CLAIMS

1. A method of wireless communication at a User Equipment (UE), comprising:

receiving, from a base station, random access configuration information for the base station;

determining a first time duration for a preamble of a first random access message based on the random access configuration information received from the base station and a reference subcarrier spacing (SCS) associated with an uplink bandwidth part (BWP) configured for the first random access message;

determining a second time duration for a payload of the first random access message based on the random access configuration information received from the base station and the reference SCS;

determining a gap time duration for a transmission gap between the preamble and the payload based on the random access configuration information received from the base station and the reference SCS; and

transmitting the first random access message to the base station to initiate a random access procedure.

2. The method of claim 1, further comprising:

determining a third time duration for a guard time between the preamble and the payload of the first random access message, wherein the third time duration of the guard time is determined based on the random access configuration information received from the base station and the reference SCS.

3. The method of claim 2, wherein at least one of the preamble or the payload comprise the guard time.

4. The method of claim 1, further comprising:

determining a bandwidth of a guard band and a duration of a guard period for the first random access message based on the random access configuration information received from the base station and the reference SCS.

5. The method of claim 4, wherein at least one of the preamble or the payload are transmitted using the guard band.

6. The method of claim 1, further comprising:

determining a common reference slot index for the first random access message based on the reference SCS associated with an active uplink BWP configured for the first random access message; or

determining a common reference physical resource block (PRB) for the first random access message based on the reference SCS.

7. The method of claim 6, wherein a time domain mapping of the first random access message is based on the common reference slot index.

8. The method of claim 6, wherein a frequency domain mapping of the first random access message is based on the common reference PRB.

9. The method of claim 6, wherein transmission of the first random access message is based on at least one of the common reference slot index or the common reference PRB.

10. The method of claim 6, further comprising:

receiving, from the base station, a second random access response message in response to the first random access message, wherein a time domain mapping of the second random access response message is based on the common reference slot index or a frequency domain mapping of the second random access response message is based on the common reference PRB.

11. The method of claim 1, further comprising:

determining at least one physical uplink shared channel (PUSCH) resource unit for the payload, the PUSCH resource unit (PRU) being associated with a demodulated reference signal (DMRS) antenna port and a DMRS scrambling identifier (ID),

wherein the DMRS scrambling ID is based at least on a preamble sequence index of the preamble.

12. The method of claim 11, wherein the at least one PRU comprises a code domain index, the code domain index based at least on the DMRS antenna port, the DMRS scrambling ID, or the preamble sequence index.

13. The method of claim 1, further comprising:

receiving, from the base station, a second random access response message in response to the first random access message, wherein the second random access response message comprises at least one of a timing advance indication or an uplink grant indication.

14. The method of claim 13, wherein the at least one of the timing advance indication or the uplink grant indication is based on the reference SCS.

15. The method of claim 13, wherein the at least one of the timing advance indication or the uplink grant indication is based on an actual SCS used in transmission of the payload comprised in the first random access message.

16. The method of claim 13, wherein the at least one of the timing advance indication or the uplink grant indication is based on a network configuration for an initial uplink BWP.

17. The method of claim 13, wherein the at least one of the timing advance indication or the uplink grant indication is based on an active uplink BWP.

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

means for receiving, from a base station, random access configuration information for the base station;

means for determining a first time duration for a preamble of a first random access message based on the random access configuration information received from the base station

and a reference subcarrier spacing (SCS) associated with an uplink bandwidth part (BWP) configured for the first random access message;

means for determining a second time duration for a payload of the first random access message based on the random access configuration information received from the base station and the reference SCS;

means for determining a gap time duration for a transmission gap between the preamble and the payload based on the random access configuration information received from the base station and the reference SCS; and

means for transmitting the first random access message to the base station to initiate a random access procedure.

19. The apparatus of claim 18, further comprising:

means for determining a third time duration for a guard time between the preamble and the payload of the first random access message, wherein the third time duration of the guard time is determined based on the random access configuration information received from the base station and the reference SCS.

20. The apparatus of claim 19, wherein at least one of the preamble or the payload comprise the guard time.

21. The apparatus of claim 18, further comprising:

means for determining a bandwidth of a guard band and a duration of a guard period for the first random access message based on the random access configuration information received from the base station and the reference SCS.

22. The apparatus of claim 21, wherein at least one of the preamble or the payload are transmitted using the guard band.

23. The apparatus of claim 18, further comprising:

means for determining a common reference slot index for the first random access message based on the reference SCS associated with an active uplink BWP configured for the first random access message; or

means for determining a common reference physical resource block (PRB) for the first random access message based on the reference SCS.

24. The apparatus of claim 23, wherein a time domain mapping of the first random access message is based on the common reference slot index.

25. The apparatus of claim 23, wherein a frequency domain mapping of the first random access message is based on the common reference PRB.

26. The apparatus of claim 23, wherein transmission of the first random access message is based on at least one of the common reference slot index or the common reference PRB.

27. The apparatus of claim 23, further comprising:

means for receiving, from the base station, a second random access response message in response to the first random access message, wherein a time domain mapping of the second random access response message is based on the common reference slot index or a frequency domain mapping of the second random access response message is based on the common reference PRB.

28. The apparatus of claim 18, further comprising:

means for determining at least one physical uplink shared channel (PUSCH) resource unit for the payload, the PUSCH resource unit (PRU) being associated with a demodulated reference signal (DMRS) antenna port and a DMRS scrambling identifier (ID),

wherein the DMRS scrambling ID is based at least on a preamble sequence index of the preamble.

29. The apparatus of claim 28, wherein the at least one PRU comprises a code domain index, the code domain index based at least on the DMRS antenna port, the DMRS scrambling ID, or the preamble sequence index.

30. The apparatus of claim 18, further comprising:

means for receiving, from the base station, a second random access response message in response to the first random access message, wherein the second random access response message comprises at least one of a timing advance indication or an uplink grant indication.

31. The apparatus of claim 30, wherein the at least one of the timing advance indication or the uplink grant indication is based on the reference SCS.

32. The apparatus of claim 30, wherein the at least one of the timing advance indication or the uplink grant indication is based on an actual SCS used in transmission of the payload comprised in the first random access message.

33. The apparatus of claim 30, wherein the at least one of the timing advance indication or the uplink grant indication is based on a network configuration for an initial uplink BWP.

34. The apparatus of claim 30, wherein the at least one of the timing advance indication or the uplink grant indication is based on an active uplink BWP.

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

a memory; and

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

receive, from a base station, random access configuration information for the base station;

determine a first time duration for a preamble of a first random access message based on the random access configuration information received from the base station and a reference subcarrier spacing (SCS) associated with an uplink bandwidth part (BWP) configured for the first random access message;

determine a second time duration for a payload of the first random access message based on the random access configuration information received from the base station and the reference SCS;

determine a gap time duration for a transmission gap between the preamble and the payload based on the random access configuration information received from the base station and the reference SCS; and

transmit the first random access message to the base station to initiate a random access procedure.

36. The apparatus of claim 35, the at least one processor further configured to:

determine a third time duration for a guard time between the preamble and the payload of the first random access message, wherein the third time duration of the guard time is determined based on the random access configuration information received from the base station and the reference SCS.

37. The apparatus of claim 35, the at least one processor further configured to:

determine a bandwidth of a guard band and a duration of a guard period for the first random access message based on the random access configuration information received from the base station and the reference SCS.

38. The apparatus of claim 35, the at least one processor further configured to:

determine a common reference slot index for the first random access message based on the reference SCS associated with an active uplink BWP configured for the first random access message; or

determine a common reference physical resource block (PRB) for the first random access message based on the reference SCS.

39. The apparatus of claim 38, the at least one processor further configured to:

receive, from the base station, a second random access response message in response to the first random access message, wherein a time domain mapping of the second random access response message is based on the common reference slot index or a frequency domain mapping of the second random access response message is based on the common reference PRB.

40. The apparatus of claim 35, the at least one processor further configured to:

determine at least one physical uplink shared channel (PUSCH) resource unit for the payload, the PUSCH resource unit (PRU) being associated with a demodulated reference signal (DMRS) antenna port and a DMRS scrambling identifier (ID),

wherein the DMRS scrambling ID is based at least on a preamble sequence index of the preamble.

41. The apparatus of claim 35, the at least one processor further configured to:

receive, from the base station, a second random access response message in response to the first random access message, wherein the second random access response message comprises at least one of a timing advance indication or an uplink grant indication.

42. A non-transitory computer-readable medium storing computer executable code for wireless communication at a user equipment (UE), the code when executed by a processor cause the processor to:

receive, from a base station, random access configuration information for the base station;

determine a first time duration for a preamble of a first random access message based on the random access configuration information received from the base station and a reference subcarrier spacing (SCS) associated with an uplink bandwidth part (BWP) configured for the first random access message;

determine a second time duration for a payload of the first random access message based on the random access configuration information received from the base station and the reference SCS;

determine a gap time duration for a transmission gap between the preamble and the payload based on the random access configuration information received from the base station and the reference SCS; and

transmit the first random access message to the base station to initiate a random access procedure.

43. A method of wireless communication at a base station, comprising:

transmitting random access configuration information for a random access procedure to a user equipment (UE) based on a reference subcarrier spacing (SCS) associated with an uplink bandwidth part (BWP) configured for a first random access message;

receiving the first random access message from the UE to initiate a random access channel (RACH) procedure, the first random access message comprising a preamble and a payload, wherein a first time duration of the preamble and a second time duration of the payload are based on the reference SCS, wherein a gap time duration for a transmission gap between the preamble and the payload is based on the random access configuration information and the reference SCS;

processing the first random access message;

generating a second random access response message in response to the first random access message; and

transmitting the second random access response message to the UE.

44. The method of claim 43, further comprising:

determining a common reference slot index for the second random access response message based on a reference SCS associated with a RACH procedure capability of the UE; or

determining a common reference physical resource block (PRB) for the second random access response message based on the reference SCS.

45. The method of claim 44, wherein a time domain mapping of the second random access response message is based on the common reference slot index.

46. The method of claim 44, wherein a frequency domain mapping of the second random access response message is based on the common reference PRB.

47. The method of claim 44, wherein transmission of the second random access response message is based on at least one of the common reference slot index or the common reference PRB.

48. The method of claim 43, wherein processing the first random access message comprises using a demodulated reference signal (DMRS) scrambling identifier (ID) based at least on a preamble sequence index of the preamble.

49. The method of claim 43, wherein the second random access response message comprises at least one of a timing advance indication or an uplink grant indication.

50. The method of claim 49, wherein the at least one of the timing advance indication or the uplink grant indication is based on the reference SCS.

51. The method of claim 49, wherein the at least one of the timing advance indication or the uplink grant indication is based on an actual SCS used in transmission of the payload comprised in the first random access message.

52. The method of claim 49, wherein the at least one of the timing advance indication or the uplink grant indication is based on a network configuration for an initial uplink BWP.

53. The method of claim 49, wherein the at least one of the timing advance indication or the uplink grant indication is based on an active uplink BWP.

54. An apparatus for wireless communication at a base station, comprising:

means for transmitting random access configuration information for a random access procedure of a user equipment (UE) based on a reference subcarrier spacing (SCS) associated with an uplink bandwidth part (BWP) configured for a first random access message;

means for receiving the first random access message from the UE to initiate a random access channel (RACH) procedure, the first random access message comprising a preamble and a payload, wherein a first time duration of the preamble and a second time duration of the payload are based on the reference SCS, wherein a gap time duration for a transmission gap between the preamble and the payload is based on the random access configuration information and the reference SCS;

means for processing the first random access message;

means for generating a second random access response message in response to the first random access message; and

means for transmitting the second random access response message to the UE.

55. The apparatus of claim 54, further comprising:

means for determining a common reference slot index for the second random access response message based on a reference SCS associated with a RACH procedure capability of the UE; or

means for determining a common reference physical resource block (PRB) for the second random access response message based on the reference SCS.

56. The apparatus of claim 55, wherein a time domain mapping of the second random access response message is based on the common reference slot index.

57. The apparatus of claim 55, wherein a frequency domain mapping of the second random access response message is based on the common reference PRB.

58. The apparatus of claim 55, wherein transmission of the second random access response message is based on at least one of the common reference slot index or the common reference PRB.

59. The apparatus of claim 54, wherein processing the first random access message comprises using a demodulated reference signal (DMRS) scrambling identifier (ID) based at least on a preamble sequence index of the preamble.

60. The apparatus of claim 54, wherein the second random access response message comprises at least one of a timing advance indication or an uplink grant indication.

61. The apparatus of claim 60, wherein the at least one of the timing advance indication or the uplink grant indication is based on the reference SCS.

62. The apparatus of claim 60, wherein the at least one of the timing advance indication or the uplink grant indication is based on an actual SCS used in transmission of the payload comprised in the first random access message.

63. The apparatus of claim 60, wherein the at least one of the timing advance indication or the uplink grant indication is based on a network configuration for an initial uplink bandwidth part (BWP).

64. The apparatus of claim 60, wherein the at least one of the timing advance indication or the uplink grant indication is based on an active uplink BWP.

65. An apparatus for wireless communication at a base station, comprising:
a memory; and
at least one processor coupled to the memory and configured to:
transmit random access configuration information for a random access procedure of a user equipment (UE) based on a reference subcarrier spacing (SCS) associated with an uplink bandwidth part (BWP) configured for a first random access message;
receive the first random access message from the UE to initiate a random access channel (RACH) procedure, the first random access message comprising a preamble and a payload, wherein a first time duration of the preamble and a second time duration of the payload are based on the reference SCS, wherein a gap time duration for a transmission gap between the preamble and the payload is based on the random access configuration information and the reference SCS;
process the first random access message;
generate a second random access response message in response to the first random access message; and
transmit the second random response access message to the UE.

66. The apparatus of claim 65, the at least one processor further configured to:
determine a common reference slot index for the second random access response message based on a reference SCS associated with a RACH procedure capability of the UE; or

determine a common reference physical resource block (PRB) for the second random access response message based on the reference SCS.

67. A non-transitory computer-readable medium storing computer executable code for wireless communication at a base station, the code when executed by a processor cause the processor to:

transmit random access configuration information for a random access procedure of a user equipment (UE) based on a reference subcarrier spacing (SCS) associated with an uplink bandwidth part (BWP) configured for a first random access message;

receive the first random access message from the UE to initiate a random access channel (RACH) procedure, the first random access message comprising a preamble and a payload, wherein a first time duration of the preamble and a second time duration of the payload are based on the reference SCS, wherein a gap time duration for a transmission gap between the preamble and the payload is based on the random access configuration information and the reference SCS;

process the first random access message;

generate a second random access response message in response to the first random access message; and

transmit the second random access response message to the UE.