Claims

[Claim 1] A method of transmitting a phase tracking reference signal (PT-RS) by a user equipment (UE) in a wireless communication system, the method comprising:
receiving, from a base station, (i) first information regarding power boosting for transmission of the PT-RS and (ii) second information regarding a precoding matrix for transmission of a Physical Uplink Shared Channel (PUSCH);
determining a power boosting level based on the first information and the second information, wherein the power boosting level is related to a ratio of PUSCH power to PT-RS power per layer and per resource element (RE); and
transmitting, to the base station, the PT-RS using the determined power boosting level,
wherein determining the power boosting level based on the first information and the second information comprises:
based on the precoding matrix indicated by the second information being a partial coherent precoding matrix or a non-coherent precoding matrix, determining the power boosting level based on a number of PT-RS ports.

[Claim 2] The method of claim 1, wherein the first information indicates a plurality of power boosting levels, and
wherein determining the power boosting level based on the first information and the second information comprises determining, based on the second information, one of the plurality of power boosting levels.

[Claim 3] The method of claim 2, wherein determining the power boosting level based on the first information and the second information comprises:
based on the second information indicating the partial coherent precoding matrix, determining the power boosting level as a first power boosting level from among the plurality of power boosting levels indicated by the first information; and
based on the second information indicating the non-coherent precoding matrix, determining the power boosting level as a second power boosting level different from the first power boosting level, from among the plurality of power boosting levels indicated by the first information.

[Claim 4] The method of claim 1, wherein determining the power boosting level

based on the number of PT-RS ports comprises:
based on (i) the second information indicating the partial coherent precoding matrix, and (ii) the number of PT-RS ports being equal to 1:
determining the power boosting level to be 0 dB in a state in which a number of PUSCH layers is equal to 2 or 3; and
determining the power boosting level to be 3 dB in a state in which a number of PUSCH layers is equal to 4.

[Claim 5] The method of claim 1, wherein determining the power boosting level based on the number of PT-RS ports comprises:
based on (i) the second information indicating the partial coherent precoding matrix, and (ii) the number of PT-RS ports being equal to 2:
determining the power boosting level to be 3 dB in a state in which a number of PUSCH layers is equal to 2 or 3; and
determining the power boosting level to be 6 dB in a state in which a number of PUSCH layers is equal to 4.

[Claim 6] The method of claim 1, wherein determining the power boosting level based on the number of PT-RS ports comprises:
based on (i) the second information indicating the non-coherent precoding matrix, and (ii) the number of PT-RS ports being equal to 1:
determining the power boosting level to be 0 dB.

[Claim 7] The method of claim 1, wherein determining the power boosting level based on the number of PT-RS ports comprises:
based on (i) the second information indicating the non-coherent precoding matrix, and (ii) the number of PT-RS ports being equal to 2:
determining the power boosting level to be 3 dB.

[Claim 8] The method of claim 1, wherein the second information relates to a transmit rank indicator (TRI) and a transmit precoding matrix indicator (TPMI) for the precoding matrix for the transmission of the PUSCH.

[Claim 9] The method of claim 8, wherein the second information indicates whether the precoding matrix for the transmission of the PUSCH is the partial coherent precoding matrix or the non-coherent precoding matrix.

[Claim 10] The method of claim 1, further comprising:
determining that the transmission of the PUSCH is non-codebook based; and
based on the transmission of the PUSCH being non-codebook based, determining the power boosting level based on the number of PT-RS ports by:
based on the number of PT-RS ports being equal to 1, determining the

power boosting level to be 0 dB; and

based on the number of PT-RS ports being equal to 2, determining the power boosting level to be 3 dB.

[Claim 11] A user equipment (UE) configured to transmit a phase tracking reference signal (PT-RS) in a wireless communication system, the UE comprising:

a radio frequency (RF) module;

at least one processor; and

at least one computer memory operably connectable to the at least one processor and storing instructions that, when executed, cause the at least one processor to perform operations comprising:

receiving, through the RF module and from a base station, (i) first information regarding power boosting for transmission of the PT-RS and (ii) second information regarding a precoding matrix for transmission of a Physical Uplink Shared Channel (PUSCH);

determining a power boosting level based on the first information and the second information, wherein the power boosting level is related to a ratio of PUSCH power to PT-RS power per layer and per resource element (RE); and

transmitting, through the RF module and to the base station, the PT-RS using the determined power boosting level,

wherein determining the power boosting level based on the first information and the second information comprises:

based on the precoding matrix indicated by the second information being a partial coherent precoding matrix or a non-coherent precoding matrix, determining the power boosting level based on a number of PT-RS ports.

[Claim 12] The UE of claim 11, wherein the first information indicates a plurality of power boosting levels, and

wherein determining the power boosting level based on the first information and the second information comprises determining, based on the second information, one of the plurality of power boosting levels.

[Claim 13] The UE of claim 12, wherein determining the power boosting level based on the first information and the second information comprises:

based on the second information indicating the partial coherent precoding matrix, determining the power boosting level as a first power boosting level from among the plurality of power boosting levels indicated by the first information; and

based on the second information indicating the non-coherent precoding matrix, determining the power boosting level as a second power boosting level different from the first power boosting level, from among the plurality of power boosting levels indicated by the first information.

[Claim 14] The UE of claim 11, wherein determining the power boosting level based on the number of PT-RS ports comprises:
based on (i) the second information indicating the partial coherent precoding matrix, and (ii) the number of PT-RS ports being equal to 1:
determining the power boosting level to be 0 dB in a state in which a number of PUSCH layers is equal to 2 or 3; and
determining the power boosting level to be 3 dB in a state in which a number of PUSCH layers is equal to 4.

[Claim 15] The UE of claim 11, wherein determining the power boosting level based on the number of PT-RS ports comprises:
based on (i) the second information indicating the partial coherent precoding matrix, and (ii) the number of PT-RS ports being equal to 2:
determining the power boosting level to be 3 dB in a state in which a number of PUSCH layers is equal to 2 or 3; and
determining the power boosting level to be 6 dB in a state in which a number of PUSCH layers is equal to 4.

[Claim 16] The UE of claim 11, wherein determining the power boosting level based on the number of PT-RS ports comprises:
based on (i) the second information indicating the non-coherent precoding matrix, and (ii) the number of PT-RS ports being equal to 1:
determining the power boosting level to be 0 dB.

[Claim 17] The UE of claim 11, wherein determining the power boosting level based on the number of PT-RS ports comprises:
based on (i) the second information indicating the non-coherent precoding matrix, and (ii) the number of PT-RS ports being equal to 2:
determining the power boosting level to be 3 dB.

[Claim 18] The UE of claim 11, wherein the second information relates to a transmit rank indicator (TRI) and a transmit precoding matrix indicator (TPMI) for the precoding matrix for the transmission of the PUSCH.

[Claim 19] The UE of claim 18, wherein the second information indicates whether the precoding matrix for the transmission of the PUSCH is the partial coherent precoding matrix or the non-coherent precoding matrix.

[Claim 20] The UE of claim 11, wherein the operations further comprise:

determining that the transmission of the PUSCH is non-codebook based; and

based on the transmission of the PUSCH being non-codebook based, determining the power boosting level based on the number of PT-RS ports by:

based on the number of PT-RS ports being equal to 1, determining the power boosting level to be 0 dB; and

based on the number of PT-RS ports being equal to 2, determining the power boosting level to be 3 dB.