serving cell to provide PDSCH assignments and/or PUSCH grants for transmissions in other serving cell(s).

SUMMARY

[0008] A method and apparatus for Time Division Duplex (TDD) operation in a wireless transmit/receive unit (WTRU) are disclosed. The method includes receiving a first TDD uplink (UL)/downlink (DL) configuration for a serving cell, receiving a second TDD UL/DL configuration for the serving cell, receiving an indication of directions to use for subframes with conflicting directions between the first TDD UL/DL configuration and the second TDD UL/DL configuration, using the first TDD UL/DL configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ), using the second TDD UL/DL configuration for timing of DL scheduling and DL HARQ, and determining a direction for each subframe with conflicting directions based on the received indication, wherein on a condition that the determined direction for a subframe with conflicting directions is DL, receiving in the subframe in the DL.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 shows an example of a TDD frame;

[0010] FIG. 2 shows an example of TDD UL/DL configurations in accordance with LTE;

[0011] FIGS. 3A-3F show examples of RE locations which may also be called patterns of WTRU-specific reference signals, DM-RS patterns or DMRS patterns;

[0012] FIG. 4A is a system diagram of an example communications system in which one or more disclosed embodiments may be implemented;

[0013] FIG. 4B is a system diagram of an example wireless transmit/receive unit (WTRU) that may be used within the communications system illustrated in FIG. 4A;

serving cell to provide PDSCH assignments and/or PUSCH grants for transmissions in other serving cell(s).

SUMMARY

[0008] In a first aspect, there is provided a method for Time Division Duplex (TDD) operation in a wireless transmit/receive unit (WTRU), the method comprising: receiving, by the WTRU via a system information block (SIB), a first TDD uplink (UL)/downlink (DL) reference configuration for a serving cell, wherein the first TDD UL/DL reference configuration is cell-specific; receiving, by the WTRU, a second TDD UL/DL reference configuration for the serving cell; receiving, by the WTRU via physical layer signaling, a third TDD UL/DL reference configuration for the serving cell; using, by the WTRU, the received first TDD UL/DL reference configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ); using, by the WTRU, the received second TDD UL/DL reference configuration for timing of DL HARQ; and determining, by the WTRU, a UL or DL direction for each subframe based on the received third TDD UL/DL reference configuration; wherein on a condition that the determined direction for a subframe is DL, receiving DL transmissions in the subframe.

[0008a] In a second aspect, there is provided a method for Time Division Duplex (TDD) in an evolved Node B (eNB), the method comprising: transmitting, by the eNB via a system information block (SIB), a first TDD uplink (UL)/downlink (DL) reference configuration for a cell, wherein the first TDD UL/DL reference configuration is cell-specific; transmitting, by the eNB, a second TDD UL/DL reference configuration for the cell to at least one WTRU; transmitting, by the eNB via physical layer signaling, a third TDD UL/DL reference configuration for the cell to the at least one WTRU; using, by the eNB, for the at least one WTRU the first TDD UL/DL reference configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ); using, by the eNB, for the at least one WTRU the second UL/DL reference configuration for timing of DL HARQ; and transmitting, by the eNB, DL transmissions in at least one subframe which is DL in the third TDD UL/DL reference configuration.

[0008] In a third aspect, there is provided a wireless transmit/receive unit (WTRU) for Time Division Duplex (TDD) operation comprising: a transceiver operatively coupled to a processor, the transceiver and the processor configured to receive, via a system information block (SIB), a first TDD uplink (UL)/downlink (DL) reference configuration for a serving

cell, wherein the first TDD UL/DL reference configuration is cell-specific; the transceiver and the processor further configured to receive a second TDD UL/DL reference configuration for the serving cell; the transceiver and the processor further configured to receive, via physical layer signaling, a third TDD UL/DL reference configuration for the serving cell; the transceiver and the processor further configured to use the received first TDD UL/DL reference configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ); the transceiver and the processor further configured to use the received second TDD UL/DL reference configuration for timing of DL HARQ; and the transceiver and the processor further configured to determine a UL or DL direction for each subframe based on the received third TDD UL/DL reference configuration; wherein on a condition that the determined direction for a subframe is DL, the transceiver and the processor further configured to receive DL transmissions in the subframe.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 shows an example of a TDD frame;

[0010] FIG. 2 shows an example of TDD UL/DL configurations in accordance with LTE;

[0011] FIGS. 3A-3F show examples of RE locations which may also be called patterns of WTRU-specific reference signals, DM-RS patterns or DMRS patterns;

[0012] FIG. 4A is a system diagram of an example communications system in which one or more disclosed embodiments may be implemented;

[0013] FIG. 4B is a system diagram of an example wireless transmit/receive unit (WTRU) that may be used within the communications system illustrated in FIG. 4A;

CLAIMS

What is claimed:

1. A method for Time Division Duplex (TDD) operation in a wireless transmit/receive unit (WTRU), the method comprising:

receiving a first TDD uplink (UL)/downlink (DL) reference configuration for a serving cell;

receiving a second TDD UL/DL reference configuration for the serving cell;

receiving a third TDD UL/DL reference configuration for the serving cell;

using the first TDD UL/DL reference configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ);

using the second TDD UL/DL reference configuration for timing of DL scheduling and DL HARQ; and

using the third TDD UL/DL reference configuration as an indication for determining a UL or DL direction for each subframe;

wherein on a condition that the determined direction for a subframe is DL, receiving in the subframe in the DL.

2. The method of claim 1, wherein receiving in a subframe in the DL includes at least one of monitoring a Physical Downlink Control Channel (PDCCH), monitoring an enhanced PDCCH (EPDCCH), decoding a Physical Hybrid ARQ Indicator Channel (PHICH), and decoding a Physical Downlink Shared Channel (PDSCH).

3. The method of claim 1, wherein the first TDD UL/DL reference configuration is cell-specific.

4. The method of claim 1, wherein the second TDD UL/DL reference configuration is WTRU-specific.

5. The method of claim 1, further comprising:

cancelling a scheduled UL transmission for a specific subframe on a condition that the specific subframe is indicated as DL.

6. The method of claim 1, wherein on a condition that the WTRU does not receive the third TDD UL/DL reference, the WTRU performs blind decoding in each subframe indicated as DL in the second TDD UL/DL reference configuration to determine whether the subframe is intended for DL use.

7. The method of claim 1, further comprising:

receiving an updated third TDD UL/DL reference configuration in a current reconfiguration period; and

applying the updated configuration in at least part of at least one of the current reconfiguration period and a next reconfiguration period.

8. The method of claim 1, further comprising:

receiving a format and a location of a special subframe as part of downlink control information (DCI) to allow for dynamic configuration of the special subframe.

9. The method of claim 1, further comprising:

receiving an updated TDD UL/DL configuration to replace at least one of the first TDD UL/DL reference configuration or the second TDD UL/DL reference configuration; and

mapping at least one of a previous ongoing UL/DL HARQ processes to at least one new UL/DL HARQ process corresponding to the updated TDD UL/DL configuration.

10. The method of claim 1, wherein the third TDD UL/DL reference configuration is WTRU-specific.

11. The method of claim 1, further comprising:

expecting to receive an updated third TDD UL/DL reference configuration in a reconfiguration period; and

on a condition that the updated third TDD UL/DL reference configuration is not received, blind decoding in a subframe indicated as a DL subframe in the second TDD UL/DL configuration until a later time when an updated third TDD UL/DL reference configuration is received.

12. A wireless transmit/receive unit (WTRU) for Time Division Duplex (TDD) operation comprising:

a receiver configured to receive a first TDD uplink (UL)/downlink (DL) reference configuration for a serving cell;

the receiver is further configured to receive a second TDD UL/DL reference configuration for the serving cell;

the receiver is further configured to receive a third TDD UL/DL reference configuration for the serving cell;

a processor configured to use the first TDD UL/DL reference configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ);

the processor is further configured to use the second TDD UL/DL reference configuration for timing of DL scheduling and DL HARQ; and

the processor is further configured to use the third TDD UL/DL reference configuration as an indication for determining a UL or DL direction for each subframe;

wherein on a condition that the determined direction for a subframe is DL, receiving in the subframe in the DL.

13. The WTRU of claim 12, wherein receiving in a subframe in the DL includes at least one of monitoring a Physical Downlink Control Channel (PDCCH), monitoring an enhanced PDCCH (EPDCCH), decoding a Physical Hybrid ARQ Indicator Channel (PHICH), and decoding a Physical Downlink Shared Channel (PDSCH).

14. The WTRU of claim 12, wherein the first TDD UL/DL reference configuration is cell-specific.

15. The WTRU of claim 12, wherein the second TDD UL/DL reference configuration is WTRU-specific.

CLAIMS

1. A method for Time Division Duplex (TDD) operation in a wireless transmit/receive unit (WTRU), the method comprising:

receiving, by the WTRU via a system information block (SIB), a first TDD uplink (UL)/downlink (DL) reference configuration for a serving cell, wherein the first TDD UL/DL reference configuration is cell-specific;

receiving, by the WTRU, a second TDD UL/DL reference configuration for the serving cell;

receiving, by the WTRU via physical layer signaling, a third TDD UL/DL reference configuration for the serving cell;

using, by the WTRU, the received first TDD UL/DL reference configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ);

using, by the WTRU, the received second TDD UL/DL reference configuration for timing of DL HARQ; and

determining, by the WTRU, a UL or DL direction for each subframe based on the received third TDD UL/DL reference configuration;

wherein on a condition that the determined direction for a subframe is DL, receiving DL transmissions in the subframe.

2. The method of claim 1, wherein the receiving DL transmissions in the subframe includes at least one of monitoring a Physical Downlink Control Channel (PDCCH), monitoring an enhanced PDCCH (EPDCCH), decoding a Physical Hybrid Automatic Repeat Request (ARQ) Indicator Channel (PHICH), and decoding a Physical Downlink Shared Channel (PDSCH).

3. The method of claim 1, wherein the second TDD UL/DL reference configuration is WTRU-specific.

4. The method of claim 1, further comprising:
cancelling, by the WTRU, a scheduled UL transmission for a specific subframe on a condition that the specific subframe is indicated as DL.

5. The method of claim 1, wherein the SIB is a SIB1.

6. The method of claim 1, wherein on a condition that the WTRU does not receive the third TDD UL/DL reference configuration, the WTRU performs blind decoding in each subframe indicated as DL in the first TDD UL/DL reference configuration.

7. The method of claim 6, wherein blind decoding includes monitoring at least one of a Physical Downlink Control Channel (PDCCH) and an enhanced PDCCH (EPDCCH).

8. The method of claim 6, wherein blind decoding is not performed in a subframe in which the WTRU has a scheduled UL transmission and the WTRU transmits as scheduled in the subframe.

9. The method of claim 6, wherein the WTRU receives a Physical Hybrid ARQ Indicator Channel (PHICH) in a subframe in which a PHICH intended for the WTRU is expected by the WTRU.

10. The method of claim 1, wherein the third TDD UL/DL reference configuration is WTRU-specific.

11. The method of claim 1, wherein the third TDD UL/DL reference configuration is received in a current reconfiguration period; and

wherein the determination of the UL or DL direction is determined for at least one of at least one subframe of the current reconfiguration period and a plurality of subframes of a next reconfiguration period.

12. The method of claim 11, wherein the reconfiguration period occurs periodically.

13. The method of claim 1, further comprising:

on a condition that the updated third TDD UL/DL reference configuration is not received in a reconfiguration period, blind decoding, by the WTRU, in a subframe indicated as a DL subframe in the first TDD UL/DL configuration.

14. The method of claim 11, wherein the reconfiguration period is a radio frame.

15. A method for Time Division Duplex (TDD) in an evolved Node B (eNB), the method comprising:

transmitting, by the eNB via a system information block (SIB), a first TDD uplink (UL)/downlink (DL) reference configuration for a cell, wherein the first TDD UL/DL reference configuration is cell-specific;

transmitting, by the eNB, a second TDD UL/DL reference configuration for the cell to at least one WTRU;

transmitting, by the eNB via physical layer signaling, a third TDD UL/DL reference configuration for the cell to the at least one WTRU;

using, by the eNB, for the at least one WTRU the first TDD UL/DL reference configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ);

using, by the eNB, for the at least one WTRU the second UL/DL reference configuration for timing of DL HARQ; and

transmitting, by the eNB, DL transmissions in at least one subframe which is DL in the third TDD UL/DL reference configuration.

16. The method of claim 15, wherein the eNB uses the first TDD UL/DL reference configuration for both the UL and DL scheduling and HARQ operations for at least one other WTRU.

17. The method of claim 15, wherein the second TDD UL/DL reference configuration is WTRU-specific.

18. The method of claim 15, wherein the third TDD UL/DL reference configuration is WTRU-specific.

19. The method of claim 15, wherein the third TDD UL/DL reference configuration is transmitted in a current reconfiguration period; and

wherein the determination of the UL or DL direction is determined for at least one of at least one subframe of the current reconfiguration period and a plurality of subframes of a next reconfiguration period.

20. The method of claim 15, wherein the SIB is a SIB1.

21. The method of claim 19, wherein the reconfiguration period occurs periodically.

22. The method of claim 19, wherein the reconfiguration period is a radio frame.

23. A wireless transmit/receive unit (WTRU) for Time Division Duplex (TDD) operation comprising:

a transceiver operatively coupled to a processor, the transceiver and the processor configured to receive, via a system information block (SIB), a first TDD uplink (UL)/downlink (DL) reference configuration for a serving cell, wherein the first TDD UL/DL reference configuration is cell-specific;

the transceiver and the processor further configured to receive a second TDD UL/DL reference configuration for the serving cell;

the transceiver and the processor further configured to receive, via physical layer signaling, a third TDD UL/DL reference configuration for the serving cell;

the transceiver and the processor further configured to use the received first TDD UL/DL reference configuration for timing of UL scheduling and UL Hybrid Automatic Repeat Request (HARQ);

the transceiver and the processor further configured to use the received second TDD UL/DL reference configuration for timing of DL HARQ; and

the transceiver and the processor further configured to determine a UL or DL direction for each subframe based on the received third TDD UL/DL reference configuration;

wherein on a condition that the determined direction for a subframe is DL, the transceiver and the processor further configured to receive DL transmissions in the subframe.

24. The WTRU of claim 23, wherein to receive DL transmissions in the subframe includes at least one of monitoring a Physical Downlink Control Channel (PDCCH), monitoring an enhanced PDCCH (EPDCCH), decoding a Physical Hybrid Automatic Repeat Request (ARQ) Indicator Channel (PHICH), and decoding a Physical Downlink Shared Channel (PDSCH).

25. The WTRU of claim 23, wherein the second TDD UL/DL reference configuration is WTRU-specific.

26. The WTRU of claim 23, wherein the third TDD UL/DL reference configuration is WTRU-specific.

27. The WTRU of claim 23, wherein the third TDD UL/DL reference configuration is received in a current reconfiguration period; and

wherein the determination of the UL or DL direction is determined for at least one of at least one subframe of the current reconfiguration period and a plurality of subframes of a next reconfiguration period.

28. The WTRU of claim 27, wherein the reconfiguration period occurs periodically.

29. The WTRU of claim 27, wherein the reconfiguration period is a radio frame.

30. The WTRU of claim 23, wherein the SIB is a SIB1.