

impulse response of a digital filter. This gives an opportunity to adapt the transmitted signal to the impulse response and thereby optimize the received signal for spatial multiplexing or to achieve low bit error rates. Statistical CSI (or long-term CSI) means that a statistical characterization of the channel is known. This description can include, for example, the type of fading distribution, the average channel gain, the line-of-sight component, and the spatial correlation. As with instantaneous CSI, statistical CSI can be used for transmission optimization.

[0256] The CSI acquisition is practically limited by how fast the channel conditions are changing. In fast fading systems, where channel conditions vary rapidly under the transmission of a single information symbol, only statistical CSI may be reasonable. On the other hand, in slow fading systems, instantaneous CSI can be estimated with reasonable accuracy and used for transmission adaptation for some time before being outdated. In practical systems, the available CSI may lie in between these two levels; instantaneous CSI with some estimation/quantization error is combined with statistical information.

[0257] Multiple subbands may be determined or configured for CSI feedback. Specifically, two or more D-subbands (e.g., two or four) may be determined or configured as a subband for CSI feedback which may include at least one of channel quality indicator (CQI), precoding matrix indicator (PMI), and rank indicator (RI). As used herein, the D-subband configured or determined for CSI feedback may be referred to as a CSI-subband. A WTRU may monitor for and/or receive a CSI feedback request in the CSI-subband. The CSI-subband (i.e., D-subband) may be used by the network (e.g., eNode-B) to transmit in the downlink a signal that indicates and/or requests a CSI report (i.e., feedback) from the WTRU. In response to receiving the CSI feedback indication and/or request, the WTRU may perform the requested CSI measurements and transmit the CSI feedback, along with a DL subband index corresponding to a CSI-subband, to the network (e.g., the eNodeB). An associated U-subband to transmit the CSI feedback report may be identified and/or determined by the WTRU (or network) for the reporting,

CLAIMS

What is claimed is:

1. A method for use in a wireless transmit/receive unit (WTRU), the method comprising:

receiving, by the WTRU, configuration information from an base station indicating at least one subband of a plurality of subbands to monitor for an machine-type communication physical downlink control channel (MPDCCH), wherein each subband of the plurality of subbands is made up of a subset of frequency resources in a system bandwidth;

determining, by the WTRU, the at least one subband to monitor for the MPDCCH based on the received configuration information, wherein each of the at least one determined subband for monitoring the MPDCCH is further determined, by the WTRU, as a channel state information (CSI) downlink subband (CSI-subband) for measuring CSI feedback thereon;

monitoring, by the WTRU, each CSI-subband for a downlink signal associated with the MPDCCH; and

measuring, by the WTRU, the CSI feedback on each CSI-subband.

2. The method of claim 1, further comprising:

reporting, by the WTRU, the measured CSI feedback for each CSI-subband on at least one uplink channel, wherein each of the at least one uplink channel is associated with a corresponding CSI-subband.

3. The method of claim 2, wherein the measured CSI feedback includes a channel quality indicator (CQI) value for a corresponding CSI-subband.

4. The method of claim 1, further comprising:
determining, by the WTRU, a downlink (DL) subband index for each CSI-subband, and
reporting, by the WTRU, the CSI feedback for at least one determined DL subband index.

5. The method of claim 4, wherein reporting the CSI feedback includes reporting the DL subband index and a channel quality indicator (CQI) value for each of the at least one determined DL subband index being reported.

6. The method of claim 4, wherein reporting the CSI feedback for the at least one determined DL subband index includes reporting the CSI feedback for each of the at least one determined DL subband index one at a time.

7. The method of claim 1, further comprising:
selecting, by the WTRU, a CSI-subband from among CSI-subbands for CSI feedback reporting; and
reporting, by the WTRU, the CSI feedback corresponding to the selected CSI-subband on an uplink channel.

8. The method of claim 7, wherein the selected CSI-subband for CSI feedback reporting is a preferred CSI-subband among the CSI-subbands.

9. The method of claim 8, wherein the preferred CSI-subband has a highest CQI value among the CSI-subbands.

10. The method of claim 7, wherein reporting the CSI feedback for the selected CSI-subband includes reporting a downlink (DL) subband index and a channel quality indicator (CQI) value corresponding to the selected CSI-subband.

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

a receiver configured to receive configuration information from an base station indicating at least one subband of a plurality of subbands to monitor for an machine-type communication physical downlink control channel (MPDCCH), wherein each subband of the plurality of subbands is made up of a subset of frequency resources in a system bandwidth;

at least one processor configured to determine the at least one subband to monitor for the MPDCCH based on the received configuration information, and further determine each of the at least one determined subband for monitoring the MPDCCH as a channel state information (CSI) downlink subband (CSI-subband) for measuring CSI feedback thereon;

the receiver and the at least one processor further configured to monitor each CSI-subband for a downlink signal associated with the MPDCCH; and

the receiver and the at least one processor further configured to measure the CSI feedback on each CSI-subband.

12. The WTRU of claim 11, further comprising:

a transmitter configured to report the measured CSI feedback for each CSI-subband on at least one uplink channel, wherein each of the at least one uplink channel is associated with a corresponding CSI-subband.

13. The WTRU of claim 12, wherein the measured CSI feedback includes a channel quality indicator (CQI) value for a corresponding CSI-subband.

14. The WTRU of claim 11, wherein the at least one processor is configured to determine a downlink (DL) subband index for each CSI-subband, and

the WTRU further comprises a transmitter configured to report the CSI feedback for at least one determined DL subband index.

15. The WTRU of claim 14, wherein the CSI feedback includes the DL subband index and a channel quality indicator (CQI) value for each of the at least one determined DL subband index being reported.

16. The WTRU of claim 14, wherein the transmitter is configured to report the CSI feedback for each of the at least one determined DL subband index one at a time.

17. The WTRU of claim 11, wherein the at least one processor is configured to select a CSI-subband from among CSI-subbands for CSI feedback reporting, and

the WTRU further comprises a transmitter configured to report the CSI feedback corresponding to the selected CSI-subband on an uplink channel.

18. The WTRU of claim 17, wherein the selected CSI-subband for CSI feedback reporting is a preferred CSI-subband among the CSI-subbands.

19. The WTRU of claim 18, wherein the preferred CSI-subband has a highest CQI value among the CSI-subbands.

20. The WTRU of claim 17, wherein the CSI feedback for the selected CSI-subband includes a downlink (DL) subband index and a channel quality indicator (CQI) value corresponding to the selected CSI-subband.