

CLAIMS

1. A method for wireless communication, comprising:
 - receiving a first synchronization signal for synchronizing with a cell, the first synchronization signal transmitted by a base station serving the cell according to a first periodicity;
 - receiving system information comprising one or more parameters associated with a second synchronization signal;
 - receiving, subsequent to the synchronizing, the second synchronization signal for resynchronizing with the cell based at least in part on the system information, the second synchronization signal transmitted by the base station according to a second periodicity, wherein the second synchronization signal comprises a plurality of repetitions of a first sequence that is based at least in part on a cell identifier of the cell; and
 - communicating over the cell with the base station based at least in part on the resynchronizing.
2. The method of claim 1, wherein the second synchronization signal comprises a plurality of repetitions of a second sequence, and wherein the plurality of repetitions of the first sequence and the plurality of repetitions of the second sequence are transmitted according to a binary sequence.
3. The method of claim 2, wherein the first sequence and the second sequence have low absolute value of cross-correlation with each other.
4. The method of claim 2, wherein the second sequence corresponds to a complex conjugate of the first sequence.
5. The method of claim 2, wherein the second sequence corresponds to a phase-rotated version of the first sequence.
6. The method of claim 2, wherein the binary sequence is based at least in part on a length of the first sequence, or a length of the second synchronization signal, or the cell identifier, or a combination thereof.
7. The method of claim 2, wherein a sequence type of the binary sequence is based at least in part on a length of the first sequence or a length of the second synchronization signal, and wherein the sequence type corresponds to a Gold sequence.

8. The method of claim 7, wherein the sequence type of the binary sequence is based at least in part on the length of the first sequence or the length of the second synchronization signal satisfying a threshold.
9. The method of claim 8, wherein the sequence type of the binary sequence comprises a Gold sequence or an m-sequence based at least in part on the length of the first sequence or the length of the second synchronization signal satisfying the threshold.
10. The method of claim 8, wherein the sequence type of the binary sequence comprises a computer-generated sequence with minimum sidelobe amplitude in an autocorrelation function based at least in part on the length of the first sequence or the length of the second synchronization signal not satisfying the threshold.
11. The method of claim 2, wherein the binary sequence comprises a four-bit binary sequence given by {1, 0, 1, 1}, an eight-bit binary sequence given by {1, 0, 0, 1, 0, 1, 1, 1}, a sixteen-bit binary sequence given by {0, 0, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1}, a thirty-two-bit binary sequence given by {1, 1, 0, 0, 1, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1, 1, 0, 1, 0, 1, 0, 0, 0, 1, 1, 0, 1}, or a forty-bit binary sequence given by {0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 0, 1, 1, 0}.
12. The method of claim 2, wherein a sequence type of the binary sequence is based at least in part on a length of the first sequence or a length of the second synchronization signal, and wherein the sequence type corresponds to an m-sequence.
13. The method of claim 2, wherein a sequence type of the binary sequence is based at least in part on a length of the first sequence or a length of the second synchronization signal, and wherein the sequence type corresponds to a computer-generated sequence with minimum sidelobe amplitude in an autocorrelation function.
14. The method of claim 1, wherein the first sequence comprises a first subsequence and a second subsequence.
15. The method of claim 14, wherein the second subsequence corresponds to a complex conjugate of the first subsequence.

16. The method of claim 1, further comprising:

receiving a third synchronization signal for the resynchronizing with the cell, the third synchronization signal being transmitted by the base station over the cell subsequent to the second synchronization signal and having a sequence length longer than a sequence length of the first sequence.

17. The method of claim 16, wherein the sequence length of the third synchronization signal is shorter than a sequence length of the second synchronization signal.

18. The method of claim 1, wherein the first synchronization signal spans a plurality of physical resource blocks (PRBs) and the second synchronization signal spans the plurality of PRBs.

19. The method of claim 1, wherein the second synchronization signal spans a subset of a plurality of physical resource blocks (PRBs) corresponding to a bandwidth of a narrowband protocol type.

20. The method of claim 19, wherein a transmission power associated with the second synchronization signal is increased relative to a transmission power associated with the first synchronization signal by a ratio of a first number of PRBs in the plurality of PRBs to a second number of PRBs in the subset of the plurality of PRBs.

21. The method of claim 19, wherein the subset of the plurality of PRBs correspond to a contiguous set of PRBs.

22. The method of claim 19, wherein the subset of the plurality of PRBs correspond to a non-contiguous set of PRBs.

23. The method of claim 1, further comprising:

determining the cell identifier of the base station from the first synchronization signal; and
correlating the second synchronization signal for the resynchronizing using a representation of the first sequence determined based at least in part on the cell identifier.

24. The method of claim 1, further comprising:

determining the second periodicity based at least in part on an association between a length of the second synchronization signal received in the system information and the second periodicity.

25. The method of claim 24, wherein the association between the length of the second synchronization signal received in the system information and the second periodicity is determined based at least in part on a multiplicative factor.

26. The method of claim 1, further comprising:

determining a length of the second synchronization signal based at least in part on an association between the second periodicity received in the system information and a length of the second synchronization signal.

27. The method of claim 26, wherein the association between the second periodicity received in the system information and the length of the second synchronization signal is determined based at least in part on an overhead percentage.

28. The method of claim 1, wherein at least one of a plurality of scheduled subframes for the second synchronization signal coincides with a subframe that is restricted for transmission of the second synchronization signal, and wherein the receiving the second synchronization signal comprises:

modifying the plurality of scheduled subframes for the receiving the second synchronization signal.

29. The method of claim 28, wherein the restricted subframe comprises one of a multicast subframe, a machine-type communication (MTC) invalid subframe, a time division duplex (TDD) uplink subframe, or a TDD special subframe.

30. The method of claim 28, wherein the modifying the plurality of scheduled subframes comprises selecting a modification action from the group comprising postponing the at least one of the plurality of scheduled subframes to a next subframe after the restricted subframe, suppressing reception of the at least one of the plurality of scheduled subframes for the restricted subframe, and receiving a portion of the at least one of the plurality of scheduled subframes in the restricted subframe.

31. The method of claim 30, wherein the selecting the modification action is based at least in part on a TDD special subframe configuration.

32. The method of claim 1, wherein the second synchronization signal is punctured by at least one of a reference signal, the first synchronization signal, or a broadcast channel.

33. The method of claim 1, further comprising:

receiving, from the base station, a resynchronization signal configuration for a neighbor cell, the resynchronization signal configuration comprising at least one of a presence of a resynchronization signal for the neighbor cell, a periodicity for the resynchronization signal, a length of the resynchronization signal, a timing offset for the resynchronization signal, a frequency offset for the resynchronization signal, a transmit power for the resynchronization signal, a bandwidth of the resynchronization signal, or a hopping pattern for the resynchronization signal.

34. The method of claim 33, wherein the resynchronization signal configuration is received in system information or in dedicated signaling from the base station.

35. The method of claim 1, further comprising:

transitioning, subsequent to the synchronizing, out of a connected mode with the base station.

36. The method of claim 35, wherein the subsequence corresponds to a pseudo-noise sequence or a Zadoff-Chu sequence and the binary sequence corresponds to a maximum length sequence, a Barker code, or a Gold sequence.

37. The method of claim 1, wherein the first sequence corresponds to a pseudo-noise sequence, a Zadoff-Chu sequence, or a result of a Kronecker product of a subsequence with a binary sequence.

38. The method of claim 1, further comprising:

receiving a second instance of the first synchronization signal for the resynchronizing with the cell based at least in part on phase or timing information determined from the second synchronization signal.

39. The method of claim 1, wherein a length of the first sequence is based at least in part on a length of the second synchronization signal, and wherein the length of the second synchronization signal is a multiple of the length of the first sequence.

40. The method of claim 39, wherein an association between the length of the first sequence and the length of the second synchronization signal is identified from a look-up table.

41. The method of claim 1, wherein the one or more parameters indicate a presence of the second synchronization signal.
42. The method of claim 1, wherein the one or more parameters comprise timing information for the second synchronization signal.
43. The method of claim 1, wherein the one or more parameters comprise a length of the second synchronization signal.
44. The method of claim 1, wherein the one or more parameters comprise a frequency offset and/or a frequency location for the second synchronization signal.
45. The method of claim 1, wherein the one or more parameters comprise a transmit power for the second synchronization signal.
46. The method of claim 1, wherein the one or more parameters comprise a bandwidth of the second synchronization signal.
47. The method of claim 1, wherein the one or more parameters comprise a hopping pattern for the second synchronization signal.
48. The method of claim 1, wherein the one or more parameters comprise a multiplicative factor for the second periodicity.
49. The method of claim 1, wherein the one or more parameters comprise an overhead percentage.
50. A method for wireless communication, comprising:
- transmitting, by a base station serving a cell, a first synchronization signal for the cell, the first synchronization signal transmitted according to a first periodicity;
 - transmitting system information comprising one or more parameters associated with a second synchronization signal;
 - transmitting the second synchronization signal for the cell based at least in part on the system information, the second synchronization signal transmitted according to a second periodicity, wherein the

second synchronization signal comprises a plurality of repetitions of a first sequence that is based at least in part on a cell identifier of the cell; and

communicating with at least one user equipment (UE) over the cell based at least in part on the transmission of the first synchronization signal or the second synchronization signal.

51. The method of claim 50, further comprising:

transmitting the first subsequence via a first antenna port and the second subsequence via a second antenna port.

52. The method of claim 50, wherein the second synchronization signal comprises a plurality of repetitions of a second sequence, and wherein the plurality of repetitions of the first sequence and the plurality of repetitions of the second sequence are transmitted according to a binary sequence.

53. The method of claim 52, wherein the first sequence and the second sequence have low absolute value of cross-correlation with each other.

54. The method of claim 52, wherein the second sequence corresponds to a complex conjugate of the first sequence.

55. The method of claim 52, wherein the binary sequence is based at least in part on a length of the first sequence, or a length of the second synchronization signal, or the cell identifier, or a combination thereof.

56. The method of claim 52, wherein a sequence type of the binary sequence is based at least in part on a length of the first sequence or a length of the second synchronization signal, and wherein the sequence type corresponds to a Gold sequence.

57. The method of claim 56, wherein the sequence type of the binary sequence is based at least in part on the length of the first sequence or the length of the second synchronization signal satisfying a threshold.

58. The method of claim 57, wherein the sequence type of the binary sequence comprises a Gold sequence or an m-sequence based at least in part on the length of the first sequence or the length of the second synchronization signal satisfying the threshold.

59. The method of claim 58, wherein the sequence type of the binary sequence comprises a computer-generated sequence with minimum sidelobe amplitude in an autocorrelation function based at least in part on the length of the first sequence or the length of the second synchronization signal not satisfying the threshold.

60. The method of claim 52, wherein a sequence type of the binary sequence is based at least in part on a length of the first sequence or a length of the second synchronization signal, and wherein the sequence type corresponds to an m-sequence.

61. The method of claim 52, wherein a sequence type of the binary sequence is based at least in part on a length of the first sequence or a length of the second synchronization signal, and wherein the sequence type corresponds to a computer-generated sequence with minimum sidelobe amplitude in an autocorrelation function.

62. The method of claim 50, further comprising:

transmitting the first sequence via a first antenna port and the second sequence via a second antenna port.

63. The method of claim 50, wherein the first sequence comprises a first subsequence and a second subsequence.

64. The method of claim 63, wherein the second subsequence corresponds to a complex conjugate of the first subsequence.

65. The method of claim 50, further comprising:

transmitting a third synchronization signal for the cell subsequent to the second synchronization signal, the third synchronization signal having a sequence length longer than a sequence length of the first sequence.

66. The method of claim 65, wherein the sequence length of the third synchronization signal is shorter than a sequence length of the second synchronization signal.

67. The method of claim 50, wherein the first synchronization signal spans a plurality of physical resource blocks (PRBs) and the second synchronization signal spans the plurality of PRBs.

68. The method of claim 50, wherein the first synchronization signal spans a plurality of physical resource blocks (PRBs) and the second synchronization signal spans a subset of the plurality of PRBs.

69. The method of claim 68, wherein a transmission power associated with the second synchronization signal is increased relative to a transmission power associated with the first synchronization signal by a ratio of a first number of PRBs in the plurality of PRBs to a second number of PRBs in the subset of the plurality of PRBs.

70. The method of claim 68, wherein the subset of the plurality of PRBs correspond to a contiguous set of PRBs.

71. The method of claim 68, wherein the subset of the plurality of PRBs correspond to a non-contiguous set of PRBs.

72. The method of claim 50, further comprising:

determining the second periodicity based at least in part on an association between a length of the second synchronization signal indicated in the system information and the second periodicity, wherein the association between the length of the second synchronization signal received in the system information and the second periodicity is determined based at least in part on a multiplicative factor.

73. The method of claim 72, further comprising:

determining the length of the second synchronization signal based at least in part on an association between the second periodicity indicated in the system information and the length of the second synchronization signal, wherein the association between the second periodicity received in the system information and the length of the second synchronization signal is determined based at least in part on an overhead percentage.

74. The method of claim 50, wherein at least one of a plurality of scheduled subframes for the second synchronization signal coincides with a subframe that is restricted for of the second synchronization signal, and wherein the transmitting the second synchronization signal comprises:

modifying the plurality of scheduled subframes for the transmitting the second synchronization signal.

75. The method of claim 74, wherein the restricted subframe comprises one of a multicast subframe, a machine-type communication (MTC) invalid subframe, a time division duplex (TDD) uplink subframe, or a TDD special subframe.

76. The method of claim 74, wherein the modifying the plurality of scheduled subframes comprises selecting a modification action from the group comprising postponing the at least one of the plurality of scheduled subframes to a next subframe after the restricted subframe, suppressing transmission of the at least one of the plurality of scheduled subframes for the restricted subframe, and transmitting a portion of the at least one of the plurality of scheduled subframes in the restricted subframe.

77. The method of claim 76, wherein the selecting the modification action is based at least in part on a TDD special subframe configuration.

78. The method of claim 50, further comprising:

puncturing the second synchronization signal with at least one of a reference signal, the first synchronization signal, or a broadcast channel.

79. The method of claim 50, further comprising:

transmitting, to the at least one UE, a resynchronization signal configuration for a neighbor cell, the resynchronization signal configuration comprising at least one of a presence of a resynchronization signal for the neighbor cell, a periodicity for the resynchronization signal, a length of the resynchronization signal, a timing offset for the resynchronization signal, a frequency offset for the resynchronization signal, a transmit power for the resynchronization signal, a bandwidth of the resynchronization signal, or a hopping pattern for the resynchronization signal.

80. The method of claim 79, wherein the resynchronization signal configuration is transmitted in system information or in dedicated signaling from the base station to the at least one UE.

81. The method of claim 50, wherein the first sequence corresponds to a pseudo-noise sequence, a Zadoff-Chu sequence, or a result of a Kronecker product of a subsequence with a binary sequence.

82. The method of claim 81, wherein the subsequence corresponds to a pseudo-noise sequence or a Zadoff-Chu sequence and the binary sequence corresponds to a maximum length sequence, a Barker code, or a Gold sequence.

83. The method of claim 50, wherein identifying a length of the first sequence is based at least in part on a length of the second synchronization signal, and wherein the length of the second synchronization signal is a multiple of the length of the first sequence.

84. The method of claim 83, wherein an association between the length of the first sequence and the length of the second synchronization signal is identified from a look-up table.

85. The method of claim 50, wherein the one or more parameters indicate a presence of the second synchronization signal.

86. The method of claim 50, wherein the one or more parameters comprise timing information for the second synchronization signal.

87. The method of claim 50, wherein the one or more parameters comprise a length of the second synchronization signal.

88. The method of claim 50, wherein the one or more parameters comprise a frequency offset and/or a frequency location for the second synchronization signal.

89. The method of claim 50, wherein the one or more parameters comprise a transmit power for the second synchronization signal.

90. The method of claim 50, wherein the one or more parameters comprise a bandwidth of the second synchronization signal.

91. The method of claim 50, wherein the one or more parameters comprise a hopping pattern for the second synchronization signal.

92. The method of claim 50, wherein the one or more parameters comprise a multiplicative factor for the second periodicity.

93. The method of claim 50, wherein the one or more parameters comprise an overhead percentage.

94. An apparatus for wireless communication, 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:
 - receive a first synchronization signal for synchronizing with a cell, the first synchronization signal transmitted by a base station serving the cell according to a first periodicity;
 - receive system information comprising one or more parameters associated with a second synchronization signal;
 - receive, subsequent to the synchronizing, the second synchronization signal for resynchronizing with the cell based at least in part on the system information, the second synchronization signal transmitted by the base station according to a second periodicity, wherein the second synchronization signal comprises a plurality of repetitions of a first sequence that is based at least in part on a cell identifier of the cell; and
 - communicate over the cell with the base station based at least in part on the resynchronizing.

95. The apparatus of claim 94, wherein the second synchronization signal comprises a plurality of repetitions of a second sequence, and wherein the plurality of repetitions of the first sequence and the plurality of repetitions of the second sequence are transmitted according to a binary sequence.

96. The apparatus of claim 95, wherein the first sequence and the second sequence have low absolute value of cross-correlation with each other.

97. An apparatus for wireless communication, 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, by a base station serving a cell, a first synchronization signal for the cell, the first synchronization signal transmitted according to a first periodicity;
 - transmit system information comprising one or more parameters associated with a second synchronization signal;
 - transmit the second synchronization signal for the cell based at least in part on the system information, the second synchronization signal transmitted according to a second periodicity, wherein the second synchronization signal comprises a plurality of repetitions of a first sequence that is based at least in part on a cell identifier of the cell; and

communicate with at least one user equipment (UE) over the cell based at least in part on the transmission of the first synchronization signal or the second synchronization signal.