

CLAIMS:

1. An user equipment in a communication system including a transmission point and the user equipment, the user equipment comprising:

a receiving section configured to receive a message indicating a resource, for which an interference is measured;

a processing section configured to calculate a CQI based on the message; and

a transmitting section configured to transmit the CQI to the transmission point.

2. The user equipment according to claim 1, wherein the message includes a precoding matrix index that is used in another user equipment.

3. The user equipment according to claim 1, wherein the message includes information indicating that at least one port is associated with a signal measured as an interference.

4. The user equipment according to claim 1, wherein the message indicates the resource that is assigned to a signal measured as an interference.

5. The user equipment according to claim 1, wherein the communication system includes a serving transmission point and at least one interfering transmission point, and said processing section calculates the CQI using a signal, which is transmitted using the resource from the at least one interfering transmission point.

6. The user equipment according to claim 1, wherein the message indicates the resource with a bitmap.

7. The user equipment according to claim 1, wherein the message indicates the resource that is assigned according to a specific pattern.

8. The user equipment according to claim 1, wherein the message indicates that a transmission power of a CSI-RS port is zero.

9. The user equipment according to claim 1, wherein the message indicates the resource with a subset of subframes.

10. A transmission point in a communication system including the transmission point

and an user equipment, the transmission point comprising:

a transmitting section configured to transmit, to the user equipment, a message indicating a resource, for which an interference is measured; and

a receiving section configured to receive a CQI, which is measured based on the message at the user equipment.

11. The transmission point according to claim 10, wherein the message includes a precoding matrix index that is used in another user equipment.

12. The transmission point according to claim 10, wherein the message includes information indicating that at least one port is associated with a signal measured as an interference.

13. The transmission point according to claim 10, wherein the message indicates the resource that is assigned to a signal measured as an interference.

14. The transmission point according to claim 10, wherein the communication system includes a serving transmission point and at least one interfering transmission point, and said receiving section receives the CQI calculated using a signal, which is transmitted using the resource from the at least one interfering transmission point.

15. The transmission point according to claim 10, wherein the message indicates the resource with a bitmap.

16. The transmission point according to claim 10, wherein the message indicates the resource that is assigned according to a specific pattern.

17. The transmission point according to claim 10, wherein the message indicates that a transmission power of a CSI-RS port is zero.

18. The transmission point according to claim 10, wherein the message indicates the resource with a subset of subframes.

19. A method for transmitting a CQI from an user equipment in a communication system including a transmission point and the user equipment, the method comprising:

receiving a message indicating a resource, for which an interference is measured;

calculating a CQI based on the message; and
transmitting the CQI to the transmission point.

20. A method for receiving a CQI transmitted from an user equipment in a communication system including a transmission point and the user equipment, the method comprising:

transmitting, to the user equipment, a message indicating a resource, for which an interference is measured; and

receiving a CQI, which is measured based on the message at the user equipment.

CLAIMS

WHAT IS CLAIMED IS:

1. A method of feeding back channel quality indicator (MU-CQI) to a
5 transmission point in a communication system including the transmission point and a plurality of user equipments, the method comprising steps:

the transmission point sending a message to an intended user equipment of the plurality of user equipments; and

10 the intended user equipment calculating the MU-CQI based on the message, and feeding back the MU-CQI to the transmission point.

2. The method according to claim 1, wherein the message includes precoding matrix index (BCI) to be used by another user equipment of the plurality of user equipments which is potentially paired with the intended user equipment.

15

3. The method according to claim 2, further comprising steps:

the intended user equipment measures downlink channel, and multiplies the measured downlink channel with the BCI sent from the transmission point to obtain interference to the intended user equipment; and

20 the intended user equipment calculates the MU-CQI based on the interference.

4. The method according to claim 3, wherein the intended user equipment calculates the MU-CQI based on the equation: $SNR = \frac{S}{I + N}$, wherein S represents signals, N represents noises, I , which represents the interference, can be calculated based on the knowledge of $H\vec{W}$, where H represents the downlink channel matrix, and $\vec{W}$ represents the BCI.

25

5. The method according to claim 1, wherein the message includes information indicating that at least one signal port is associated with undesired signal.

30

6. The method according to claim 5, wherein the intended user equipment measures signal power on the at least one signal port as the interference to the intended user equipment, and calculates the MU-CQI based on the interference.

35

7. The method according to claim 5, wherein the signal ports 7-14 are allocated as DMRS ports, the signal ports 15-22 are allocated as CSI-RS ports.

8. The method according to claim 5, wherein the communication system includes a plurality of transmission points composed of a serving transmission point and at least one interfering transmission points, in which the undesired signal is from the at least one interfering transmission points.

9. The method according to claim 8, wherein the serving transmission point and the at least one interfering transmission point have the same cell ID or different cell ID.

10. The method according to claim 9, wherein if one signal port is associated with the undesired signal, the intended user equipment measures signal power on the one signal port as the interference, calculates and reports the MU-CQI based on the interference.

11. The method according to claim 9, wherein if two or more signal ports are associated with the undesired signal, and transmitted from one interfering transmission point, the intended user equipment estimates the BCI to cause lease interference to the intended user equipment, calculates the MU-CQI based on the BCI, and additionally reports the BCI and the MU-CQI to the serving transmission point.

12. The method according to claim 9, wherein if two or more signal ports are associated with the undesired signal, and transmitted from different interfering transmission points respectively, the intended user equipment measures signal power on each of the signal ports as the interferences, calculates and reports the MU-CQI based on each of the interferences.

13. The method according to claim 9, wherein if two or more signal ports are associated with the undesired signal, and transmitted from different interfering transmission points respectively, the intended user equipment measures overall signal power on all signal ports as the interference, calculates and reports the MU-CQI based on the interference.

14. The method according to any one of claims 10-13, wherein if the serving transmission point and interfering transmission points have different cell IDs, the serving transmission point further indicates the intended user equipment the cell ID associated with the undesired signal.

15. A user equipment for feeding back channel quality indicator (MU-CQI) to a

transmission point in a communication system including the transmissin point and a plurality of user equipments, the user equipment:

- a receiving unit which receives a message from the transmissin point;
- a processing unit which calculates the MU-CQI based on the message; and
- 5 a transmitting unit which reports the MU-CQI to the transmission point.

16. The user equipment according to claim 15, wherein the message includes precoding matrix index (BCI) to be used by another user equipment of the plurality of user equipments which is potentially paired with the user equipment.

10

17. The user equipment according to claim 16, further comprising:

a measuring unit which measures downlink channel,

wherein the processing unit multiplies the measured downlink channel with the BCI received from the transmission point to obtain interference to the user equipment, and calculates the MU-CQI based on the interference.

15

18. The user equipment according to claim 17, wherein the processing unit calculates the MU-CQI based on the equation: $SNR = \frac{S}{I + N}$, wherein S represents signals, N represents noises, I , which represents the interference, can be calculated based on the knowledge of HW , where H represents the downlink channel matrix, and $\vec{W}$ represents the BCI.

20

19. The user equipment according to claim 15, wherein the message includes information indicating that at least one signal port is associated with undesired signal.

25

20. The user equipment according to claim 19, wherein the measuring unit measures signal power on the at least one signal port as the interference to the user equipment, and the processing unit calculates the MU-CQI based on the interference.

30

21. The user equipment according to claim 19, wherein the signal ports 7-14 are allocated as DMRS ports, the signal ports 15-22 are allocated as CSI-RS ports.

35

22. The user equipment accordong to claim 19, wherein the communication system includes a plurality of transmission points composed of a serving transmission point and at least one interfering transmission points, in which the undesired signal is from the at least one interfering transmission points.

23. The user equipment according to claim 22, wherein the serving transmission point and the at least one interfering transmission point have the same cell ID or different cell ID.

5 24. The user equipment according to claim 23, wherein if one signal port is associated with the undesired signal, the measuring unit measures signal power on the one signal port as the interference, the processing unit calculates the MU-CQI based on the interference, and the transmitting unit reports the MU-CQI to the serving transmission point.

10 25. The user equipment according to claim 23, wherein if two or more signal ports are associated with the undesired signal, and transmitted from one interfering transmission point, the measuring unit estimates the BCI to cause lease interference to the user equipment, the processing unit calculates the MU-CQI based on the BCI, and
15 the transmitting unit additionally reports the BCI and the MU-CQI to the serving transmission point.

20 26. The user equipment according to claim 23, wherein if two or more signal ports are associated with the undesired signal, and transmitted from different interfering transmission points respectively, the measuring unit measures signal power on each of the signal ports as the interferences, the processing unit calculates the MU-CQI based on each of the interferences, and the transmitting unit reports the MU-CQI to the serving transmission point.

25 27. The user equipment according to claim 23, wherein if two or more signal ports are associated with the undesired signal, and transmitted from different interfering transmission points respectively, the measuring unit measures overall signal power on all singal ports as the interference, the processing unit calculates the MU-CQI based on the interference, and the transmitting unit reports the MU-CQI to
30 the serving transmission point.

35 28. The user equipment according to any one of claims 24-27, wherein if the serving transmission point and interfering transmission points have different cell IDs, the serving transmission point further indicates the user equipment the cell ID associated with the undesired signal.

29. A transmission point device for receiving channel quality indicator (MU-CQI) from user equipment in a communication system, the transmission point device comprising:

a transmitting unit which transmits a message to an intended user equipment; and receiving unit which receives the MU-CQI from the intended user equipment, wherein the MU-CQI is calculated based on the message.

5 30. The transmission point device according to claim 29, wherein the message includes precoding matrix index (BCI) to be used by another user equipment in the communication system which is potentially paired with the intended user equipment.

10 31. The transmission point device according to claim 30, wherein the intended user equipment measures downlink channel, multiplies the measured downlink channel with the BCI sent from the transmitting unit to obtain interference to the intended user equipment, and calculates the MU-CQI based on the interference.

15 32. The transmission point device according to claim 31, wherein the MU-CQI is calculated based on the equation: $SNR = \frac{S}{I + N}$, wherein S represents signals, N represents noises, I, which represents the interference, can be calculated based on the knowledge of HW , where H represents the downlink channel matrix, and $\vec{W}$ represents the BCI.

20 33. The transmission point device according to claim 29, wherein the message includes information indicating that at least one signal port is associated with undesired signal.

25 34. The transmission point device according to claim 33, wherein the intended user equipment measures signal power on the at least one signal port as the interference to the intended user equipment, and calculates the MU-CQI based on the interference.

30 35. The transmission point device according to claim 33, wherein the signal ports 7-14 are allocated as DMRS ports, the signal ports 15-22 are allocated as CSI-RS ports.

35 36. The transmission point device according to claim 33, wherein the undesired signal is from at least one interfering transmission point devices.

37. The transmission point device according to claim 36, wherein the transmission point device and the at least one interfering transmission point device

have the same cell ID or different cell ID.

38. The transmission point device according to claim 37, wherein if one signal port is associated with the undesired signal, the intended user equipment measures
5 signal power on the one signal port as the interference, calculates the MU-CQI based on the interference, and reports the MU-CQI to the transmission point device.

39. The transmission point device according to claim 37, wherein if two or more signal ports are associated with the undesired signal, and transmitted from one
10 interfering transmission point device, the intended user equipment estimates the BCI to cause lease interference to the intended user equipment, calculates the MU-CQI based on the BCI, and reports the BCI and the MU-CQI to the transmission point device.

40. The transmission point device according to claim 37, wherein if two or more signal ports are associated with the undesired signal, and transmitted from different interfering transmission point devices respectively, the intended user equipment
15 measures signal power on each of the signal ports as the interferences, calculates the MU-CQIs based on each of the interferences, and reports each of the MU-CQIs to the
20 transmission point device.

41. The transmission point device according to claim 37, wherein if two or more signal ports are associated with the undesired signal, and transmitted from different interfering transmission points respectively, the intended user equipment measures
25 overall signal power on all singal ports as the interference, calculates the MU-CQI based on the interference, and reports the MU-CQI to the transmission point device.

42. The transmission point device according to any one of claims 38-41, wherein if the transmission point device and the interfering transmission point devices have
30 different cell IDs, the transmission point device further indicates the intended user equipment the cell ID associated with the undesired signal.