

CLAIMS

1. A method of wireless communication for a base station, comprising:

determining a time-division duplex (TDD) mode for narrowband communications, the TDD mode including an in-band mode, a guard band mode, or a standalone mode;

determining a TDD frame structure for the narrowband communications from a group of TDD frame structures, each TDD frame structure in the group of TDD frame structures having a different ordered subframe arrangement of downlink, uplink, special, or flexible subframes, wherein the TDD frame structure is selected from a first set of TDD frame structures when the base station is operating in one of the in-band mode or the guard band mode, wherein the TDD frame structure is selected from a second set of TDD frame structures when the base station is operating in the standalone mode, and wherein the second set includes at least one TDD frame structure different from the first set;

determining at least one common subframe for use in transmitting a primary synchronization signal (PSS), the at least one common subframe being configured as a downlink subframe in each TDD frame structure in the group of TDD frame structures; and

transmitting the PSS using the at least one common subframe in the TDD frame structure determined for the narrowband communications.

2. The method of claim 1, wherein when the at least one common subframe includes a plurality of common subframes, the method comprises:

determining one of the plurality of common subframes for use in transmitting the PSS, the one of the plurality of common subframes being determined as a function of the TDD frame structure determined for the narrowband communications.

3. The method of claim 1, wherein a first periodicity associated with transmitting the PSS using the TDD frame structure is reduced or increased as compared to a second periodicity associated with transmission of a second PSS using a frequency-division duplex (FDD) frame structure for narrowband communications.

4. A method of wireless communication for a base station, comprising:

determining a time-division duplex (TDD) mode for narrowband communications, the TDD mode including an in-band mode, a guard band mode, or a standalone mode;

determining a TDD frame structure for the narrowband communications from a group of TDD frame structures, each TDD frame structure in the group of TDD frame structures having a different ordered subframe arrangement of downlink, uplink, special, or flexible subframes, wherein the TDD frame structure is selected from a first set of TDD frame structures when the base station is operating in one of the in-band mode or the guard band mode, wherein the TDD frame structure is selected from a second set of TDD frame structures when the base station is operating in the standalone mode, and wherein the second set includes at least one TDD frame structure different from the first set; and

transmitting a primary synchronization signal (PSS) using the TDD frame structure determined for the narrowband communications, a set of PSS sequences being associated with at least one of the TDD mode or the TDD frame structure determined for the narrowband communications.

5. The method of claim 4, wherein the set of PSS sequences transmitted using the TDD frame structure is the same as a second set of PSS sequences transmitted using a frequency-division duplex (FDD) frame structure for narrowband communications.

6. The method of claim 4, wherein the set of PSS sequences transmitted using the TDD frame structure is different than a second set of PSS sequences transmitted using a frequency-division duplex (FDD) frame structure for narrowband communications.

7. The method of claim 6, wherein the set of PSS sequences transmitted using the TDD frame structure has a different Zadoff Chu sequence for initialization than the second set of PSS sequences transmitted using the FDD frame structure.

8. The method of claim 6, wherein the set of PSS sequences transmitted using the TDD frame structure has a different cover code than the second set of PSS sequences transmitted using the FDD frame structure.

9. The method of claim 6, wherein the set of PSS sequences is a function of one or more of a deployment mode, the TDD frame structure, or a location of at least one of a physical broadcast channel (PBCH) carrier, a system information block (SIB) carrier, or a PSS carrier.

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

means for determining a time-division duplex (TDD) mode for narrowband communications, the TDD mode including an in-band mode, a guard band mode, or a standalone mode;

wherein the means for determining is configured to determine a TDD frame structure for the narrowband communications from a group of TDD frame structures, each TDD frame structure in the group of TDD frame structures having a different ordered subframe arrangement of downlink, uplink, special, or flexible subframes, wherein the TDD frame structure is selected from a first set of TDD frame structures when the base station is operating in one of the in-band mode or the guard band mode, wherein the TDD frame structure is selected from a second set of TDD frame structures when the base station is operating in the standalone mode, and wherein the second set includes at least one TDD frame structure different from the first set;

wherein the means for determining is further configured to determine at least one common subframe for use in transmitting a primary synchronization signal (PSS), the at least one common subframe being configured as a downlink subframe in each TDD frame structure in the group of TDD frame structures; and

means for transmitting the PSS using the at least one common subframe in the TDD frame structure determined for the narrowband communications.

11. The apparatus of claim 10, wherein when the at least one common subframe includes a plurality of common subframes, the apparatus further comprises:

means for determining one of a plurality of common subframes for use in transmitting the PSS, the one of the plurality of common subframes being determined as a function of the TDD frame structure determined for the narrowband communications.

12. The apparatus of claim 10, wherein a first periodicity associated with the transmitting the PSS using the TDD frame structure is reduced or increased as compared to a second periodicity

associated with transmission of a second PSS using a frequency-division duplex (FDD) frame structure for narrowband communications.

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

means for determining a time-division duplex (TDD) mode for narrowband communications, the TDD mode including an in-band mode, a guard band mode, or a standalone mode;

wherein the means for determining is configured to determine a TDD frame structure for the narrowband communications from a group of TDD frame structures, each TDD frame structure in the group of TDD frame structures having a different ordered subframe arrangement of downlink, uplink, special, or flexible subframes, wherein the TDD frame structure is selected from a first set of TDD frame structures when the base station is operating in one of the in-band mode or the guard band mode, wherein the TDD frame structure is selected from a second set of TDD frame structures when the base station is operating in the standalone mode, and wherein the second set includes at least one TDD frame structure different from the first set; and

means for transmitting a primary synchronization signal (PSS) using the TDD frame structure determined for the narrowband communications, a set of PSS sequences being associated with at least one of the TDD mode or the TDD frame structure determined for the narrowband communications.

14. The apparatus of claim 13, wherein the set of PSS sequences transmitted using the TDD frame structure is the same as a second set of PSS sequences transmitted using a frequency-division duplex (FDD) frame structure for narrowband communications.

15. The apparatus of claim 13, wherein the set of PSS sequences transmitted using the TDD frame structure is different than a second set of PSS sequences transmitted using a frequency-division duplex (FDD) frame structure for narrowband communications.

16. The apparatus of claim 15, wherein the set of PSS sequences transmitted using the TDD frame structure has a different Zadoff Chu sequence for initialization than the second set of PSS sequences transmitted using the FDD frame structure.

17. The apparatus of claim 15, wherein the set of PSS sequences transmitted using the TDD frame structure has a different cover code than the second set of PSS sequences transmitted using the FDD frame structure.

18. The apparatus of claim 15, wherein the set of PSS sequences is a function of one or more of a deployment mode, the TDD frame structure, or a location of at least one of a physical broadcast channel (PBCH) carrier, a system information block (SIB) carrier, or a PSS carrier.

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

- a memory; and

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

- determine a time-division duplex (TDD) mode for narrowband communications, the TDD mode including an in-band mode, a guard band mode, or a standalone mode;

- determine a TDD frame structure for the narrowband communications from a group of TDD frame structures, each TDD frame structure in the group of TDD frame structures having a different ordered subframe arrangement of downlink, uplink, special, or flexible subframes, wherein the TDD frame structure is selected from a first set of TDD frame structures when the base station is operating in one of the in-band mode or the guard band mode, wherein the TDD frame structure is selected from a second set of TDD frame structures when the base station is operating in the standalone mode, and wherein the second set includes at least one TDD frame structure different from the first set;

- determine at least one common subframe for use in transmitting a primary synchronization signal (PSS), the at least one common subframe being configured as a downlink subframe in each TDD frame structure in the group of TDD frame structures; and

- transmit the PSS using the at least one common subframe in the TDD frame structure determined for the narrowband communications.

20. The apparatus of claim 19, wherein when the at least one common subframe includes a plurality of common subframes, the at least one processor is further configured to:

determine one of the plurality of common subframes for use in transmitting the PSS, the one of the plurality of common subframes being determined as a function of the TDD frame structure determined for the narrowband communications.

21. The apparatus of claim 19, wherein a first periodicity associated with the transmitting the PSS using the TDD frame structure is reduced or increased as compared to a second periodicity associated with transmission of a second PSS using a frequency-division duplex (FDD) frame structure for narrowband communications.

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

- a memory; and

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

- determine a time-division duplex (TDD) mode for narrowband communications, the TDD mode including an in-band mode, a guard band mode, or a standalone mode;

- determine a TDD frame structure for the narrowband communications from a group of TDD frame structures, each TDD frame structure in the group of TDD frame structures having a different ordered subframe arrangement of downlink, uplink, special, or flexible subframes, wherein the TDD frame structure is selected from a first set of TDD frame structures when the base station is operating in one of the in-band mode or the guard band mode, wherein the TDD frame structure is selected from a second set of TDD frame structures when the base station is operating in the standalone mode, and wherein the second set includes at least one TDD frame structure different from the first set; and

- transmit a primary synchronization signal (PSS) using the TDD frame structure determined for the narrowband communications, a set of PSS sequences being associated with at least one of the TDD mode or the TDD frame structure determined for the narrowband communications.

23. The apparatus of claim 22, wherein the set of PSS sequences transmitted using the TDD frame structure is the same as a second set of PSS sequences transmitted using a frequency-division duplex (FDD) frame structure for narrowband communications.

24. The apparatus of claim 22, wherein the set of PSS sequences transmitted using the TDD frame structure is different than a second set of PSS sequences transmitted using a frequency-division duplex (FDD) frame structure for narrowband communications.

25. The apparatus of claim 24, wherein the set of PSS sequences transmitted using the TDD frame structure has a different Zadoff Chu sequence for initialization than the second set of PSS sequences transmitted using the FDD frame structure.

26. The apparatus of claim 24, wherein the set of PSS sequences transmitted using the TDD frame structure has a different cover code than the second set of PSS sequences transmitted using the FDD frame structure.

27. The apparatus of claim 24, wherein the set of PSS sequences is a function of one or more of a deployment mode, the TDD frame structure, or a location of at least one of a physical broadcast channel (PBCH) carrier, a system information block (SIB) carrier, or a PSS carrier.

28. A non-transitory computer-readable medium storing computer executable code for a base station, comprising code to:

- determine a time-division duplex (TDD) mode for narrowband communications, the TDD mode including an in-band mode, a guard band mode, or a standalone mode;

- determine a TDD frame structure for the narrowband communications from a group of TDD frame structures, each TDD frame structure in the group of TDD frame structures having a different ordered subframe arrangement of downlink, uplink, special, or flexible subframes, wherein the TDD frame structure is selected from a first set of TDD frame structures when the base station is operating in one of the in-band mode or the guard band mode, wherein the TDD frame structure is selected from a second set of TDD frame structures when the base station is operating in the standalone mode, and wherein the second set includes at least one TDD frame structure different from the first set;

- determine at least one common subframe for use in transmitting a primary synchronization signal (PSS), the at least one common subframe being configured as a downlink subframe in each TDD frame structure in the group of TDD frame structures; and

transmit the PSS using the at least one common subframe in the TDD frame structure determined for the narrowband communications.

29. The non-transitory computer-readable medium of claim 28, wherein when the at least one common subframe includes a plurality of common subframes, the code is configured to:

determine one of the plurality of common subframes for use in transmitting the PSS, the one of the plurality of common subframes being determined as a function of the TDD frame structure determined for the narrowband communications.

30. The non-transitory computer-readable medium of claim 28, wherein a first periodicity associated with the transmitting the PSS using the TDD frame structure is reduced or increased as compared to a second periodicity associated with transmission of a second PSS using a frequency-division duplex (FDD) frame structure for narrowband communications.

31. A non-transitory computer-readable medium storing computer executable code for a base station, comprising code to:

determine a time-division duplex (TDD) mode for narrowband communications, the TDD mode including an in-band mode, a guard band mode, or a standalone mode;

determine a TDD frame structure for the narrowband communications from a group of TDD frame structures, each TDD frame structure in the group of TDD frame structures having a different ordered subframe arrangement of downlink, uplink, special, or flexible subframes, wherein the TDD frame structure is selected from a first set of TDD frame structures when the base station is operating in one of the in-band mode or the guard band mode, wherein the TDD frame structure is selected from a second set of TDD frame structures when the base station is operating in the standalone mode, and wherein the second set includes at least one TDD frame structure different from the first set; and

transmit a primary synchronization signal (PSS) using the TDD frame structure determined for the narrowband communications, a set of PSS sequences being associated with at least one of the TDD mode or the TDD frame structure determined for the narrowband communications.

32. The non-transitory computer-readable medium of claim 31, wherein the set of PSS sequences transmitted using the TDD frame structure is the same as a second set of PSS sequences transmitted using a frequency-division duplex (FDD) frame structure for narrowband communications.

33. The non-transitory computer-readable medium of claim 31, wherein the set of PSS sequences transmitted using the TDD frame structure is different than a second set of PSS sequences transmitted using a frequency-division duplex (FDD) frame structure for narrowband communications.

34. The non-transitory computer-readable medium of claim 33, wherein the set of PSS sequences transmitted using the TDD frame structure has a different Zadoff Chu sequence for initialization than the second set of PSS sequence transmitted using the FDD frame structure.

35. The non-transitory computer-readable medium of claim 33, wherein the set of PSS sequences transmitted using the TDD frame structure has a different cover code than the second set of PSS sequences transmitted using the FDD frame structure.

36. The non-transitory computer-readable medium of claim 33, wherein the set of PSS sequences is a function of one or more of a deployment mode, the TDD frame structure, or a location of at least one of a physical broadcast channel (PBCH) carrier, a system information block (SIB) carrier, or a PSS carrier.