

What is claimed:

1. A method of operating a wireless communication device, comprising:
channel coding Channel State Information (CSI) bits jointly with Hybrid Automatic Repeat Request (HARQ) Acknowledgement (HARQ-ACK) bits, wherein channel coding the CSI bits jointly with the HARQ-ACK bits comprises appending a sequence of HARQ-ACK bits at the end of a sequence of channel quality bits to produce a joint sequence, and channel coding the joint sequence;

 multiplexing the jointly coded CSI and HARQ-ACK bits with coded data bits, wherein multiplexing the jointly coded CSI and HARQ-ACK bits with coded data bits comprises assigning the jointly coded CSI and HARQ-ACK bits for transmission on a first set of resource elements in the PUSCH, and thereafter assigning the coded data bits for transmission on a second set of resource elements in the PUSCH, wherein the first and second sets of resource elements do not include any of the same resource elements, and wherein the assigning comprises interleaving the coded CSI and HARQ-ACK bits with the coded data bits such that the coded CSI and HARQ-ACK bits are assigned to the first set of resource elements and the coded data bits are assigned to the second set of resource elements; and

 transmitting the multiplexed coded CSI and HARQ-ACK bits and coded data bits on a physical uplink shared channel (PUSCH).

2. The method of claim 1, wherein the CSI bits comprise channel quality indication (CQI) bits.

3. The method of claim 1, wherein the interleaving comprises performing a channel interleaving procedure in which HARQ-ACK bits are treated as being absent.

4. The method of claim 1, further comprising:
receiving higher layer signaling from a radio network node, the higher layer

signaling indicating that the assigning is to be performed; and
performing the assigning in response to the higher layer signaling.

5. The method of claim 1, wherein the multiplexing is triggered by physical downlink control channel (PDCCH) or enhanced physical downlink control channel (ePDCCH) signaling.

6. The method of claim 1, further comprising:
determining whether the number of HARQ-ACK bits or coded HARQ-ACK bits is greater than a threshold value; and
performing the channel coding HARQ-ACK bits jointly with the CSI bits as a consequence of the determining.

7. The method of claim 6, wherein the threshold value is 22.

8. A wireless communication device, comprising:
at least one memory, at least one processor, and at least one transceiver collectively configured to:
channel code Channel State Information (CSI) bits jointly with Hybrid Automatic Repeat Request (HARQ) Acknowledgement (HARQ-ACK) bits, wherein channel coding the CSI bits jointly with the HARQ-ACK bits comprises appending a sequence of HARQ-ACK bits at the end of a sequence of channel quality bits to produce a joint sequence, and channel coding the joint sequence;
multiplex the jointly coded CSI and HARQ-ACK bits with coded data bits, wherein multiplexing the jointly coded CSI and HARQ-ACK bits with coded data bits comprises assigning the jointly coded CSI and HARQ-ACK bits for transmission on a first set of resource elements in the PUSCH, and thereafter assigning the coded data bits for transmission on a second set of resource elements in the PUSCH, wherein the first and second sets of resource elements do not include any of the same resource elements,

and wherein the assigning comprises interleaving the coded CSI and HARQ-ACK bits with the coded data bits such that the coded CSI and HARQ-ACK bits are assigned to the first set of resource elements and the coded data bits are assigned to the second set of resource elements; and

transmit the multiplexed coded CSI and HARQ-ACK bits and coded data bits on a physical uplink shared channel (PUSCH).

9. The wireless communication device of claim 8, wherein the CSI bits comprise channel quality indication (CQI) bits.

10. The wireless communication device of claim 8, wherein the interleaving comprises performing a channel interleaving procedure in which HARQ-ACK bits are treated as being absent.

11. The wireless communication device of claim 8, wherein the at least one memory, at least one processor, and at least one transceiver are further collectively configured to receive higher layer signaling from a radio network node, the higher layer signaling indicating that the assigning is to be performed, and perform the assigning in response to the higher layer signaling.

12. The wireless communication device of claim 8, wherein the multiplexing is triggered by physical downlink control channel (PDCCH) or enhanced physical downlink control channel (ePDCCH) signaling.

13. The wireless communication device of claim 8,
wherein the at least one memory, at least one processor, and at least one transceiver are further collectively configured to determine whether the number of HARQ-ACK bits or coded HARQ-ACK bits is greater than a threshold value, and to perform the channel coding HARQ-ACK bits jointly with the CSI bits as a consequence

of the determining.

14. The wireless communication device of claim 13, wherein the threshold value is 22.

15. A wireless communication device, comprising:
at least one memory, at least one processor, and at least one transceiver
collectively configured to:

channel code Channel State Information (CSI) bits jointly with Hybrid Automatic Repeat Request (HARQ) Acknowledgement (HARQ-ACK) bits, wherein channel coding the CSI bits jointly with the HARQ-ACK bits comprises appending a sequence of HARQ-ACK bits at the end of a sequence of channel quality bits to produce a joint sequence, and channel coding the joint sequence;

multiplex the jointly coded CSI and HARQ-ACK bits with coded data bits, wherein multiplexing the jointly coded CSI and HARQ-ACK bits with coded data bits comprises assigning the jointly coded CSI and HARQ-ACK bits for transmission on a first set of resource elements in the PUSCH, and thereafter assigning the coded data bits for transmission on a second set of resource elements in the PUSCH, wherein the first and second sets of resource elements do not include any of the same resource elements, and

transmit the multiplexed coded CSI and HARQ-ACK bits and coded data bits on a physical uplink shared channel (PUSCH),

wherein the at least one memory, at least one processor, and at least one transceiver are further collectively configured to receive higher layer signaling from a radio network node, the higher layer signaling indicating that the assigning is to be performed, and perform the assigning in response to the higher layer signaling.

16. A wireless communication device, comprising:
at least one memory, at least one processor, and at least one transceiver

collectively configured to:

channel code Channel State Information (CSI) bits jointly with Hybrid Automatic Repeat Request (HARQ) Acknowledgement (HARQ-ACK) bits, wherein channel coding the CSI bits jointly with the HARQ-ACK bits comprises appending a sequence of HARQ-ACK bits at the end of a sequence of channel quality bits to produce a joint sequence, and channel coding the joint sequence;

multiplex the jointly coded CSI and HARQ-ACK bits with coded data bits, wherein multiplexing the jointly coded CSI and HARQ-ACK bits with coded data bits comprises assigning the jointly coded CSI and HARQ-ACK bits for transmission on a first set of resource elements in the PUSCH, and thereafter assigning the coded data bits for transmission on a second set of resource elements in the PUSCH, wherein the first and second sets of resource elements do not include any of the same resource elements, and

transmit the multiplexed coded CSI and HARQ-ACK bits and coded data bits on a physical uplink shared channel (PUSCH),

wherein the multiplexing is triggered by physical downlink control channel (PDCCH) or enhanced physical downlink control channel (ePDCCH) signaling.

17. A wireless communication device, comprising:

at least one memory, at least one processor, and at least one transceiver collectively configured to:

channel code Channel State Information (CSI) bits jointly with Hybrid Automatic Repeat Request (HARQ) Acknowledgement (HARQ-ACK) bits, wherein channel coding the CSI bits jointly with the HARQ-ACK bits comprises appending a sequence of HARQ-ACK bits at the end of a sequence of channel quality bits to produce a joint sequence, and channel coding the joint sequence;

multiplex the jointly coded CSI and HARQ-ACK bits with coded data bits, wherein multiplexing the jointly coded CSI and HARQ-ACK bits with coded data bits comprises assigning the jointly coded CSI and HARQ-ACK bits for transmission on a

first set of resource elements in the PUSCH, and thereafter assigning the coded data bits for transmission on a second set of resource elements in the PUSCH, wherein the first and second sets of resource elements do not include any of the same resource elements, and

transmit the multiplexed coded CSI and HARQ-ACK bits and coded data bits on a physical uplink shared channel (PUSCH),

wherein the at least one memory, at least one processor, and at least one transceiver are further collectively configured to determine whether the number of HARQ-ACK bits or coded HARQ-ACK bits is greater than a threshold value, and to perform the channel coding HARQ-ACK bits jointly with the CSI bits as a consequence of the determining.