

CLAIMS

1. A method for wireless communications, comprising:
transmitting a first Orthogonal Frequency-Division Multiple Access (OFDMA) communications signal to a wireless node in a licensed spectrum; and
transmitting, concurrently with the transmission of the first OFDMA communications signal, a second OFDMA communications signal to the wireless node in an unlicensed spectrum;
wherein the transmission of the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.
2. The method of claim 1, wherein the transmission of the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.
3. The method of claim 1, wherein the fixed offset is equal to zero.
4. The method of claim 1, further comprising:
receiving, concurrently with the transmission of the first and second OFDMA communications signals, a first Single-Carrier Frequency-Division Multiple Access (SC-FDMA) communications signal from the wireless node in the licensed spectrum.
5. The method of claim 4, further comprising:
receiving, concurrently with the transmission of the first and second OFDMA communications signals, a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

6. The method of claim 4, wherein the first SC-FDMA communications signal received from the wireless node in the licensed spectrum carries signaling or other control information related to the second OFDMA communications signal transmitted in the unlicensed spectrum.

7. The method of claim 6, further comprising:
receiving, concurrently with the transmission of the first and second OFDMA communications signals, a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

8. The method of claim 1, further comprising:
receiving, concurrently with the transmission of the first and second OFDMA communications signals, a first SC-FDMA communications signal from the wireless node in the licensed spectrum and a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

9. The method of claim 1, wherein the wireless node comprises a user equipment (UE).

10. The method of claim 1, wherein the first and second OFDMA communications signals are transmitted from an evolved Node B (eNB).

11. The method of claim 1, wherein each of the first and second OFDMA communications signals comprises a Long Term Evolution (LTE) signal.

12. An apparatus for wireless communications, comprising:
means for transmitting a first Orthogonal Frequency-Division Multiple Access (OFDMA) communications signal to a wireless node in a licensed spectrum; and
means for transmitting, concurrently with the transmission of the first OFDMA communications signal, a second OFDMA communications signal to the wireless node in an unlicensed spectrum;
wherein the transmission of the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum,

with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

13. The apparatus of claim 12, wherein the transmission of the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

14. The apparatus of claim 12, wherein the fixed offset is equal to zero.

15. The apparatus of claim 12, further comprising:
means for receiving, concurrently with the transmission of the first and second OFDMA communications signals, a first Single-Carrier Frequency-Division Multiple Access (SC-FDMA) communications signal from the wireless node in the licensed spectrum.

16. The apparatus of claim 15, further comprising:
means for receiving, concurrently with the transmission of the first and second OFDMA communications signals, a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

17. The apparatus of claim 15, wherein the first SC-FDMA communications signal received from the wireless node in the licensed spectrum carries signaling or other control information related to the second OFDMA communications signal transmitted in the unlicensed spectrum.

18. The apparatus of claim 17, further comprising:
means for receiving, concurrently with the transmission of the first and second OFDMA communications signals, a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

19. The apparatus of claim 12, further comprising:

means for receiving, concurrently with the transmission of the first and second OFDMA communications signals, a first SC-FDMA communications signal from the wireless node in the licensed spectrum and a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

20. The apparatus of claim 12, wherein the wireless node comprises a user equipment (UE).

21. The apparatus of claim 12, wherein the first and second OFDMA communications signals are transmitted from an evolved Node B (eNB).

22. The apparatus of claim 12, wherein each of the first and second OFDMA communications signals comprises a Long Term Evolution (LTE) signal.

23. An apparatus for wireless communications, comprising:
 a processor;
 memory in electronic communication with the processor; and
 instructions stored in the memory, the instructions being executable by the processor to:
 transmit a first Orthogonal Frequency-Division Multiple Access (OFDMA) communications signal to a wireless node in a licensed spectrum; and
 transmit, concurrently with the transmission of the first OFDMA communications signal, a second OFDMA communications signal to the wireless node in an unlicensed spectrum;
 wherein the transmission of the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

24. The apparatus of claim 23, wherein the transmission of the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the

first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

25. The apparatus of claim 23, wherein the fixed offset is equal to zero.

26. The apparatus of claim 23, wherein the instructions are executable by the processor to: receive, concurrently with the transmission of the first and second OFDMA communications signals, a first Single-Carrier Frequency-Division Multiple Access (SC-FDMA) communications signal from the wireless node in the licensed spectrum.

27. The apparatus of claim 26, wherein the instructions are executable by the processor to: receive, concurrently with the transmission of the first and second OFDMA communications signals, a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

28. The apparatus of claim 26, wherein the first SC-FDMA communications signal received from the wireless node in the licensed spectrum carries signaling or other control information related to the second OFDMA communications signal transmitted in the unlicensed spectrum.

29. The apparatus of claim 28, wherein the instructions are executable by the processor to: receive, concurrently with the transmission of the first and second OFDMA communications signals, a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

30. The apparatus of claim 23, wherein the instructions are executable by the processor to: receive, concurrently with the transmission of the first and second OFDMA communications signals, a first SC-FDMA communications signal from the wireless node in the licensed spectrum and a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

31. The apparatus of claim 23, wherein the wireless node comprises a user equipment (UE).

32. The apparatus of claim 23, wherein the first and second OFDMA communications signals are transmitted from an evolved Node B (eNB).

33. The apparatus of claim 23, wherein each of the first and second OFDMA communications signals comprises a Long Term Evolution (LTE) signal.

34. A computer program product for communications by a wireless communications apparatus in a wireless communications system, the computer program product comprising a non-transitory computer-readable medium storing instructions executable by a processor to cause the wireless communications apparatus to:

transmit a first Orthogonal Frequency-Division Multiple Access (OFDMA) communications signal to a wireless node in a licensed spectrum; and

transmit, concurrently with the transmission of the first OFDMA communications signal, a second OFDMA communications signal to the wireless node in an unlicensed spectrum;

wherein the transmission of the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

35. The computer program product of claim 34, wherein the transmission of the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

36. The computer program product of claim 34, wherein the fixed offset is equal to zero.

37. The computer program product of claim 34, wherein the instructions are executable by the processor to cause the wireless communications apparatus to:

receive, concurrently with the transmission of the first and second OFDMA communications signals, a first SC-FDMA communications signal from the wireless node in the licensed spectrum and a second SC-FDMA communications signal from the wireless node in the unlicensed spectrum.

38. The computer program product of claim 34, wherein the wireless node comprises a user equipment (UE).

39. A method for wireless communications, comprising:
receiving a first Orthogonal Frequency-Division Multiple Access (OFDMA) communications signal from a wireless node in a licensed spectrum; and
receiving, concurrently with the reception of the first OFDMA communications signal, a second OFDMA communication signal from the wireless node in an unlicensed spectrum;
wherein the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

40. The method of claim 39, further comprising:
transmitting, concurrently with the reception of the first and second OFDMA communications signals, a first SC-FDMA communications signal to the wireless node in the licensed spectrum.

41. The method of claim 40, further comprising:
transmitting, concurrently with the reception of the first and second OFDMA communications signals, a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

42. The method of claim 40, wherein the first SC-FDMA communications signal transmitted to the wireless node in the licensed spectrum carries signaling or other control information related to the second OFDMA signal received in the unlicensed spectrum.

43. The method of claim 42, further comprising:

transmitting, concurrently with the reception of the first and second OFDMA communications signals, a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

44. The method of claim 39, further comprising:

transmitting, concurrently with the reception of the first and second OFDMA communications signals, a first SC-FDMA communications signal to the wireless node in the licensed spectrum and a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

45. The method of claim 39, wherein the wireless node comprises an evolved Node B (eNB).

46. The method of claim 39, wherein the first and second OFDMA communications signals are received at a user equipment (UE).

47. The method of claim 39, wherein each of the first and second OFDMA communications signals comprises a Long Term Evolution (LTE) signal.

48. An apparatus for wireless communications, comprising:

means for receiving a first Orthogonal Frequency-Division Multiple Access (OFDMA) communications signal from a wireless node in a licensed spectrum; and

means for receiving, concurrently with the reception of the first OFDMA communications signal, a second OFDMA communication signal from the wireless node in an unlicensed spectrum;

wherein the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

49. The apparatus of claim 48, further comprising:

means for transmitting, concurrently with the reception of the first and second OFDMA communications signals, a first SC-FDMA communications signal to the wireless node in a licensed spectrum.

50. The apparatus of claim 49, further comprising:

means for transmitting, concurrently with the reception of the first and second OFDMA communications signals, a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

51. The apparatus of claim 49, wherein the first SC-FDMA communications signal transmitted to the wireless node in the licensed spectrum carries signaling or other control information related to the second OFDMA signal received in the unlicensed spectrum.

52. The apparatus of claim 51, further comprising:

means for transmitting, concurrently with the reception of the first and second OFDMA communications signals, a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

53. The apparatus of claim 48, further comprising:

means for transmitting, concurrently with the reception of the first and second OFDMA communications signals, a first SC-FDMA communications signal to the wireless node in the licensed spectrum and a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

54. The apparatus of claim 48, wherein the wireless node comprises an evolved Node B (eNB).

55. The apparatus of claim 48, wherein the first and second OFDMA communications signals are received at a user equipment (UE).

56. The apparatus of claim 48, wherein each of the first and second OFDMA communications signals comprises LTE signals.

57. An apparatus for wireless communications, comprising:

a processor;
 memory in electronic communication with the processor; and
 instructions stored in the memory, the instructions being executable by the processor to:
 receive a first Orthogonal Frequency-Division Multiple Access (OFDMA) communications
 signal from a wireless node in a licensed spectrum; and
 receive, concurrently with the reception of the first OFDMA communications signal, a second
 OFDMA communication signal from the wireless node in an unlicensed spectrum;
 wherein the second OFDMA communications signal in the unlicensed spectrum is time-
 synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed
 offset between a frame structure of the first OFDMA communications signal and a frame structure of
 the second OFDMA communications signal.

58. The apparatus of claim 57, wherein the instructions are executable by the processor to:
 transmit, concurrently with the reception of the first and second OFDMA communications
 signals, a first SC-FDMA communications signal to the wireless node in a licensed spectrum.

59. The apparatus of claim 58, wherein the instructions are executable by the processor to:
 transmit, concurrently with the reception of the first and second OFDMA communications
 signals, a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

60. The apparatus of claim 58, wherein the first SC-FDMA communications signal
 transmitted to the wireless node in the licensed spectrum carries signaling or other control information
 related to the second OFDMA signal received in the unlicensed spectrum.

61. The apparatus of claim 60, wherein the instructions are executable by the processor to:
 transmit, concurrently with the reception of the first and second OFDMA communications
 signals, a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

62. The apparatus of claim 57, wherein the instructions are executable by the processor to:

transmit, concurrently with the reception of the first and second OFDMA communications signals, a first SC-FDMA communications signal to the wireless node in the licensed spectrum and a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

63. The apparatus of claim 57, wherein the wireless node comprises an evolved Node B (eNB).

64. The apparatus of claim 57, wherein the first and second OFDMA communications signals are received at a user equipment (UE).

65. The apparatus of claim 57, wherein each of the first and second OFDMA communications signals comprises LTE signals.

66. A computer program product for communications by a wireless communications apparatus in a wireless communications system, the computer program product comprising a non-transitory computer-readable medium storing instructions executable by a processor to cause the wireless communications apparatus to:

receive a first Orthogonal Frequency-Division Multiple Access (OFDMA) communications signal from a wireless node in a licensed spectrum; and

receive, concurrently with the reception of the first OFDMA communications signal, a second OFDMA communication signal from the wireless node in an unlicensed spectrum;

wherein the second OFDMA communications signal in the unlicensed spectrum is time-synchronized with the first OFDMA communications signal in the licensed spectrum, with a fixed offset between a frame structure of the first OFDMA communications signal and a frame structure of the second OFDMA communications signal.

67. The computer program product of claim 66, wherein the instructions are executable by the processor to cause the wireless communications apparatus to:

transmit, concurrently with the reception of the first and second OFDMA communications signals, a first SC-FDMA communications signal to the wireless node in a licensed spectrum.

68. The computer program product of claim 67, wherein the instructions are executable by the processor to cause the wireless communications apparatus to:

transmit, concurrently with the reception of the first and second OFDMA communications signals, a second SC-FDMA communications signal to the wireless node in the unlicensed spectrum.

69. The computer program product of claim 66, wherein the wireless node comprises an evolved Node B (eNB).