CLAIMS

1. A method for wireless communication at a user equipment (UE), comprising:

transmitting a first message of a two-step random access procedure to a base station, the first message comprising a preamble sequence and a data payload, a last symbol of the preamble sequence and a first symbol of the data payload separated by at least a tuning gap, wherein a configuration for the tuning gap is based at least in part on a first subcarrier spacing of resources used to transmit the preamble sequence or a second subcarrier spacing of resources used to transmit the data payload;

monitoring for a second message of the two-step random access procedure from the base station; and

transmitting a third message of a four-step random access procedure to the base station if the UE determines based at least in part on the monitoring that the base station has not successfully received at least a portion of the first message.

2. The method of claim 1, further comprising:

receiving, based at least in part on the monitoring, the second message of the two-step random access procedure from the base station, the second message comprising at least one of a negative acknowledgement of the data payload, a fallback command, an uplink grant for the third message of the four-step random access procedure, or a combination thereof; and

wherein the transmitting the third message of the four-step random access procedure comprises transmitting a physical uplink shared channel transmission comprising a retransmission of at least a portion of the data payload in response to receiving the second message of the two-step random access procedure from the base station.

3. The method of claim 1, further comprising:

receiving a fallback command indicating that the UE is to terminate or suspend the two-step random access procedure; and

wherein the transmitting the third message of the four-step random access procedure comprises transmitting the third message based at least in part on the fallback command.

4. The method of claim 3, wherein the fallback command is received via one or more of downlink control information, group-common downlink control information, one or more medium access control (MAC) control elements, or a combination thereof.

5. The method of claim 3, further comprising:

identifying, from a set of fallback indicators in the fallback command, a fallback indicator of whether the UE is to terminate or suspend the two-step random access procedure based at least in part on a type of the data payload.

6. The method of claim 3, wherein the fallback command indicates a number of retransmissions of the first message of the two-step random access procedure prior to terminating or suspending the two-step random access procedure.

7. The method of claim 3, wherein the fallback command indicates a set of non-contention resources and a transmission scheme for the transmitting the third message of the four-step random access procedure.

8. The method of claim 1, further comprising:

starting a fallback timer upon transmitting the first message of the two-step random access procedure;

wherein the monitoring comprises monitoring for the second message of the two-step random access procedure based at least in part on the fallback timer; and

wherein the transmitting the third message of the four-step random access procedure comprises transmitting the third message if the UE determines that the base station has not successfully received the at least the portion of the first message before an expiration of the fallback timer.

9. The method of claim 8, further comprising:

receiving signaling indicating at least a duration of the fallback timer, wherein the signaling is system information, one or more radio resource control messages, or both.

10. The method of claim 9, wherein the duration of the fallback timer is based at least in part on an associated quality of service, a traffic load, a radio resource

control configuration state, a size of the data payload of the first message, or a combination thereof.

11. The method of claim 1, wherein:

the transmitting the first message comprises transmitting one or more repetitions of the first message of the two-step random access procedure; and

the transmitting the third message of the four-step random access procedure comprises transmitting the third message if the UE determines that the base station has not successfully received the at least the portion of the one or more of the repetitions of the first message.

12. The method of claim 11, further comprising:

starting a fallback timer for the UE to monitor for the second message of the two-step random access procedure;

wherein the monitoring comprises monitoring for the second message of the two-step random access procedure for a duration of the fallback timer; and

wherein the transmitting the third message of the four-step random access procedure comprises transmitting the third message if the UE determines that the base station has not successfully received the at least the portion of the one or more repetitions of the first message before an expiration of the fallback timer.

13. The method of claim 12, wherein the starting the fallback timer comprises:

starting the fallback timer upon transmitting a last repetition of the one or more repetitions of the first message.

14. The method of claim 12, wherein the starting the fallback timer comprises:

starting the fallback timer upon transmitting a first repetition of the one or more repetitions of the first message.

15. The method of claim 11, wherein at least one of the repetitions of the first message of the two-step random access procedure is transmitted with a different transmit

power, from at least one other of the repetitions of the first message of the two-step random access procedure.

16. The method of claim 11, further comprising:

receiving signaling indicating a repetition configuration for the repetitions of the first message of the two-step random access procedure, the repetition configuration indicating a repetition periodicity for periodic repetitions, a repetition pattern for aperiodic repetitions, a resource assignment for one or more of the repetitions, or a combination thereof.

17. The method of claim 11, wherein the monitoring comprises:

monitoring for the second message of the two-step random access procedure after transmitting each of the repetitions of the first message of the two-step random access procedure.

18. The method of claim 11, wherein the transmitting the one or more repetitions of the first message of the two-step random access procedure comprises:

transmitting incremental redundancy information associated with the data payload.

19. The method of claim 18, further comprising:

receiving signaling indicating a hybrid automatic repeat request (HARQ) configuration for the repetitions of the first message of the two-step random access procedure, the HARQ configuration indicating a modulation and coding scheme for the repetitions, preamble sequences for one or more of the repetitions, a transmit power for one or more of the repetitions, a resource assignment for one or more of the repetitions, or a combination thereof.

20. The method of claim 11, further comprising:

updating a counter upon transmitting each of the one or more repetitions of the first message of the two-step random access procedure; and

wherein the transmitting the third message of the four-step random access procedure comprises transmitting the third message if the UE determines that it did not

successfully receive the second message of the two-step random access procedure before the counter satisfies a threshold.

21. The method of claim 11, wherein the transmitting the third message of the four-step random access procedure comprises:

transmitting the third message if the UE determines that it did not successfully receive the second message of the two-step random access procedure after retransmitting the first message of the two-step random access procedure using a maximum transmit power, using a maximum number of different preamble sequences, or a combination thereof.

22. The method of claim 1, further comprising:

determining whether to transmit the first message of the two-step random access procedure based at least in part on a signal quality measurement, a signal quality target, an offset value associated with UE overloading, a radio resource control state of the UE, a size of the data payload to be transmitted in the first message, a modulation and coding scheme associated with the first message, an estimated transmit power for a retransmission of the first message, or any combination thereof.

23. The method of claim 1, further comprising:

identifying a plurality of occasions associated with the two-step random access procedure; and

selecting one or more occasions of the plurality of occasions for transmitting the first message of the two-step random access procedure based at least in part on a size of the data payload and respective sizes of each of the plurality of occasions.

24. The method of claim 1, wherein the first message of the two-step random access procedure comprises a preamble, a physical uplink shared channel (PUSCH) comprising the data payload, and a demodulation reference signal (DMRS) associated with the PUSCH.

25. The method of claim 24, further comprising:

performing a first listen-before-talk (LBT) procedure prior to transmitting the preamble of the two-step random access procedure; and

performing a second LBT procedure prior to transmitting the PUSCH and DMRS of the two-step random access procedure.

26. The method of claim 24, wherein the preamble is transmitted via a first set of frequency resources and the PUSCH and DMRS are transmitted via a second, different set of frequency resources.

27. The method of claim 24, wherein the preamble is transmitted via a first beam and the PUSCH and DMRS are transmitted via a second, different beam.

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

means for transmitting a first message of a two-step random access procedure to a base station, the first message comprising a preamble sequence and a data payload, a last symbol of the preamble sequence and a first symbol of the data payload separated by at least a tuning gap, wherein a configuration for the tuning gap is based at least in part on a first subcarrier spacing of resources used to transmit the preamble sequence or a second subcarrier spacing of resources used to transmit the data payload;

means for monitoring for a second message of the two-step random access procedure from the base station; and

means for transmitting a third message of a four-step random access procedure to the base station if the UE determines based at least in part on the monitoring that the base station has not successfully received at least a portion of the first message.

29. The apparatus of claim 28, further comprising:

means for receiving, based at least in part on the monitoring, the second message of the two-step random access procedure from the base station, the second message comprising at least one of a negative acknowledgement of the data payload, a fallback command, an uplink grant for the third message of the four-step random access procedure, or a combination thereof; and

wherein the means for transmitting the third message of the four-step random access procedure transmits a physical uplink shared channel transmission comprising a retransmission of at least a portion of the data payload in response to receiving the second message of the two-step random access procedure from the base station.

30. The apparatus of claim 28, further comprising:

means for receiving a fallback command indicating that the UE is to terminate or suspend the two-step random access procedure,

wherein the means for transmitting the third message of the four-step random access procedure transmits the third message based at least in part on the fallback command.

31. The apparatus of claim 30, wherein the fallback command is received via one or more of downlink control information, group-common downlink control information, one or more medium access control (MAC) control elements, or a combination thereof.

32. The apparatus of claim 30, further comprising:

means for identifying, from a set of fallback indicators in the fallback command, a fallback indicator of whether the UE is to terminate or suspend the two-step random access procedure based at least in part on a type of the data payload.

33. The apparatus of claim 30, wherein the fallback command indicates a number of retransmissions of the first message of the two-step random access procedure prior to terminating or suspending the two-step random access procedure.

34. The apparatus of claim 30, wherein the fallback command indicates a set of non-contention resources and a transmission scheme for the transmitting the third message of the four-step random access procedure.

35. The apparatus of claim 28, further comprising:

means for starting a fallback timer upon transmitting the first message of the two-step random access procedure,

wherein the means for monitoring monitors for the second message of the two-step random access procedure based at least in part on the fallback timer, and

wherein the means for transmitting the third message of the four-step random access procedure transmits the third message if the UE determines that the base station has not successfully received the at least the portion of the first message before an expiration of the fallback timer.

36. The apparatus of claim 35, further comprising:

means for receiving signaling indicating at least a duration of the fallback timer, wherein the signaling is system information, one or more radio resource control messages, or both.

37. The apparatus of claim 36, wherein the duration of the fallback timer is based at least in part on an associated quality of service, a traffic load, a radio resource control configuration state, a size of the data payload of the first message, or a combination thereof.

38. The apparatus of claim 28, wherein:

the means for transmitting the first message transmits one or more repetitions of the first message of the two-step random access procedure; and

the means for transmitting the third message of the four-step random access procedure transmits the third message if the UE determines that the base station has not successfully received the at least the portion of the one or more of the repetitions of the first message.

39. The apparatus of claim 38, further comprising:

means for starting a fallback timer for the UE to monitor for the second message of the two-step random access procedure,

wherein the means for monitoring monitors for the second message of the two-step random access procedure for a duration of the fallback timer, and

wherein the means for transmitting the third message of the four-step random access procedure transmits the third message if the UE determines that the base station has not successfully received the at least the portion of the one or more repetitions of the first message before an expiration of the fallback timer.

40. The apparatus of claim 39, wherein the means for starting the fallback timer starts the fallback timer upon transmitting a last repetition of the one or more repetitions of the first message.

41. The apparatus of claim 39, wherein means for starting the fallback timer starts the fallback timer upon transmitting a first repetition of the one or more repetitions of the first message.

42. The apparatus of claim 38, wherein at least one of the repetitions of the first message of the two-step random access procedure is transmitted with a different transmit power, from at least one other of the repetitions of the first message of the two-step random access procedure.

43. The apparatus of claim 38, further comprising:

means for receiving signaling indicating a repetition configuration for the repetitions of the first message of the two-step random access procedure, the repetition configuration indicating a repetition periodicity for periodic repetitions, a repetition pattern for aperiodic repetitions, a resource assignment for one or more of the repetitions, or a combination thereof.

44. The apparatus of claim 38, wherein the means for monitoring monitors for the second message of the two-step random access procedure after transmitting each of the repetitions of the first message of the two-step random access procedure.

45. The apparatus of claim 38, wherein means for transmitting the one or more repetitions of the first message transmits incremental redundancy information associated with the data payload.

46. The apparatus of claim 45, further comprising:

means for receiving signaling indicating a hybrid automatic repeat request (HARQ) configuration for the repetitions of the first message of the two-step random access procedure, the HARQ configuration indicating a modulation and coding scheme for the repetitions, preamble sequences for one or more of the repetitions, a transmit power for one or more of the repetitions, a resource assignment for one or more of the repetitions, or a combination thereof.

47. The apparatus of claim 38, further comprising:

means for updating a counter upon transmitting each of the one or more repetitions of the first message of the two-step random access procedure,

wherein the means for transmitting the third message of the four-step random access procedure transmits the third message if the UE determines that it did not successfully receive the second message of the two-step random access procedure before the counter satisfies a threshold.

48. The apparatus of claim 38, wherein means for transmitting the third message of the four-step random access procedure transmits the third message if the UE determines that it did not successfully receive the second message of the two-step random access procedure after retransmitting the first message of the two-step random access procedure using a maximum transmit power, using a maximum number of different preamble sequences, or a combination thereof.

49. The apparatus of claim 28, further comprising:

means for determining whether to transmit the first message of the two-step random access procedure based at least in part on a signal quality measurement, a signal quality target, an offset value associated with UE overloading, a radio resource control state of the UE, a size of the data payload to be transmitted in the first message, a modulation and coding scheme associated with the first message, an estimated transmit power for a retransmission of the first message, or any combination thereof.

50. The apparatus of claim 28, further comprising:

means for identifying a plurality of occasions associated with the two-step random access procedure; and

means for selecting one or more occasions of the plurality of occasions for transmitting the first message of the two-step random access procedure based at least in part on a size of the data payload and respective sizes of each of the plurality of occasions.

51. The apparatus of claim 28, wherein the first message of the two-step random access procedure comprises a preamble, a physical uplink shared channel (PUSCH) comprising the data payload, and a demodulation reference signal (DMRS) associated with the PUSCH.

52. The apparatus of claim 51, further comprising:

means for performing a first listen-before-talk (LBT) procedure prior to transmitting the preamble of the two-step random access procedure; and

means for performing a second LBT procedure prior to transmitting the PUSCH and DMRS of the two-step random access procedure.

53. The apparatus of claim 51, wherein the preamble is transmitted via a first set of frequency resources and the PUSCH and DMRS are transmitted via a second, different set of frequency resources.

54. The apparatus of claim 51, wherein the preamble is transmitted via a first beam and the PUSCH and DMRS are transmitted via a second, different beam.

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

a processor,

memory in electronic communication with the processor; and

instructions stored in the memory and executable by the processor to cause the apparatus to:

transmit a first message of a two-step random access procedure to a base station, the first message comprising a preamble sequence and a data payload, a last symbol of the preamble sequence and a first symbol of the data payload separated by at least a tuning gap, wherein a configuration for the tuning gap is based at least in part on a first subcarrier spacing of resources used to transmit the preamble sequence or a second subcarrier spacing of resources used to transmit the data payload;

monitor for a second message of the two-step random access procedure from the base station; and

transmit a third message of a four-step random access procedure to the base station if the UE determines based at least in part on the monitoring that the base station has not successfully received at least a portion of the first message.

56. A non-transitory computer-readable medium storing code for wireless communication at a user equipment (UE), the code comprising instructions executable by a processor to:

transmit a first message of a two-step random access procedure to a base station, the first message comprising a preamble sequence and a data payload, a last symbol of the preamble sequence and a first symbol of the data payload separated by at least a tuning gap, wherein a configuration for the tuning gap is based at least in part on a first subcarrier spacing of resources used to transmit the preamble sequence or a second subcarrier spacing of resources used to transmit the data payload;

monitor for a second message of the two-step random access procedure from the base station; and

transmit a third message of a four-step random access procedure to the base station if the UE determines based at least in part on the monitoring that the base station has not successfully received at least a portion of the first message.