CLAIMS

~~What is claimed is:~~

1. A method for wireless communications, comprising:

receiving, from a base station, an indication of a scaling factor associated with a wakeup signal (WUS), wherein the scaling factor is based at least on a WUS transmission characteristic;

receiving, from the base station and for a WUS time duration, the WUS in accordance with the WUS transmission characteristic, wherein the WUS time duration is based at least on the scaling factor and an associated control channel repetition parameter; and

monitoring a downlink channel from the base station for scheduling information based at least on the received WUS, wherein the scheduling information comprises information for a paging message from the base station.

2. The method of claim 1, further comprising:

receiving, from the base station, an indication of the WUS time duration.

3. The method of claim 1, further comprising:

determining a WUS reception duration based at least on a signal quality of a reference signal and a probability of detection threshold, wherein the WUS reception duration is less than the WUS time duration.

4. The method of claim 3, wherein the WUS reception duration is determined based at least on the WUS transmission characteristic.

5. The method of claim 3, further comprising:

receiving the reference signal from the base station; and

measuring the signal quality of the reference signal.

6. The method of claim 1, wherein receiving the indication of the scaling factor comprises:

receiving a system information block (SIB) that comprises the indication of the scaling factor, a value of the scaling factor, or a combination thereof.

7. The method of claim 6, further comprising:

receiving a power offset parameter for the WUS in the SIB.

8. The method of claim 7, further comprising:

determining that no higher layer signaling has been received to configure a power ratio;

wherein the power offset parameter comprises a fixed power ratio between ~~the~~a narrowband reference signal and the WUS.

9. The method of claim 7, further comprising:

determining that no higher layer signaling has been received to configure a power ratio;

wherein the power offset parameter comprises a fixed power ratio between a cell-specific reference signal and the WUS, and wherein the WUS is associated with machine type communication (MTC).

10. The method of claim 1, further comprising:

determining a maximum WUS time duration based at least on a ratio of a maximum repetition of an associated control channel and the scaling factor, wherein the WUS time duration is based at least on the maximum WUS time duration, and wherein the associated control channel repetition parameter corresponds to a maximum number of repetitions of an associated narrowband control channel for paging.

11. The method of claim 1, further comprising:

receiving, from the base station, an indication of a transmit diversity dimension for transmission of the WUS.

12. The method of claim 11, wherein the transmit diversity dimension is determined by a number of antennas switching on one antenna port every two subframes or by a number of antenna ports switching on all antenna ports every two subframes.

13. The method of claim 1, wherein the WUS time duration is determined based at least on a predetermined maximum WUS time duration.

14. The method of claim 1, wherein the WUS transmission characteristic comprises a WUS transmit power, a WUS transmit diversity scheme, an indication of a legacy synchronization signal detection before WUS reception, a power ratio between the WUS and a narrowband reference signal, a maximum coupling loss (MCL) associated with the UE, or a combination thereof.

15. The method of claim 1, wherein a signal to noise ratio (SNR) is determined based at least on a power ratio between the WUS and a narrowband reference signal, and wherein a single port SNR is estimated for the WUS based at least on the SNR.

16. The method of claim 1, wherein the scaling factor is based at least in part on a transmit diversity scheme that includes a pattern index of fixed patterns, with each pattern defining a number of fixed basic units and a transmit diversity dimension, or includes the number of fixed basic units and the transmit diversity dimension.

17. The method of claim 16, wherein the fixed basic ~~unit comprises a number of~~units comprise subframes, ~~a~~ 1 millisecond transmission time ~~interval (TTI), a slot~~intervals (TTIs), slots, or ~~a~~ mini-~~slot.~~slots.

18. The method of claim 1, further comprising:

receiving a maximum number of repetitions of narrowband control channel transmissions in a system information block (SIB), wherein the WUS time duration is determined based at least on the maximum number of repetitions of the narrowband control channel transmissions.

19. The method of claim 1, wherein further comprising:

determining an early termination duration based at least on a target signal to noise ratio (SNR) or a maximum coupling loss (MCL) associated with the UE, wherein the WUS time duration is based at least on the early termination duration.

20. A method for wireless communications, comprising:

transmitting an indication of a scaling factor associated with a wakeup signal (WUS) to a user equipment (UE), wherein the scaling factor is determined based at least on a WUS transmission characteristic; and

transmitting, to the UE and for a WUS time duration, the WUS in accordance with the WUS transmission characteristic, wherein the WUS time duration is determined based at least on the scaling factor and an associated control channel repetition parameter.

21. The method of claim 20, further comprising:

transmitting, to the UE, an indication of the WUS time duration, wherein the WUS time duration is based at least on a target signal to noise ratio (SNR) or a maximum coupling loss (MCL) associated with the UE.

22. The method of claim 20, further comprising:

transmitting, to the UE, a reference signal, wherein the WUS time duration is based at least on a signal quality of the reference signal and a probability of detection threshold.

23. The method of claim 22, wherein the reference signal comprises a narrowband reference signal or a cell-specific reference signal.

24. The method of claim 20, wherein transmitting the indication of the scaling factor comprises:

transmitting a system information block (SIB) that comprises the indication of the scaling factor, a value of the scaling factor, or a combination thereof.

25. The method of claim 24, wherein the SIB further comprises a power offset parameter that indicates a power ratio between a narrowband reference signal and the WUS.

26. The method of claim 20, further comprising:

transmitting, to the UE, an indication of a transmit diversity dimension for transmission of the WUS.

27. The method of claim 26, further comprising:

determining the transmit diversity dimension based at least in part on a number of antennas switching on one antenna port every two subframes or a number of antenna ports switching on all antenna ports every two subframes.

28. The method of claim 20, wherein the WUS time duration is determined based at least on a predetermined maximum WUS time duration.

29. The method of claim 20, wherein the WUS transmission characteristic comprises a WUS transmit power, a WUS transmit diversity scheme, an indication of a legacy synchronization signal detection of the UE before WUS detection, a power ratio between the WUS and a narrowband reference signal, a maximum coupling loss (MCL) associated with the UE, or a combination thereof.

30. The method of claim ~~29~~20, wherein a signal to noise ratio (SNR) is determined based at least on a power ratio between the WUS and a narrowband reference signal, and wherein a single port SNR is estimated for the WUS based at least on the SNR.

31. The method of claim 29, wherein the scaling factor is based at least on a transmit diversity scheme that includes a pattern index of fixed patterns, with each pattern defining a number of fixed basic units and a transmit diversity dimension, or includes the number of fixed basic units and the transmit diversity dimension.

32. The method of claim 31, wherein the fixed basic ~~unit comprises a number of~~units comprise subframes, ~~a~~ 1 millisecond transmission time ~~interval (TTI), a slot~~intervals (TTIs), slots, or ~~a~~ mini-~~slot.~~slots.

33. The method of claim 20, further comprising:

transmitting a maximum number of repetitions of narrowband control channel transmissions in a system information block (SIB), wherein the WUS time duration is based at least on the maximum number of repetitions of the narrowband control channel transmissions.

34. The method of claim 20, further comprising:

identifying a signal to noise ratio (SNR) for the UE, wherein the scaling factor is determined based at least on the SNR.

35. An apparatus for wireless communications, 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, from a base station, an indication of a scaling factor associated with a wakeup signal (WUS), wherein the scaling factor is based at least on a WUS transmission characteristic;

receive, from the base station and for a WUS time duration, the WUS in accordance with the WUS transmission characteristic, wherein the WUS time duration is based at least on the scaling factor and an associated control channel repetition parameter; and

monitor a downlink channel from the base station for scheduling information based at least on the received WUS, wherein the scheduling information comprises information for a paging information from the base station.

36. The apparatus of claim 35, wherein the instructions are further executable by the processor to cause the apparatus to:

receive, from the base station, an indication of the WUS time duration.

37. The apparatus of claim 35, wherein the instructions are further executable by the processor to cause the apparatus to:

determine a WUS reception duration based at least on a signal quality of a reference signal and a probability of detection threshold, wherein WUS reception duration is less than the WUS time duration.

38. The apparatus of claim 37, wherein the WUS reception duration is determined based at least on the WUS transmission characteristic.

39. The apparatus of claim 37, wherein the instructions are further executable by the processor to cause the apparatus to:

receive the reference signal from the base station; and

measure the signal quality of the reference signal.

40. The apparatus of claim 35, wherein the instructions to receive the indication of the scaling factor are executable by the processor to cause the apparatus to:

receive a system information block (SIB) that comprises the indication of the scaling factor, a value of the scaling factor, or a combination thereof.

41. The apparatus of claim 40, wherein the instructions are further executable by the processor to cause the apparatus to:

receive a power offset parameter for the WUS in the SIB.

42. The apparatus of claim 41, wherein the instructions are further executable by the processor to cause the apparatus to:

determine that no higher layer signaling has been received to configure a power ratio;

wherein the power offset parameter comprises a fixed power ratio between ~~the~~a narrowband reference signal and the WUS.

43. The apparatus of claim 41, wherein the instructions are further executable by the processor to cause the apparatus to:

determine that no higher layer signaling has been received to configure a power ratio;

wherein the power offset parameter comprises a fixed power ratio between a cell-specific reference signal and the WUS, and wherein the WUS is associated with machine type communication (MTC).

44. The apparatus of claim 35, wherein the instructions are further executable by the processor to cause the apparatus to:

determine a maximum WUS time duration based at least on a ratio of a maximum repetition of an associated control channel and the scaling factor, wherein the

WUS time duration is based at least on the maximum WUS time duration, and wherein the associated control channel repetition parameter corresponds to a maximum number of repetitions of an associated narrowband control channel for paging.

45.————— The apparatus of claim 35, wherein the instructions are further executable by the processor to cause the apparatus to:

receive, from the base station, an indication of a transmit diversity dimension for transmission of the WUS, wherein the transmit diversity dimension is determined by a number of antennas switching on one antenna port every two subframes or by a number of antenna ports switching on all antenna ports every two subframes.

46.————— The apparatus of claim 35, wherein the WUS time duration is determined based at least on a predetermined WUS maximum duration.

47.————— The apparatus of claim 35, wherein the WUS transmission characteristic comprises a WUS transmit power, a WUS transmit diversity scheme, an indication of a legacy synchronization signal detection before WUS reception, a power ratio between the WUS and a narrowband reference signal, a maximum coupling loss (MCL) associated with the UE, or a combination thereof.

48.————— The apparatus of claim ~~47~~35, wherein a signal to noise ratio (SNR) is determined based at least on a power ratio between the WUS and a narrowband reference signal, and wherein a single port SNR is estimated for the WUS based at least on the SNR.

49.————— The apparatus of claim 47, wherein the scaling factor is based at least on a transmit diversity scheme that includes a pattern index of fixed patterns, with each pattern defining a number of fixed basic units and a transmit diversity dimension, or includes the number of fixed basic units and the transmit diversity dimension, the fixed basic ~~unit~~units comprising ~~a number of~~ subframes, ~~a~~ 1 millisecond transmission time ~~interval (TTI), a slot~~intervals (TTIs), slots, or ~~a~~ mini-~~slot.~~slots.

50.————— The apparatus of claim 35, wherein the instructions are further executable by the processor to cause the apparatus to:

receive a maximum number of repetitions of narrowband control channel transmissions in a system information block (SIB), wherein the WUS time duration is determined based at least on the maximum number of repetitions of the narrowband control channel transmissions.

51. The apparatus of claim 35, wherein the instructions are further executable by the processor to cause the apparatus to:

determine an early termination duration based at least on a target signal to noise ratio (SNR) or a maximum coupling loss (MCL) associated with the UE, wherein the WUS time duration is based at least on the early termination duration.

52. An apparatus for wireless communications, 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 an indication of a scaling factor associated with a wakeup signal (WUS) to a user equipment (UE), wherein the scaling factor is determined based at least on a WUS transmission characteristic; and

transmit, to the UE and for a WUS time duration, the WUS in accordance with the WUS transmission characteristic, wherein the WUS time duration is determined based at least on the scaling factor and an associated control channel repetition parameter.

53. The apparatus of claim 52, wherein the instructions are further executable by the processor to cause the apparatus to:

transmit, to the UE, an indication of the WUS time duration, wherein the WUS time duration is based at least on a target signal to noise ratio (SNR) or a maximum coupling loss (MCL) associated with the UE.

54. The apparatus of claim 52, wherein the instructions are further executable by the processor to cause the apparatus to:

transmit, to the UE, a reference signal, wherein the WUS time duration is based at least on a signal quality of the reference signal and a probability of detection

threshold, and wherein the reference signal comprises a narrowband reference signal or a cell-specific reference signal.

55. The apparatus of claim 52, wherein the instructions to transmit the indication of the scaling factor are executable by the processor to cause the apparatus to:

transmit a system information block (SIB) that comprises the indication of the scaling factor, a value of the scaling factor, or a combination thereof.

56. The apparatus of claim 55, wherein the SIB further comprises a power offset parameter that indicates a power ratio between a narrowband reference signal and the WUS.

57. The apparatus of claim 52, wherein the instructions are further executable by the processor to cause the apparatus to:

transmit, to the UE, an indication of a transmit diversity dimension for transmission of the WUS, wherein the transmit diversity dimension based at least on a number of antennas switching on one antenna port every two subframes or a number of antenna ports switching on all antenna ports every two subframes.

58. The apparatus of claim 52, wherein the WUS time duration is determined based at least on a predetermined maximum WUS time duration.

59. The apparatus of claim 52, wherein the WUS transmission characteristic comprises a WUS transmit power, a WUS transmit diversity scheme, an indication of a legacy synchronization signal detection of the UE before WUS detection, a power ratio between the WUS and a narrowband reference signal, a maximum coupling loss (MCL) associated with the UE, or a combination thereof.

60. The apparatus of claim ~~59~~52, wherein a signal to noise ratio (SNR) is determined based at least on a power ratio between the WUS and a narrowband reference signal, and wherein a single port SNR is estimated for the WUS based at least on the SNR.

61. The apparatus of claim 59, wherein the scaling factor is based at least on a transmit diversity scheme includes a pattern index of fixed patterns, with each pattern defining a number of fixed basic units and a transmit diversity dimension, or includes the

number of fixed basic units and the transmit diversity dimension, the fixed basic ~~unit~~units comprising ~~a number of~~ subframes, ~~a~~ 1 millisecond transmission time ~~interval (TTI), a slot~~intervals (TTIs), slots, or ~~a~~ mini-~~slot.~~slots.

62.———— The apparatus of claim 52, wherein the instructions are further executable by the processor to cause the apparatus to:

transmit a maximum number of repetitions of narrowband control channel transmissions in a system information block (SIB), wherein the WUS time duration is based at least on the maximum number of repetitions of the narrowband control channel transmissions.

63.———— The apparatus of claim 52, wherein the instructions are further executable by the processor to cause the apparatus to:

identify a signal to noise ratio (SNR) for the UE, wherein the scaling factor is determined based at least on the SNR.

64.———— An apparatus for wireless communications, comprising:

means for receiving, from a base station, an indication of a scaling factor associated with a wakeup signal (WUS), wherein the scaling factor is based at least on a WUS transmission characteristic;

means for receiving, from the base station and for a WUS time duration, the WUS in accordance with the WUS transmission characteristic, wherein the WUS time duration is determined based at least on the scaling factor and an associated control channel repetition parameter; and

means for monitoring a downlink channel from the base station for scheduling information based at least on the received WUS, wherein the scheduling information comprises information for a paging message from the base station.

65.———— The apparatus of claim 64, wherein the means for receiving the indication of the scaling factor comprises:

means for receiving a system information block (SIB) that comprises the indication of the scaling factor, a value of the scaling factor, or a combination thereof.

66.———— The apparatus of claim 64, further comprising:

means for receiving, from the base station, an indication of a transmit diversity dimension for transmission of the WUS.

67. The apparatus of claim 64, further comprising:

means for receiving a maximum number of repetitions of narrowband control channel transmissions in a system information block (SIB), wherein the WUS time duration ~~of the WUS~~ is determined based at least on the maximum number of repetitions of the narrowband control channel transmissions.

68. An apparatus for wireless communications, comprising:

means for transmitting an indication of a scaling factor associated with a wakeup signal (WUS) to a user equipment (UE), wherein the scaling factor is determined based at least on a WUS transmission characteristic; and

means for transmitting, to the UE and for a WUS time duration, the WUS in accordance with the WUS transmission characteristic, wherein the WUS time duration is determined based at least on the scaling factor and an associated control channel repetition parameter.

69. The apparatus of claim 68, wherein the means for transmitting the indication of the scaling factor comprises:

means for transmitting a system information block (SIB) that comprises the indication of the scaling factor, a value of the scaling factor, or a combination thereof.

70. The apparatus of claim 68, further comprising:

means for transmitting, to the UE, an indication of a transmit diversity dimension for transmission of the WUS.

71. The apparatus of claim 68, further comprising:

means for transmitting a maximum number of repetitions of narrowband control channel transmissions in a system information block (SIB), wherein the WUS time duration is based at least on the maximum number of repetitions of the narrowband control channel transmissions.

72. A non-transitory computer-readable medium storing code for wireless communications, the code comprising instructions executable by a processor to:

receive, from a base station, an indication of a scaling factor associated with a wakeup signal (WUS), wherein the scaling factor is based at least on a WUS transmission characteristic;

receive, from the base station and for a WUS time duration, the WUS in accordance with the WUS transmission characteristic, wherein the WUS time duration is determined based at least on the scaling factor and an associated control channel repetition parameter; and

monitor a downlink channel from the base station for scheduling information based at least on the received WUS, wherein the scheduling information comprises information for a paging information from the base station.

73. The non-transitory computer-readable medium of claim 72, wherein the instructions to receive the indication of the scaling factor are executable by the processor to:

receive a system information block (SIB) that comprises the indication of the scaling factor, a value of the scaling factor, or a combination thereof.

74. The non-transitory computer-readable medium of claim 72, wherein the instructions are further executable by the processor to:

receive, from the base station, an indication of a transmit diversity dimension for transmission of the WUS.

75. The non-transitory computer-readable medium of claim 72, wherein the instructions are further executable by the processor to:

receive a maximum number of repetitions of narrowband control channel transmissions in a system information block (SIB), wherein the WUS time duration is determined based at least on the maximum number of repetitions of the narrowband control channel transmissions.

76. A non-transitory computer-readable medium storing code for wireless communications, the code comprising instructions executable by a processor to:

transmit an indication of a scaling factor associated with a wakeup signal (WUS) to a user equipment (UE), wherein the scaling factor is determined based at least on a WUS transmission characteristic;

and transmit, to the UE and for a WUS time duration, the WUS in accordance with the WUS transmission characteristic, wherein the WUS time duration is determined based at least on the scaling factor and an associated control channel repetition parameter.

77. The non-transitory computer-readable medium of claim 76, wherein the instructions to transmit the indication of the scaling factor are executable by the processor to:

transmit a system information block (SIB) that comprises the indication of the scaling factor, a value of the scaling factor, or a combination thereof.

78. The non-transitory computer-readable medium of claim 76, wherein the instructions are further executable by the processor to:

transmit, to the UE, an indication of a transmit diversity dimension for transmission of the WUS.

79. The non-transitory computer-readable medium of claim 76, wherein the instructions are further executable by the processor to:

transmit a maximum number of repetitions of narrowband control channel transmissions in a system information block (SIB), wherein the WUS time duration is based at least on the maximum number of repetitions of the narrowband control channel transmissions.