~~CLAIMS~~

What is claimed is:

1. A method, comprising:

receiving information indicating one or more sets of reference signal patterns from a first transmission point, wherein the one or more sets of reference signal patterns comprise one or more muting reference signal patterns that have zero transmit power for certain frames of transmissions by the first transmission point, and at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points;

measuring the channel quality for the indicated one or more sets of reference signal patterns using the one or more muting reference signal patterns; and

reporting indications of the measured channel quality for the indicated one or more sets of reference signal patterns to the first transmission point.

2. The method of claim 1, wherein the information comprises a pattern of bits, each of the bits indicating a set of reference signal patterns that should be measured for channel quality.

3. The method of claim 2, wherein the pattern comprises a zero power channel state information – reference signal bitmap.

4. The method of claim 1, wherein:

the method further comprises receiving an indication of a user equipment specific reference signal pattern that should be measured for channel quality;

measuring further comprises measuring the user equipment specific reference signal pattern for channel quality; and

reporting further comprises reporting both the measured channel quality for the indicated one or more sets of reference signal patterns and for the user equipment specific reference signal pattern.

5. The method of claim 1, wherein reporting indications of the measured channel quality further comprises reporting for at least one of the indicated one or more sets of reference signal patterns whether a corresponding measured channel quality meets a predetermined threshold.

6. The method of claim 1, wherein:

measuring further comprises measuring, for at least one of the indicated one or more sets of reference signal patterns, channel quality for a plurality of ports; and

reporting further comprises reporting for the at least one of the indicated one or more sets of reference signal patterns and a corresponding plurality of ports whether a corresponding measured channel quality meets a predetermined threshold.

7. The method of claim 1, wherein the measuring is performed in response to a channel state information – reference signals report request message.

8. The method of claim 1, wherein the reporting is performed using a channel state information – reference signals quality report message.

9. The method of claim 1, wherein:

the first transmission point is in a cell;

the one or more other transmission points are a plurality of other transmission points;

at least one of the plurality of other transmission points is in the cell; and

at least an additional one of the plurality of other transmission points are in one or more neighbor cells.

10. The method of claim 1, wherein measuring the channel quality is performed in response to signaling from the first transmission point indicating the indicated one or more sets of reference signal patterns are to be measured for signal quality.

11. The method of claim 1, wherein receiving, measuring, and reporting are performed by a user equipment and wherein measuring the channel quality is performed in response to internal configuration of the user equipment indicating the indicated one or more sets of reference signal patterns are to be measured for signal quality.

12. An apparatus, comprising:

one or more processors; and

one or more memories including computer program code,

the one or more memories and the computer program code configured to, with the one or more processors, cause the apparatus to perform at least the following:

receiving information indicating one or more sets of reference signal patterns from a first transmission point, wherein the one or more sets of reference signal patterns comprise one or more muting reference signal patterns that have zero transmit power for certain frames of transmissions by the first transmission point, and at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points;

measuring the channel quality for the indicated one or more sets of reference signal patterns using the one or more muting reference signal patterns; and

reporting indications of the measured channel quality for the indicated one or more sets of reference signal patterns to the first transmission point.

13. The apparatus of claim 12, wherein the information comprises a pattern of bits, each of the bits indicating a set of reference signal patterns that should be measured for channel quality.

14. The apparatus of claim 13, wherein the pattern comprises a zero power channel state information – reference signal bitmap.

15. The apparatus of claim 12, wherein:

the at least one memory and the computer program code are further configured to, with the at least one processor, cause the apparatus to perform at least the following: receiving an indication of a user

~~equipment specific reference signal pattern that should be measured~~ for channel quality;

measuring further comprises measuring the user equipment specific reference signal pattern for channel quality; and

reporting further comprises reporting both the measured channel quality for the indicated one or more sets of reference signal patterns and for the ~~user equipment specific reference signal pattern.~~

16. ~~A computer program product comprising a computer-readable memory~~ bearing computer program code embodied therein for use with a computer, the computer program code comprising:

code for receiving information indicating one or more sets of reference signal patterns from a first transmission point, wherein at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points;

code for measuring the channel quality for the indicated one or more sets of reference signal patterns; and

code for reporting indications of the measured channel quality for the indicated one or more sets of reference signal patterns to the first transmission point.

17. A method, comprising:

transmitting information indicating one or more sets of reference signal patterns from a first transmission point to a user equipment, wherein the one or more sets of reference signal patterns comprise one or more muting reference signal patterns that have zero transmit power for certain frames of transmissions by the first transmission point, and at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points; and

receiving from the user equipment indications of measured channel quality for the indicated one or more sets of reference signal patterns that are measured using the one or more muting reference signal patterns.

18. The method of claim 17, further comprising:

determining a user equipment specific set of reference signal patterns the user equipment should measure; and

signaling an indication to the user equipment of the determined user equipment specific set of reference signal patterns the user equipment should measure.

19. The method of claim 17, further comprising:

determining channel quality information to be provided by the user equipment to the first transmission point for the measured channel quality; and

signaling indications of the determined channel quality information to the user equipment.

20. The method of claim 17, further comprising sending a channel state information – reference signals report request message to the user equipment to request the user equipment to measure the channel quality.

21. The method of claim 17, wherein the receiving comprises receiving a channel state information – reference signals quality report message.

22. The method of claim 17, wherein:

the first transmission point is in a cell;

the one or more other transmission points are a plurality of other transmission points;

at least one of the plurality of other transmission points is in the cell; and

at least an additional one of the plurality of other transmission points are in one or more neighbor cells.

23. The method of claim 17, further comprising, prior to receiving, signaling the user equipment an indication the one or more sets of reference signal patterns are to be measured for signal quality.

24. An apparatus, comprising

one or more processors; and

one or more memories including computer program code,

the one or more memories and the computer program code configured to, with the one or more processors, cause the apparatus to perform at least the following:

transmitting information indicating one or more sets of reference signal patterns from a first transmission point to a user equipment, wherein the one or more sets of reference signal patterns comprise one or more muting reference signal patterns that have zero transmit power for certain frames of transmissions by the first transmission point, and at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points; and

receiving from the user equipment indications of measured channel quality for the indicated one or more sets of reference signal patterns that are measured using the one or more muting reference signal patterns.

25. The apparatus of claim 24, wherein the at least one memory and the computer program code are further configured to, with the at least one processor, cause the apparatus to perform at least the following:

determining a user equipment specific set of reference signal patterns the user equipment should measure; and

signaling an indication to the user equipment of the determined user equipment specific set of reference signal patterns the user equipment should measure.

26. The apparatus of claim 24, wherein the at least one memory and the computer program code are further configured to, with the at least one processor, cause the apparatus to perform at least the following:

determining channel quality information to be provided by the user equipment to the first transmission point for the measured channel quality; and

signaling indications of the determined channel quality information to the user equipment.

27. A computer program product comprising a computer-readable memory bearing computer program code embodied therein for use with a computer, the computer program code comprising:

code for transmitting information indicating one or more sets of reference signal patterns from a first transmission point to a user equipment, wherein the one or more sets of reference signal patterns comprise one or more muting reference signal patterns that have zero transmit power for certain frames of transmissions by the first transmission point, and at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points; and

code for receiving from the user equipment indications of channel quality for the indicated one or more sets of reference signal patterns that are measured using the one or more muting reference signal patterns.

CLAIMS

What is claimed is:

1. An apparatus comprising:
one or more processors; and
one or more memories including computer program code, the one or more memories and the computer program code configured, with the one or more processors, to cause the apparatus to perform the following:
receiving information indicating one or more sets of reference signal patterns from a first transmission point, wherein the one or more sets of reference signal patterns comprise one or more muting reference signal patterns that have zero transmit power for certain frames of transmissions by the first transmission point, and at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points;
measuring the channel quality for the indicated one or more sets of reference signal patterns using the one or more muting reference signal patterns; and
reporting indications of the measured channel quality for the indicated one or more sets of reference signal patterns to the first transmission point,
wherein the first transmission point is coupled via a data and control path to the one of one or more other transmission points.

2. The apparatus of claim 1, wherein the information comprises a pattern of bits, each of the bits indicating a set of reference signal patterns that should be measured for channel quality.

3. The apparatus of claim 2, wherein the pattern comprises a zero power channel state information-reference signal bitmap.

4. The apparatus of claim 1, wherein:
the at least one memory and the computer program code are further configured, with the at least one processor, to cause the apparatus to perform at least the following:
receiving an indication of a user equipment specific reference signal pattern that should be measured for channel quality;
measuring further comprises measuring the user equipment specific reference signal pattern for channel quality; and

reporting further comprises reporting both the measured channel quality for the indicated one or more sets of reference signal patterns and for the user equipment specific reference signal pattern.

5. The apparatus of claim 1, wherein reporting indications of the measured channel quality further comprises reporting for at least one of the indicated one or more sets of reference signal patterns whether a corresponding measured channel quality meets a predetermined threshold.

6. The apparatus of claim 1, wherein:
measuring further comprises measuring, for at least one of the indicated one or more sets of reference signal patterns, channel quality for a plurality of ports; and
reporting further comprises reporting for the at least one of the indicated one or more sets of reference signal patterns and a corresponding plurality of ports whether a corresponding measured channel quality meets a predetermined threshold.

7. The apparatus of claim 1, wherein the measuring is performed in response to a channel state information-reference signals report request message.

8. The apparatus of claim 1, wherein the reporting is performed using a channel state information-reference signals quality report message.

9. The apparatus of claim 1, wherein:
the first transmission point is in a cell;
the one or more other transmission points are a plurality of other transmission points;
at least one of the plurality of other transmission points is in the cell; and
at least an additional one of the plurality of other transmission points are in one or more neighbor cells.

10. The apparatus of claim 1, wherein measuring the channel quality is performed in response to signaling from the first transmission point indicating the indicated one or more sets of reference signal patterns are to be measured for signal quality.

11. The apparatus of claim 1 comprising a user equipment and wherein measuring the channel quality is performed in response to internal configuration of the user equipment indicating the indicated one or more sets of reference signal patterns are to be measured for signal quality.

12. A computer program product comprising a non-transitory computer-readable memory bearing computer program code embodied therein for use with a computer, the computer program code comprising:
code for receiving information indicating one or more sets of reference signal patterns from a first transmission point, wherein the one or more sets of reference signal patterns comprise one or more muting reference signal patterns that have zero transmit power for certain frames of transmissions by the first transmission point, and at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points;
code for measuring the channel quality for the indicated one or more sets of reference signal patterns using the one or more muting reference signal patterns; and
code for reporting indications of the measured channel quality for the indicated one or more sets of reference signal patterns to the first transmission point,
wherein the first transmission point is coupled via a data and control path to the one of one or more other transmission points.

13. The computer program product of claim 12, wherein the information comprises a pattern of bits, each of the bits indicating a set of reference signal patterns that should be measured for channel quality.

14. An apparatus comprising:
one or more processors; and
one or more memories including computer program code, the one or more memories and the computer program code configured, with the one or more processors, to cause the apparatus to perform the following:
transmitting information indicating one or more sets of reference signal patterns from a first transmission point to a user equipment, wherein the one or more sets of reference signal patterns comprise one or more muting reference signal patterns that have zero transmit power for certain frames of transmissions by the first transmission point, and at least one of the indicated one or more sets of reference signal patterns corresponds to one of one or more other transmission points; and
receiving from the user equipment indications of channel quality for the indicated one or more sets of reference signal patterns that are measured using the one or more muting reference signal patterns, wherein the first transmission point is coupled via a data and control path to the one of one or more other transmission points.

15. The apparatus of claim 14, wherein the at least one memory and the computer program code are further configured, with the at least one processor, to cause the apparatus to perform at least the following:
determining a user equipment specific set of reference signal patterns the user equipment should measure; and
signaling an indication to the user equipment of the determined user equipment specific set of reference signal patterns the user equipment should measure.

16. The apparatus of claim 14, wherein the at least one memory and the computer program code are further configured, with the at least one processor, to cause the apparatus to perform at least the following:
determining channel quality information to be provided by the user equipment to the first transmission point for the measured channel quality; and
signaling indications of the determined channel quality information to the user equipment.

17. The apparatus of claim 14, wherein the at least one memory and the computer program code are further configured, with the at least one processor, to cause the apparatus to perform at least the following: sending a channel state information-reference signals report request message to the user equipment to request the user equipment to measure the channel quality.

18. The apparatus of claim 14, wherein the receiving comprises receiving a channel state information-reference signals quality report message.

19. The apparatus of claim 14, wherein:
the first transmission point is in a cell;
the one or more other transmission points are a plurality of other transmission points;
at least one of the plurality of other transmission points is in the cell; and
at least an additional one of the plurality of other transmission points are in one or more neighbor cells.

20. The apparatus of claim 14, wherein the at least one memory and the computer program code are further configured, with the at least one processor, to cause the apparatus to perform at least the following: prior to receiving, signaling the user equipment an indication the one or more sets of reference signal patterns are to be measured for signal quality.