

CLAIMS

What is claimed is:

- 1 1. A method for wireless communication at a user equipment (UE),
2 comprising:
3 receiving a configuration identifying a plurality of sets of control channel
4 resources for a plurality of semi-persistent scheduling (SPS) configurations, the plurality of
5 sets of control channel resources including at least one set corresponding to multiple of the
6 plurality of SPS configurations;
7 receiving a first downlink signal according to a first SPS configuration of the
8 plurality of SPS configurations and a second downlink signal according to a second SPS
9 configuration of the plurality of SPS configurations, wherein acknowledgment information
10 for the first downlink signal and the second downlink signal are scheduled to be transmitted
11 during a slot;
12 selecting, based at least in part on a number of acknowledgment information
13 bits for the first downlink signal and the second downlink signal, a set of control channel
14 resources of the plurality of sets of control channel resources identified by the received
15 configuration; and
16 transmitting the acknowledgment information bits to the base station using the
17 selected set of control channel resources.
- 1 2. The method of claim 1, further comprising:
2 receiving, from the base station, the plurality of SPS configurations, including
3 the first SPS configuration and the second SPS configuration.
- 1 3. The method of claim 1, wherein selecting the set of control channel
2 resources comprises:
3 comparing the number of acknowledgment information bits to a threshold
4 number of bits; and
5 selecting the set of control channel resources from among the plurality of sets
6 of control channel resources based at least in part on the comparing.
- 1 4. The method of claim 3, wherein transmitting the acknowledgment
2 information bits comprises:

3 identifying a control channel format to use to transmit the acknowledgment
4 information bits; and
5 transmitting the acknowledgment information bits to the base station
6 according to the identified control channel format using the selected set of control channel
7 resources.

1 5. The method of claim 3, wherein the received configuration further
2 identifies the threshold number of bits.

1 6. The method of claim 3, wherein the threshold number of bits
2 comprises two bits.

1 7. The method of claim 1, further comprising:
2 receiving, in the slot, a third downlink signal scheduled according to a
3 dynamic configuration.

1 8. The method of claim 7, further comprising:
2 receiving the first SPS configuration and the second SPS configuration in
3 radio resource control signaling; and
4 receiving the dynamic configuration in downlink control information.

1 9. The method of claim 7, further comprising:
2 identifying a type of codebook configured for the UE, the type of codebook
3 being one of a semi-static codebook or a dynamic codebook, wherein the number of
4 acknowledgment bits are determined based at least in part on the identified type of codebook.

1 10. The method of claim 7, further comprising:
2 receiving one or more dynamically scheduled downlink signals according to
3 the dynamic configuration, wherein the dynamically scheduled downlink signals comprise an
4 indication of corresponding acknowledgment messages to be transmitted for the dynamically
5 scheduled downlink signals;
6 combining the acknowledgment information bits for the first downlink signal
7 and the second downlink signal with the acknowledgment messages to be transmitted for the
8 dynamically scheduled downlink signals; and

9 transmitting, to the base station, the combined acknowledgment information
10 bits with the acknowledgment messages to be transmitted for the dynamically scheduled
11 downlink signals based at least in part on an acknowledgment codebook.

1 11. The method of claim 10, wherein the acknowledgment codebook
2 comprises a semi-static codebook based at least in part on a first occasion that the first
3 downlink signal is received and a second occasion that the second downlink signal is
4 received, and wherein the acknowledgment information bits for the first downlink signal and
5 the second downlink signal are combined with the acknowledgment messages to be
6 transmitted for the dynamically scheduled downlink signals based at least in part on the semi-
7 static codebook.

1 12. The method of claim 10, wherein the acknowledgment codebook
2 comprises a dynamic codebook, and wherein the acknowledgment information bits for the
3 first downlink signal and the second downlink signal are appended to the acknowledgment
4 messages to be transmitted for the dynamically scheduled downlink signals based at least in
5 part on the dynamic codebook.

1 13. The method of claim 1, wherein the plurality of SPS configurations are
2 configured on a plurality of component carriers.

1 14. The method of claim 1, wherein multiple of the plurality of SPS
2 configurations are active for the UE during a same time.

1 15. The method of claim 1, wherein the configuration identifying the at
2 least one set of control channel resources corresponding to the multiple of the plurality of
3 SPS configurations is received in a physical uplink control channel configuration.

1 16. The method of claim 1, further comprising:
2 receiving an activation message for starting communications according to the
3 first SPS configuration, wherein the first downlink signal is received based at least in part on
4 the activation message;
5 identifying an uplink resource indicator in the activation message, the uplink
6 resource indicator comprising an indication of an uplink resource for transmitting the
7 acknowledgment information bits to the base station;

8 transmitting a first set of the acknowledgment information bits to the base
9 station based at least in part on the uplink resource indicator; and
10 transmitting subsequent sets of the acknowledgment information bits after the
11 first set of acknowledgment information bits based at least in part on the selected set of
12 control channel resources.

1 17. The method of claim 1, further comprising:
2 receiving a deactivation message for ending communications according to the
3 first SPS configuration;
4 determining an uplink resource for transmitting an acknowledgment message
5 based at least in part on receiving the deactivation message; and
6 transmitting the acknowledgment message using the determined uplink
7 resource.

1 18. The method of claim 17, further comprising:
2 combining the acknowledgment message with one or more additional
3 acknowledgment messages from additional SPS configurations, dynamic downlink messages,
4 or a combination thereof; and
5 transmitting, to the base station, the combined acknowledgment messages
6 based at least in part on an acknowledgment codebook.

1 19. The method of claim 17, wherein the determined uplink resource
2 comprises an indicated uplink resource via an uplink resource indicator included in the
3 deactivation message.

1 20. A method for wireless communication at a user equipment (UE),
2 comprising:
3 receiving a plurality of semi-persistent scheduling (SPS) configurations;
4 receiving a first downlink signal according to a first SPS configuration of the
5 plurality of SPS configurations and a second downlink signal according to a second SPS
6 configuration of the plurality of SPS configurations, wherein acknowledgment information
7 for the first downlink signal and the second downlink signal are scheduled to be transmitted
8 during a slot;

9 determining an order of a plurality of downlink signals received according to
10 the plurality of SPS configurations, the plurality of downlink signals comprising at least the
11 first downlink signal and the second downlink signal;
12 generating, for transmitting acknowledgment information bits to the base
13 station, an acknowledgment codebook based at least in part on the determined order of the
14 plurality of downlink signals; and
15 transmitting the acknowledgment information bits to the base station using the
16 generated acknowledgment codebook.

1 21. The method of claim 20, wherein the determined order of the plurality
2 of downlink signals comprises a time-first, component carrier-second order.

1 22. The method of claim 20, wherein the order of the plurality of downlink
2 signals is determined based at least in part on a corresponding index of each of the plurality
3 of SPS configurations and a component carrier index, and wherein each of the plurality of
4 SPS configurations are configured within a same component carrier associated with the
5 component carrier index.

1 23. The method of claim 20, further comprising:
2 generating a semi-static acknowledgment codebook comprising the
3 acknowledgment information bits and default values for transmission occasions where no
4 downlink signal is received; and
5 extracting the acknowledgment information bits from the semi-static
6 acknowledgment codebook to generate a dynamic acknowledgment codebook, wherein an
7 order of the acknowledgment information bits is the same for the semi-static
8 acknowledgment codebook and the dynamic acknowledgment codebook.

1 24. A method for wireless communication at a base station, comprising:
2 transmitting a configuration identifying a plurality of sets of control channel
3 resources for a plurality of semi-persistent scheduling (SPS) configurations of a user
4 equipment (UE), the plurality of sets of control channel resources including at least one set
5 corresponding to multiple of the plurality of SPS configurations;
6 transmitting a first downlink signal according to a first SPS configuration of
7 the plurality of SPS configurations and a second downlink signal according to a second SP

8 configuration of the plurality of SPS configurations, wherein acknowledgment information
9 for the first downlink signal and the second downlink signal are scheduled to be transmitted
10 during a slot;

11 selecting, based at least in part on a number of acknowledgment information
12 bits for the first downlink signal and the second downlink signal, a set of control channel
13 resources of the plurality of sets of control channel resources identified by the transmitted
14 configuration; and

15 receiving the acknowledgment information bits from the UE using the selected
16 set of control channel resources.

1 25. The method of claim 24, further comprising:
2 transmitting, to the UE, the plurality of SPS configurations, including the first
3 SPS configuration and the second SPS configuration.

1 26. The method of claim 24, wherein selecting the set of control channel
2 resources comprises:
3 comparing the determined number of acknowledgment information bits to a
4 threshold number of bits; and
5 selecting the set of control channel resources from among the plurality of sets
6 of control channel resources based at least in part on the comparing.

1 27. The method of claim 26, wherein receiving the acknowledgment
2 information bits comprises:
3 identifying a control channel format to use to receive the acknowledgment
4 information bits; and
5 receiving the acknowledgment information bits from the UE according to the
6 identified control channel format using the selected set of control channel resources.

1 28. The method of claim 26, wherein the transmitted configuration further
2 identifies the threshold number of bits, and wherein the threshold number of bits comprises
3 two bits.

1 29. The method of claim 26, wherein the acknowledgment information bits
2 are received based at least in part on a dynamic acknowledgment codebook comprising the
3 acknowledgment information bits in an order that is based at least in part on when each of a

4 plurality of downlink signals are transmitted for each of the plurality of SPS configurations, a
5 component carrier that each of the plurality of downlink signals are transmitted on, a slot in
6 which each of the plurality of downlink signals are transmitted, a semi-static
7 acknowledgment codebook, or a combination thereof.

1 30. An apparatus for wireless communication at a user equipment (UE),
2 comprising:

3 means for receiving a configuration identifying a plurality of sets of control
4 channel resources for a plurality of semi-persistent scheduling (SPS) configurations, the
5 plurality of sets of control channel resources including at least one set corresponding to
6 multiple of the plurality of SPS configurations;

7 means for receiving a first downlink signal according to a first SPS
8 configuration of the plurality of SPS configurations and a second downlink signal according
9 to a second SPS configuration of the plurality of SPS configurations, wherein
10 acknowledgment information for the first downlink signal and the second downlink signal are
11 scheduled to be transmitted during a slot;

12 means for selecting, based at least in part on a number of acknowledgment
13 information bits for the first downlink signal and the second downlink signal, a set of control
14 channel resources of the plurality of sets of control channel resources identified by the
15 received configuration; and

16 means for transmitting the acknowledgment information bits to the base
17 station using the selected set of control channel resources.