver a full-power transmission TPMI; or

configure, for the terminal device, an SRS resource corresponding to the precoding codebook, wherein the number of antenna ports of the configured SRS resource is the same as the number of non-zero antenna ports indicated by the precoding codebook; wherein

the non-zero antenna port means that row values of a precoding codebook corresponding to the antenna port are all non-zero.

19. A terminal device, comprising:

a memory, storing a computer program instruction; and

a processor, wherein when the computer program instruction is executed by the processor, the uplink full-power transmission method according to any one of claims 1 to 4 is implemented.

20. A network device, comprising:

a memory, storing a computer program instruction; and

a processor, wherein when the computer program instruction is executed by the processor, the uplink full-power transmission method according to any one of claims 5 to 9 is implemented.