CLAIMS

What is claimed is:

1. A method for reducing feedback transmission overhead in wireless communications comprising:

determining a quality metric for each sub-band within a bandwidth;

selecting M sub-bands with the M best quality metrics, where M is less than the total number of sub-bands within the bandwidth,

grouping the M sub-bands into Q groups, where $1<Q<M$;

determining an average of the metrics for sub-bands in each of the Q groups, thereby determining Q primary averages; and

determining an average of the metrics of all sub-bands not included in the M sub-bands with best quality metric, thereby determining a secondary average.

2. The method of claim 1, wherein the quality metric is a channel quality index (CQI).

3. The method of claim 1 further comprising:

transmitting a location index indicating locations of the M sub-bands with the M best quality metrics; and

transmitting a location index for each of Q-1 of the Q groups.

4. The method of claim 1, wherein no more than one group contains exactly one sub-band.

5. The method of claim 1, further comprising transmitting the primary averages and the secondary average.

6. The method of claim 5, wherein transmitting the primary and secondary averages comprises:

ordering the Q groups;

transmitting the primary average of a first group in the order;

transmitting a difference value between the primary average of each group other than the first group and the primary average of the preceding group in the order; and

transmitting a difference value between the secondary average and the primary average of the last group in the order.

7. A method for reducing feedback transmission overhead in wireless communications comprising:

determining a quality metric for each sub-band within a bandwidth;

selecting M sub-bands with the M best quality metrics, where M is less than the total number of sub-bands within the bandwidth,

determining an average of the metrics of all sub-bands not included in the M sub-bands with best quality metric;

compressing the M quality metrics and the average; and

transmitting the compressed metrics and average.

8. The method of claim 7, wherein the quality metric is a channel quality index (CQI).

9. The method of claim 7, wherein:

compressing comprises:

forming a vector comprising the M quality metrics and the average and ;

applying a compression transform to the vector to obtain a compressed vector;

and transmitting comprises

transmitting the compressed vector.

10. The method of claim 9 comprising removing at least one component of the compressed vector before the transmitting of the compressed vector.

11. The method of claim 10, wherein no information is lost when removing the at least one component.

12. The method of claim 9, wherein the compression transform is a Haar transform.

13. The method of claim 7, further comprising:

determining the M best metrics for each of a plurality of additional code layers;

determining the average for each of the additional code layers; and

assembling the M best metrics and averages for all code layers into a matrix;

wherein

compressing comprises applying a two-dimensional compression transform to the matrix; and

transmitting comprises transmitting the compressed matrix.

14. The method of claim 13, wherein the two-dimensional compression transform is a two-dimensional Haar transform.

15. The method of claim 7, wherein transmitting comprises:

quantizing the compressed metrics and average as a number of bits; and

transmitting the bits over at least two transmission time intervals.

16. A method for reducing feedback transmission overhead in wireless communications comprising:

determining a quality metric for each sub-block within a transmission band;

dividing the transmission band into partitions according to an ordering of the determined quality metrics such that each sub-block belongs to one partition;

for each partition, selecting the M sub-blocks with M best quality metrics, where M may be different for different partitions;

for each partition, obtaining an average of the quality metrics for sub-blocks not included in the M selected metrics;

for each partition, compressing the M best metrics and the average; and

for each partition transmitting the compressed M best metrics and the average.

17. The method of claim 16, wherein the quality metric is a channel quality index (CQI).

18. The method of claim 16, wherein:

compressing comprises:

forming a vector comprising the M best metrics and the average; and

applying a compression transform to the vector to obtain a compressed vector;

and transmitting comprises

transmitting the compressed vector.

19. The method of claim 18 comprising removing at least one component of the compressed vector before the transmitting of the compressed vector.

20. The method of claim 19, wherein no information is lost when removing the at least one component.

21. The method of claim 18, wherein the compression transform is a Haar transform.

22. A method for reducing feedback transmission overhead in wireless communications comprising:

measuring a quality metric for each resource block group (RBG) in a plurality of RBGs;

dividing the plurality of RBGs into N groups where N > 1;

compressing the quality metrics for the RBGs in one of the groups during a reporting time interval;

transmitting the compressed quality metrics; and

repeating the compressing and transmitting for each of the N-1 remaining groups in subsequent transmission time intervals.

23. The method of claim 22, wherein

compressing comprises:

forming a vector comprising the quality metrics; and

applying a compression transform to the vector to obtain a compressed vector;

and

transmitting comprises:

transmitting the compressed vector.

24. The method of claim 23 comprising removing at least one component of the compressed vector before the transmitting of the compressed vector.

25. The method of claim 24, wherein no information is lost when removing the at least one component.

26. The method of claim 23, wherein the compression transform is a Haar transform.

27. A wireless transmit-receive unit (WTRU) comprising:

a receiver, configured for receiving signals in a plurality of sub-bands within a bandwidth;

a processor, configured to

determine from the signals a quality metric for each sub-band;

select M sub-bands with the M best quality metrics, where M is less than the total number of sub-bands;

group the M sub-bands into Q groups, where 1<Q<M;

determine an average of the metrics for sub-bands in each of the Q groups, thereby determining Q primary averages; and

determine an average of the metrics of all sub-bands not included in the M sub-bands with best quality metric, thereby determining a secondary average.

28. The WTRU of claim 27, wherein the processor is configured to measure a channel quality index (CQI) as the quality metric.

29. The WTRU of claim 27 further comprising a transmitter configured for:

transmitting a location index indicating locations of the M sub-bands with the M best quality metrics; and

transmitting a location index for each of Q-1 of the Q groups.

30. The WTRU of claim 27, wherein the processor is configured to group the M sub-bands into Q groups such that no more than one group contains exactly one sub-band.

31. The WTRU of claim 27, wherein the transmitter is configured for transmitting the primary averages and the secondary average.

32. The WTRU of claim 31, wherein

the processor is configured for

ordering the Q groups;

determining the primary average of a first group in the order;

determining a difference value between the primary average of each group other than the first group and the primary average of the preceding group in the order; and

determining a difference value between the secondary average and the primary average of the last group in the order;

and the transmitter is configured for transmitting:

the difference value between the primary average of each group other than the first group and the primary average of the preceding group; and

the difference value between the secondary average and the primary average of the last group.

33. A wireless transmit/receive unit (WTRU) comprising:

a processor;

a transmitter; and

a receiver;

the receiver configured for receiving signals in a plurality of sub-bands within a bandwidth;

the processor configured for:

determining a quality metric for each sub-band;

selecting M sub-bands with the M best quality metrics, where M is less than the total number of sub-bands within the bandwidth,

determining an average of the metrics of all sub-bands not included in the M sub-bands with best quality metric; and

compressing the M quality metrics and the average;

and the transmitter configured for:

transmitting the compressed metrics and average.

34. The WTRU of claim 33, wherein the processor is configured to determine a channel quality index (CQI) as the quality metric.

35. The WTRU of claim 33, wherein

the processor is configured for compressing by:

forming a vector comprising the M quality metrics and the average and ;

applying a compression transform to the vector to obtain a compressed vector;

and the transmitter is configured for:

transmitting the compressed vector.

36. The WTRU of claim 35 wherein the processor is configured for removing at least one component of the compressed vector before the transmitting of the compressed vector.

37. The WTRU of claim 36, wherein the processor is configured to remove the at least one component without loss of information.

38. The WTRU of claim 35, wherein the processor is configured to use a Haar transform as the compression transform.

39. The WTRU of claim 33, wherein

the processor is configured for:

determining the M best metrics for each of a plurality of additional code layers;

determining the average for each of the additional code layers;

assembling the M best metrics and averages for all code layers into a matrix; and

compressing by applying a two-dimensional compression transform to the matrix; and

the transmitter is configured for:

transmitting the compressed matrix.

40. The WTRU of claim 39, wherein the processor is configured to apply a two-dimensional Haar transform as the two-dimensional compression transform

41. The WTRU of claim 33, wherein

the processor is configured for quantizing the compressed metrics and average as a number of bits; and

the transmitter is configured for transmitting the bits over at least two transmission time intervals.

42. A wireless transmit/receive unit comprising:

a receiver;

a transmitter; and

a processor;

the receiver configured for

receiving over a transmission band;

the processor configured for:

determining a quality metric for each sub-block within the transmission band;

dividing the transmission band into partitions according to an ordering of the determined quality metrics such that each sub-block belongs to one partition;

for each partition, selecting the M sub-blocks with M best quality metrics,

for each partition, obtaining an average of the quality metrics for sub-blocks not included in the M selected metrics;

for each partition, compressing the M best metrics and the average; and

for each partition transmitting the compressed M best metrics and the average.

43. The WTRU of claim 42, wherein the processor is configured to determine a channel quality index (CQI) as the quality metric.

44. The WTRU of claim 42, wherein

the processor is configured for compressing by:

forming a vector comprising the M best metrics and the average; and

applying a compression transform to the vector to obtain a compressed vector;

and the transmitter is configured for

transmitting the compressed vector.

45. The WTRU of claim 44, wherein the processor is configured for removing at least one component of the compressed vector before the transmitting of the compressed vector.

46. The WTRU of claim 45, wherein the processor is configured for removing at least one component of the compressed vector without loss of information.

47. The WTRU of claim 44, wherein the processor is configured to apply a Haar transform as the compression transform.

48. A wireless transmit/receive unit comprising:

a receiver;

a transmitter; and

a processor;

the receiver configured for receiving a plurality of resource block groups (RBG);

the processor configured for:

measuring a quality metric for each resource block group;

dividing the plurality of RBGs into N groups where N > 1;

compressing the quality metrics for the RBGs in one of the groups during a first reporting time interval; and

compressing the quality metrics for each of the N-1 remaining groups in transmission time intervals subsequent to the first interval;

the transmitter configured for:

transmitting the compressed quality metrics for the RBGs in one of the groups during the first reporting time interval; and

transmitting the compressed quality metrics for each of the N-1 remaining groups in the subsequent transmission time intervals.

49. The WTRU of claim 48, wherein

the processor is configured for compressing the quality metrics by

forming a vector comprising the quality metrics; and

applying a compression transform to the vector to obtain a compressed vector; and

the transmitter is configured for:

transmitting the compressed vector.

50. The WTRU of claim 49, wherein the processor is configured for removing at least one component of the compressed vector before the transmitting of the compressed vector.

51. The WTRU of claim 50 wherein the processor is configured for removing at least one component of the compressed vector without loss of information.

52. The WTRU of claim 49, wherein the processor is configured to apply a Haar transform as the compression transform.

Claims:

1. A wireless transmit/receive unit (WTRU) comprising:

a processor configured to determine a channel quality index (CQI) for a first transmission layer of each of N groups of frequency resource blocks used in a multiple input/multiple output (MIMO) communication scheme;

wherein the N groups of frequency resource blocks divide a downlink bandwidth;

wherein the processor is configured to transmit each of the N channel quality indices in a different reporting transmission time interval (TTI); and

wherein the processor is further configured to transmit along with each of the N channel quality indices information indicating a channel quality index corresponding to at least a second transmission layer for the same frequency resource block group.

2. The WTRU of claim 1 wherein the reporting transmission time interval and the frequency resource block group to be reported in that reporting transmission time interval are known in advance of the transmission by the WTRU and a wireless network.

3. The WTRU of claim 1 wherein the transmission in each of the reporting transmission time intervals does not include an index of a position of the group within the downlink bandwidth.

4. A method comprising:

determining, by a wireless transmit/receive unit (WTRU), a channel quality index (CQI) for a first transmission layer of each of N groups of frequency resource blocks used in a multiple input/multiple output (MIMO) communication scheme, wherein the N groups of frequency resource blocks divide a downlink bandwidth;

transmitting, by the WTRU, each of the N channel quality indices in different reporting transmission time intervals; and

transmitting along with each of the N channel quality indices information indicating a channel quality index corresponding to at least a second transmission layer for the same frequency resource block group.

5. The method of claim 4 wherein the reporting transmission time interval and the frequency resource block group to be reported in that reporting transmission time interval are known in advance of the transmission by the WTRU and a wireless network.

6. The method of claim 4 wherein the transmission in each of the reporting transmission time intervals does not include an index of a position of the group within the downlink bandwidth.

7. A wireless network node used in a multiple input/multiple output (MIMO) communication scheme comprising:

a processor and a receiver configured to receive channel quality index (CQI) information from one wireless transmit/receive unit (WTRU) in N reporting transmission time intervals (TTIs);

wherein the CQI information in each of the N reporting TTIs corresponds to a first transmission layer of a respective one of N groups of frequency resource blocks;

wherein the N groups of frequency resource blocks divide a downlink bandwidth; and

wherein the processor is further configured to receive along with each of the N channel quality indices information indicating a channel quality index corresponding to at least a second transmission layer for the same frequency resource block group.

8. The wireless network device of claim 7 wherein each reporting transmission time interval and the frequency resource block group to be reported in that reporting transmission time interval are known in advance of reception by the wireless network device.

9. The wireless network device of claim 7 wherein information received in the N reporting TTIs does not include an index of a position of the group within the downlink bandwidth.

10. The wireless network device of claim 7 wherein the processor is further configured to determine a CQI for the entire N groups from CQI information in each of the N reporting TTIs.