METHODS AND SYSTEMS OF POWER CONTROL FOR UPLINK TRANSMISSION

TECHNICAL FIELD

[0002] The present invention relates generally to a system and method user equipment power control, and, in particular embodiments, to a system and method for beam or RS relationship specific power control for uplink transmission.

BACKGROUND

[0003] In conventional cellular networks, each transmit/receive point (TRP) is associated with a coverage area or a conventional TRP-based cell and is assigned a conventional cell identifier (ID) to define the control channel and data channel so that simultaneous TRP to user equipment (UE) or UE to TRP communications can be supported for each conventional cell. The network may maintain the association between serving TP and the UE through assigned conventional cell ID until a handover is triggered.

[0004] As the demand on mobile broadband increases, conventional wireless networks are deployed more densely and heterogeneously with a greater number of TPs. Conventional cell ID assignment becomes more difficult and the occurrence rate of handovers increases as the UE moves between TPs. Further, the density of the conventional cells creates interference between neighboring conventional cells. Methods and systems for mitigating these drawbacks are desired, particularly in dense heterogeneous networks.

SUMMARY

[0005] Technical advantages are generally achieved by embodiments of this disclosure which describe systems and methods for power control for uplink transmission. An advantage of one or more embodiments of the present disclosure is providing RS relationship specific pathloss estimation and power control. Other advantages will be apparent to those of ordinary skill in the art upon reading the disclosure below.

[0006] In an embodiment, a method in a user equipment (UE) for reference signal (RS) relationship specific uplink (UL) transmission power control includes transmitting, by the UE,

WHAT IS CLAIMED IS:

1. A method, comprising:

obtaining, by an apparatus, configuration of a reference signal (RS) relationship between an RS and a physical uplink control channel (PUCCH), the RS relationship associated with spatial information for the PUCCH, wherein the RS relationship is associated with a plurality of power control parameters comprising a target power, a pathloss, and a transmit power command (TPC);

determining, by the apparatus, a value of the target power in accordance with the RS relationship obtained by the apparatus;

determining, by the apparatus, a value of the pathloss in accordance with the RS relationship obtained by the apparatus;

determining, by the apparatus, a value of the TPC in accordance with the RS relationship obtained by the apparatus;

determining, by the apparatus, an uplink transmission power based on the value of the target power, the value of the pathloss, and the value of the TPC; and

transmitting, by the apparatus to a base station, the PUCCH using the uplink transmission power.

2. The method of claim 1, wherein the determining the value of the pathloss comprises:

determining a downlink reference signal for pathloss estimation in accordance with the RS relationship; and

determining the value of the pathloss in accordance with the downlink reference signal.

3. The method of claim 1, further comprising:

performing a layer 3 filtering according to a filtering coefficient configured for pathloss estimation with a synchronization signal (SS) block.

4. The method of claim 1, further comprising:

performing a layer 3 filtering according to a filtering coefficient configured for pathloss estimation with a channel state information-reference signal (CSI-RS).

5. The method of claim 1, wherein the configuration of the RS relationship is indicated by a radio resource control (RRC) signaling.

6. The method of claim 1,

wherein the configuration of the RS relationship includes RS information that comprises information of one of a synchronization signal (SS) block, a channel state information-reference signal (CSI-RS), or a sounding reference signal (SRS),

wherein the determining the value of the target power includes:

determining, by the apparatus, the value of the target power in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship,

wherein the determining the value of the pathloss includes:

determining, by the apparatus, the value of the pathloss in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship, and

wherein the determining the value of the TPC includes:

determining, by the apparatus, the value of the TPC in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship.

7. The method of claim 1, wherein the target power comprises a user equipment specific target power.

8. An apparatus, comprising:

a non-transitory memory comprising instructions; and

one or more processors in communications with the non-transitory memory, wherein the one or more processors are configured to execute the instructions to perform operations, the operations comprising:

obtaining configuration of a reference signal (RS) relationship between an RS and a physical uplink control channel (PUCCH), the RS relationship associated with spatial information for the PUCCH, wherein the RS relationship is associated with a plurality of power control parameters comprising a target power, a pathloss, and a transmit power command (TPC);

determining a value of the target power in accordance with the RS relationship obtained by the apparatus;

determining a value of the pathloss in accordance with the RS relationship obtained by the apparatus;

determining a value of the TPC in accordance with the RS relationship obtained by the apparatus;

determining an uplink transmission power based on the value of the target power, the value of the pathloss, and the value of the TPC; and

transmitting, to a base station, the PUCCH using the uplink transmission power.

9. The apparatus of claim 8, wherein the determining the value of the pathloss comprises:

determining a downlink reference signal for pathloss estimation in accordance with the RS relationship; and

determining the value of the pathloss in accordance with the downlink reference signal.

10. The apparatus of claim 8, the operations further comprising:

performing a layer 3 filtering according to a filtering coefficient configured for pathloss estimation with a synchronization signal (SS) block.

11. The apparatus of claim 8, the operations further comprising:

performing a layer 3 filtering according to a filtering coefficient configured for pathloss estimation with a channel state information-reference signal (CSI-RS).

12. The apparatus of claim 8, wherein the configuration of the RS relationship is indicated by a radio resource control (RRC) signaling.

13. The apparatus of claim 8,

wherein the configuration of the RS relationship includes RS information that comprises information of one of a synchronization signal (SS) block, a channel state information-reference signal (CSI-RS), or a sounding reference signal (SRS) ,

wherein the determining the value of the target power includes:

determining, by the apparatus, the value of the target power in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship,

wherein the determining the value of the pathloss includes:

determining, by the apparatus, the value of the pathloss in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship, and

wherein the determining the value of the TPC includes:

determining, by the apparatus, the value of the TPC in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship.

14. The apparatus of claim 8, wherein the target power comprises a user equipment specific target power.

15. A non-transitory computer-readable medium storing computer instructions, that when executed by one or more processors, cause an apparatus to perform operations, the operations comprising:

obtaining configuration of a reference signal (RS) relationship between an RS and a physical uplink control channel (PUCCH), the RS relationship associated with spatial information for the PUCCH, wherein the RS relationship is associated with a plurality of power control parameters comprising a target power, a pathloss, and a transmit power command (TPC);

determining a value of the target power in accordance with the RS relationship obtained by the apparatus;

determining a value of the pathloss in accordance with the RS relationship obtained by the apparatus;

determining a value of the TPC in accordance with the RS relationship obtained by the apparatus;

determining an uplink transmission power based on the value of the target power, the value of the pathloss, and the value of the TPC; and

transmitting, to a base station, the PUCCH using the uplink transmission power.

16. The non-transitory computer-readable medium of claim 15, wherein the determining the value of the pathloss comprises:

determining a downlink reference signal for pathloss estimation in accordance with the RS relationship; and

determining the value of the pathloss in accordance with the downlink reference signal.

17. The non-transitory computer-readable medium of claim 15, the operations further comprising:

performing a layer 3 filtering according to a filtering coefficient configured for pathloss estimation with a synchronization signal (SS) block.

18. The non-transitory computer-readable medium of claim 15, the operations further comprising:

performing a layer 3 filtering according to a filtering coefficient configured for pathloss estimation with a channel state information-reference signal (CSI-RS).

19. The non-transitory computer-readable medium of claim 15, wherein the configuration of the RS relationship is indicated by a radio resource control (RRC) signaling.

20. The non-transitory computer-readable medium of claim 15,

wherein the configuration of the RS relationship includes RS information that comprises information of one of a synchronization signal (SS) block, a channel state information-reference signal (CSI-RS), or a sounding reference signal (SRS) ,

wherein the determining the value of the target power includes:

determining, by the apparatus, the value of the target power in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship,

wherein the determining the value of the pathloss includes:

determining, by the apparatus, the value of the pathloss in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship, and

wherein the determining the value of the TPC includes:

determining, by the apparatus, the value of the TPC in accordance with the information of the one of the SS block, the CSI-RS, or the SRS in the RS relationship.