

CLAIMS

WHAT IS CLAIMED IS:

1. A method of wireless communication for a user equipment (UE), comprising:
receiving one or more downlink transmissions from a base station;
determining to transmit an uplink transmission to the base station; and
transmitting, to the base station, a scheduling request for the uplink transmission with an acknowledgement (ACK) / negative ACK (NACK) associated with the one or more downlink transmissions using a narrowband physical uplink shared channel (NPUSCH) format resource structure.
2. The method of claim 1, wherein the UE is configured to transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions based on first signaling received from the base station.
3. The method of claim 2, wherein the first signaling is included in a media access control (MAC) command or a radio resource control (RRC) reconfiguration signaling.
4. The method of claim 2, wherein the UE transmits the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions after the first signaling is received and a counter at the UE reaches a threshold number.
5. The method of claim 4, wherein the threshold number is determined based on information included in the first signaling or based on preconfigured information at the UE.
6. The method of claim 1, wherein the UE is configured to not transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions based on second signaling received from the base station.

7. The method of claim 6, wherein the UE determines to not transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions when a timer at the UE expires.
8. The method of claim 1, wherein the UE is configured to increase a first number of repeated transmissions of the scheduling request based on third signaling received from the base station.
9. The method of claim 8, wherein the transmitting the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions using the NPUSCH format resource structure comprises:
 - transmitting the scheduling request with the ACK / NACK a second number of transmissions, the second number of transmissions being associated with a number of repetitions for the NPUSCH format resource structure; and
 - transmitting the scheduling request using allocated resources without the ACK / NACK a third number of transmissions, the third number of transmissions being a difference between the first number of repeated transmissions and the second number of transmissions associated with the NPUSCH format resource structure.
10. The method of claim 1, further comprising:
 - performing quadrature phase-shift keying (QPSK) mapping of a first bit value associated with the scheduling request and a second bit value associated with the ACK / NACK; and
 - performing at least one of channel coding or data scrambling of the scheduling request and the ACK / NACK after the QPSK mapping.
11. The method of claim 10, further comprising:
 - performing binary phase-shift keying (BPSK) mapping of the second bit value associated with the ACK / NACK;
 - determining if the scheduling request is transmitted with the ACK / NACK; and
 - shifting the BPSK mapping of the second bit value associated with the ACK / NACK by 90° or another angle predetermined or configured by the network.

12. An apparatus for wireless communication for a user equipment (UE), comprising:
means for receiving one or more downlink transmissions from a base station;
means for determining to transmit an uplink transmission to the base station; and
means for transmitting, to the base station, a scheduling request for the uplink transmission with an acknowledgement (ACK) / negative ACK (NACK) associated with the one or more downlink transmissions using a narrowband physical uplink shared channel (NPUSCH) format resource structure.
13. The means for of claim 12, wherein the UE is configured to transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions based on first signaling received from the base station.
14. The apparatus of claim 13, wherein the first signaling is included in a media access control (MAC) command or a radio resource control (RRC) reconfiguration signaling.
15. The apparatus of claim 13, wherein the UE transmits the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions after the first signaling is received and a counter at the UE reaches a threshold number.
16. The apparatus of claim 15, wherein the threshold number is determined based on information included in the first signaling or based on preconfigured information at the UE.
17. The apparatus of claim 12, wherein the UE is configured to not transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions based on second signaling received from the base station.
18. The apparatus of claim 17, wherein the UE determines to not transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions when a timer at the UE expires.

19. The apparatus of claim 12, wherein the UE is configured to increase a first number of repeated transmissions of the scheduling request based on third signaling received from the base station.

20. The apparatus of claim 19, wherein the means for transmitting the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions using the NPUSCH format resource structure is configured to:

transmit the scheduling request with the ACK / NACK a second number of transmissions, the second number of transmissions being associated with a number of repetitions for the NPUSCH format resource structure; and

transmit the scheduling request using allocated resources without the ACK / NACK a third number of transmissions, the third number of transmissions being a difference between the first number of repeated transmissions and the second number of transmissions associated with the NPUSCH format resource structure.

21. The apparatus of claim 12, further comprising:

means for performing quadrature phase-shift keying (QPSK) mapping of a first bit value associated with the scheduling request and a second bit value associated with the ACK / NACK; and

means for performing at least one of channel coding or data scrambling of the scheduling request and the ACK / NACK after the QPSK mapping.

22. The apparatus of claim 21, further comprising:

means for performing binary phase-shift keying (BPSK) mapping of the second bit value associated with the ACK / NACK;

means for determining if the scheduling request is transmitted with the ACK / NACK; and

means for shifting the BPSK mapping of the second bit value associated with the ACK / NACK by 90° or another angle predetermined or configured by the network.

23. An apparatus for wireless communication for a user equipment (UE), comprising:
a memory; and

at least one processor coupled to the memory and configured to:

receive one or more downlink transmissions from a base station;
determine to transmit an uplink transmission to the base station; and
transmit, to the base station, a scheduling request for the uplink transmission with an acknowledgement (ACK) / negative ACK (NACK) associated with the one or more downlink transmissions using a narrowband physical uplink shared channel (NPUSCH) format resource structure.

24. The apparatus of claim 23, wherein the UE is configured to transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions based on first signaling received from the base station.

25. The apparatus of claim 24, wherein the first signaling is included in a media access control (MAC) command or a radio resource control (RRC) reconfiguration signaling.

26. The apparatus of claim 24, wherein the UE transmits the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions after the first signaling is received and a counter at the UE reaches a threshold number.

27. The apparatus of claim 26, wherein the threshold number is determined based on information included in the first signaling or based on preconfigured information at the UE.

28. The apparatus of claim 23, wherein the UE is configured to not transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions based on second signaling received from the base station.

29. The apparatus of claim 28, wherein the UE determines to not transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions when a timer at the UE expires.

30. The apparatus of claim 23, wherein the UE is configured to increase a first number of repeated transmissions of the scheduling request based on third signaling received from the base station.

31. The apparatus of claim 30, wherein the at least one processor is configured to transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions using the NPUSCH format resource structure by:

transmitting the scheduling request with the ACK / NACK a second number of transmissions, the second number of transmissions being associated with a number of repetitions for the NPUSCH format resource structure; and

transmitting the scheduling request using allocated resources without the ACK / NACK a third number of transmissions, the third number of transmissions being a difference between the first number of repeated transmissions and the second number of transmissions associated with the NPUSCH format resource structure.

32. The apparatus of claim 23, wherein the at least one processor is further configured to:

perform quadrature phase-shift keying (QPSK) mapping of a first bit value associated with the scheduling request and a second bit value associated with the ACK / NACK; and

perform at least one of channel coding or data scrambling of the scheduling request and the ACK / NACK after the QPSK mapping.

33. The apparatus of claim 32, wherein the at least one processor is further configured to:

perform binary phase-shift keying (BPSK) mapping of the second bit value associated with the ACK / NACK;

determine if the scheduling request is transmitted with the ACK / NACK; and

shift the BPSK mapping of the second bit value associated with the ACK / NACK by 90° or another angle predetermined or configured by the network.

34. A computer-readable medium storing computer executable code for a user equipment (UE), comprising code to:

receive one or more downlink transmissions from a base station;
determine to transmit an uplink transmission to the base station; and
transmit, to the base station, a scheduling request for the uplink transmission with an acknowledgement (ACK) / negative ACK (NACK) associated with the one or more downlink transmissions using a narrowband physical uplink shared channel (NPUSCH) format resource structure.

35. The computer-readable medium of claim 34, wherein the UE is configured to transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions based on first signaling received from the base station.

36. The computer-readable medium of claim 35, wherein the first signaling is included in a media access control (MAC) command or a radio resource control (RRC) reconfiguration signaling.

37. The computer-readable medium of claim 35, wherein the UE transmits the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions after the first signaling is received and a counter at the UE reaches a threshold number.

38. The computer-readable medium of claim 37, wherein the threshold number is determined based on information included in the first signaling or based on preconfigured information at the UE.

39. The computer-readable medium of claim 34, wherein the UE is configured to not transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions based on second signaling received from the base station.

40. The computer-readable medium of claim 39, wherein the UE determines to not transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions when a timer at the UE expires.

41. The computer-readable medium of claim 34, wherein the UE is configured to increase a first number of repeated transmissions of the scheduling request based on third signaling received from the base station.

42. The computer-readable medium of claim 41, wherein the code to transmit the scheduling request for the uplink transmission with the ACK / NACK associated with the one or more downlink transmissions using the NPUSCH format resource structure is configured to:

transmit the scheduling request with the ACK / NACK a second number of transmissions, the second number of transmissions being associated with a number of repetitions for the NPUSCH format resource structure; and

transmit the scheduling request using allocated resources without the ACK / NACK a third number of transmissions, the third number of transmissions being a difference between the first number of repeated transmissions and the second number of transmissions associated with the NPUSCH format resource structure.

43. The computer-readable medium of claim 34, further comprising code to:

perform quadrature phase-shift keying (QPSK) mapping of a first bit value associated with the scheduling request and a second bit value associated with the ACK / NACK; and

perform at least one of channel coding or data scrambling of the scheduling request and the ACK / NACK after the QPSK mapping.

44. The computer-readable medium of claim 43, further comprising code to:

perform binary phase-shift keying (BPSK) mapping of the second bit value associated with the ACK / NACK;

determine if the scheduling request is transmitted with the ACK / NACK; and

shift the BPSK mapping of the second bit value associated with the ACK / NACK by 90° or another angle predetermined or configured by the network.