

IDC-11121WO01

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REPLACEMENT SHEETS**CLAIMS**

1. A method for multiple-input multiple-output (MIMO) transmissions, the method comprising:

a wireless transmit/receive unit (WTRU) receiving a downlink transmission from an eNodeB, wherein the downlink transmission includes a plurality of spatial layers transmitted to a plurality of WTRUs paired for multi-user MIMO;

the WTRU decoding the downlink transmission based on a corresponding WTRU-specific reference signal,

wherein WTRU-specific reference signals for the plurality of WTRUs are multiplexed into the downlink transmission such that WTRU-specific reference signals for different sub-group of antenna ports are multiplexed onto different subcarriers in a frequency domain and the WTRU-specific reference signals of the same sub-group of antennas ports are applied with an orthogonal cover code in a time domain,

wherein resource elements used for transmission of the WTRU-specific reference signals on antenna ports in one sub-group are muted on antenna ports in another sub-group regardless of the number of multiplexed WTRU-specific reference signals.

2. The method of claim 1 wherein the WTRU decodes the downlink transmission assuming that no data is transmitted to the WTRU on the muted resource elements.

3. The method of claim 1 wherein four antenna ports are used to support up to eight (8) layers.

4. The method of claim 1 wherein the WTRUs are paired for multi-user MIMO based on spatial correlation among the WTRUs.

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5. The method of claim 1 wherein a bandwidth assigned for the WTRU is different from a bandwidth assigned for a WTRU paired for multi-user MIMO.

6. The method of claim 5 wherein the WTRU receives information regarding a largest bandwidth among WTRUs paired for multi-user MIMO.

7. The method of claim 6 wherein the WTRU does not apply a scrambling sequence to the WTRU-specific reference signal on a condition that a bandwidth assigned to a paired WTRU for multi-user MIMO is different.

8. A method for multiple-input multiple-output (MIMO) transmission, the method comprising:

a wireless transmit/receive unit (WTRU) generating a demodulation reference signal;

the WTRU performing precoding on payload for spatial multiplexing; and

the WTRU transmitting the demodulation reference signal and the payload on allocated time-frequency resources, wherein the demodulation reference signal is transmitted without precoding for spatial multiplexing.

9. The method of claim 8 wherein a number of resource blocks allocated for the demodulation reference signal is greater than a number of resource blocks allocated for the payload.

10. The method of claim 9 further comprising:

the WTRU applying an orthogonal cover code to the demodulation reference signal over two slots in a subframe.

11-12. (Cancelled)

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

a receiver configured to receive a downlink transmission from an eNodeB, wherein the downlink transmission includes a plurality of spatial layers transmitted to a plurality of WTRUs paired for multi-user MIMO; and

a processor configured to decode the downlink transmission based on a corresponding WTRU-specific reference signal,

wherein WTRU-specific reference signals for the plurality of WTRUs are multiplexed into the downlink transmission such that WTRU-specific reference signals for different sub-group of antenna ports are multiplexed onto different subcarriers in a frequency domain and the WTRU-specific reference signals of the same sub-group of antennas ports are applied with an orthogonal cover code in a time domain,

wherein resource elements used for transmission of the WTRU-specific reference signals on antenna ports in one sub-group are muted on antenna ports in another sub-group regardless of the number of multiplexed WTRU-specific reference signals.

14. The WTRU of claim 13 wherein the processor is configured to decode the downlink transmission assuming that no data is transmitted to the WTRU on the muted resource elements.

15. The WTRU of claim 13 wherein four antenna ports are used to support up to eight (8) spatial layers.

16. The WTRU of claim 13 wherein the WTRUs are paired for multi-user MIMO based on spatial correlation among the WTRUs.

17. The WTRU of claim 13 wherein a bandwidth assigned for the WTRU is different from a bandwidth assigned for a WTRU paired for multi-user MIMO.

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18. The WTRU of claim 17 wherein the processor is configured to receive information regarding a largest bandwidth among WTRUs paired for multi-user MIMO.

19. The WTRU of claim 18 wherein the processor is configured to not apply a scrambling sequence to the WTRU-specific reference signal on a condition that a bandwidth assigned to a paired WTRU for multi-user MIMO is different.

## CLAIMS

1. A method for multiple-input multiple-output (MIMO) transmissions, the method comprising:

a wireless transmit/receive unit (WTRU) receiving a downlink transmission from an eNodeB, wherein the downlink transmission includes a plurality of spatial layers transmitted to a plurality of WTRUs paired for multi-user MIMO; and

the WTRU decoding the downlink transmission based on a corresponding WTRU-specific reference signal,

wherein WTRU-specific reference signals for the plurality of WTRUs are multiplexed into the downlink transmission such that WTRU-specific reference signals for different sub-groups of antenna ports are multiplexed onto different subcarriers in a frequency domain and the WTRU-specific reference signals of the same sub-group of antennas ports are applied with an orthogonal cover code in a time domain, and

wherein resource elements used for transmission of the WTRU-specific reference signals on antenna ports in one sub-group are muted using rate matching on antenna ports in another sub-group.

2. The method of claim 1 wherein the WTRU decodes the downlink transmission assuming that no data is transmitted to the WTRU on the muted resource elements.

3. The method of claim 1 wherein four antenna ports are used to support up to eight (8) layers.

4. The method of claim 1 wherein the WTRUs are paired for multi-user MIMO based on spatial correlation among the WTRUs.

5. The method of claim 1 wherein a bandwidth assigned for the WTRU is different from a bandwidth assigned for a WTRU paired for multi-user MIMO.

6. The method of claim 5 wherein the WTRU receives information regarding a largest bandwidth among WTRUs paired for multi-user MIMO.

7. The method of claim 6 wherein the WTRU does not apply a scrambling sequence to the WTRU-specific reference signal on a condition that a bandwidth assigned to a paired WTRU for multi-user MIMO is different.

8. A method for multiple-input multiple-output (MIMO) transmission, the method comprising:

- a wireless transmit/receive unit (WTRU) generating a demodulation reference signal;

- the WTRU performing precoding on payload for spatial multiplexing; and

- the WTRU transmitting the demodulation reference signal and the payload on allocated time-frequency resources, wherein the demodulation reference signal is transmitted without precoding for spatial multiplexing.

9. The method of claim 8 wherein a number of resource blocks allocated for the demodulation reference signal is greater than a number of resource blocks allocated for the payload.

10. The method of claim 9 further comprising:

- the WTRU applying an orthogonal cover code to the demodulation reference signal over two slots in a subframe.

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

a receiver configured to receive a downlink transmission from an eNodeB, wherein the downlink transmission includes a plurality of spatial layers transmitted to a plurality of WTRUs paired for multi-user MIMO; and

a processor configured to decode the downlink transmission based on a corresponding WTRU-specific reference signal,

wherein WTRU-specific reference signals for the plurality of WTRUs are multiplexed into the downlink transmission such that WTRU-specific reference signals for different sub-groups of antenna ports are multiplexed onto different subcarriers in a frequency domain and the WTRU-specific reference signals of the same sub-group of antennas ports are applied with an orthogonal cover code in a time domain, and

wherein resource elements used for transmission of the WTRU-specific reference signals on antenna ports in one sub-group are muted using rate matching on antenna ports in another sub-group.

12. The WTRU of claim 11 wherein the processor is configured to decode the downlink transmission assuming that no data is transmitted to the WTRU on the muted resource elements.

13. The WTRU of claim 11 wherein four antenna ports are used to support up to eight (8) spatial layers.

14. The WTRU of claim 11 wherein the WTRUs are paired for multi-user MIMO based on spatial correlation among the WTRUs.

15. The WTRU of claim 11 wherein a bandwidth assigned for the WTRU is different from a bandwidth assigned for a WTRU paired for multi-user MIMO.

16. The WTRU of claim 15 wherein the processor is configured to receive information regarding a largest bandwidth among WTRUs paired for multi-user MIMO.

17. The WTRU of claim 16 wherein the processor is configured to not apply a scrambling sequence to the WTRU-specific reference signal on a condition that a bandwidth assigned to a paired WTRU for multi-user MIMO is different.