

CLAIMS

1. A method of wireless communication of a base station, comprising: determining at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols; transmitting the at least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols to a user equipment (UE); determining a resource allocation scheme for a phase noise compensation reference signal (PC-RS) in relation to the one or more DM-RS symbols in the subframe, wherein the PC-RS is conveyed from the base station to the UE for the UE to estimate a phase noise of the UE; and transmitting the resource allocation scheme for the PC-RS to the UE.
2. The method of claim 1, wherein the transmitting of the resource allocation scheme for the PC-RS to the UE comprises sending the resource allocation scheme for the PC-RS to the UE dynamically via physical downlink control channel (PDCCH).
3. The method of claim 2, wherein one or more bits are reserved in downlink control information (DCI) to identify the resource allocation scheme for the PC-RS.
4. The method of claim 1, wherein the transmitting of the resource allocation scheme for the PC-RS to the UE comprises sending the resource allocation scheme for the PC-RS to the UE via radio resource control (RRC) signaling.
5. The method of claim 1, wherein the resource allocation scheme informs the UE to rate match the PC-RS around subcarriers of the one or more DM-RS symbols.
6. The method of claim 1, wherein the resource allocation scheme informs the UE to puncture the one or more DM-RS symbols in subcarriers that are reserved for the PC-RS.
7. The method of claim 1, wherein the resource allocation scheme informs the UE to puncture the PC-RS in the one or more DM-RS symbols.
8. A method of wireless communication of a base station, comprising: determining information to be conveyed by a physical downlink control channel (PDCCH); allocating a phase noise compensation reference signal (PC-RS) in relation to one or more demodulation reference signal (DM-RS) symbols; and transmitting the information to a user equipment (UE) via the PDCCH, wherein the PDCCH is punctured to accommodate the PC-RS conveyed from the base station to the UE for the UE to estimate a phase noise of the UE.
9. The method of claim 8, wherein the information comprises at least one of a number of the one or more DM-RS symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols.
10. The method of claim 9, wherein one or more bits are reserved in downlink control information (DCI) to identify the at least one of the number of the one or more DM-RS symbols

or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols.

11. The method of claim 9, wherein the number of the one or more DM-RS symbols is one, wherein the one or more locations comprise a first symbol of physical downlink shared channel (PDSCH).

12. The method of claim 9, wherein the number of the one or more DM-RS symbols is two, wherein the one or more locations comprise a first location at a beginning of physical downlink shared channel (PDSCH) and a second location in a middle of the PDSCH, the first location and the second location being separated by at least one symbol.

13. A method of wireless communication of a user equipment (UE), comprising: receiving at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols from a base station; decoding the one or more DM-RS symbols from the subframe based on the at least one of the number of the one or more DM-RS symbols or the one or more locations; receiving a resource allocation scheme for a phase noise compensation reference signal (PC-RS); and decoding the PC-RS from the subframe based on the resource allocation scheme for the PC-RS.

14. The method of claim 13, wherein the resource allocation scheme for the PC-RS is determined with regard to the one or more DM-RS symbols.

15. The method of claim 13, wherein the receiving of the resource allocation scheme for the PC-RS comprises receiving the resource allocation scheme for the PC-RS dynamically via physical downlink control channel (PDCCH).

16. The method of claim 15, wherein one or more bits are reserved in downlink control information (DCI) to identify the resource allocation scheme for the PC-RS.

17. The method of claim 13, wherein the receiving of the resource allocation scheme for the PC-RS comprises receiving the resource allocation scheme for the PC-RS via radio resource control (RRC) signaling.

18. The method of claim 13, wherein the resource allocation scheme informs the UE to rate match the PC-RS around subcarriers of the one or more DM-RS symbols.

19. The method of claim 13, wherein the resource allocation scheme informs the UE to puncture the one or more DM-RS symbols in subcarriers that are reserved for the PC-RS.

20. The method of claim 13, wherein the resource allocation scheme informs the UE to puncture the PC-RS in the one or more DM-RS symbols.

21. A method of wireless communication of a user equipment (UE), comprising: receiving a first information via a physical downlink control channel (PDCCH) from a base station, wherein the PDCCH is punctured to accommodate a phase noise compensation reference signal (PC-RS)

conveyed from the base station to the UE for the UE to estimate a phase noise of the UE, wherein the first information comprises at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols from the base station; and decoding the one or more DM-RS symbols from the subframe based on the at least one of the number of the one or more DM-RS symbols or the one or more locations.

22. The method of claim 21, wherein one or more bits are reserved in downlink control information (DCI) to identify the at least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols.

23. The method of claim 21, wherein the number of the one or more DM-RS symbols is one, wherein the one or more locations comprise a first symbol of physical downlink shared channel (PDSCH).

24. The method of claim 21, wherein the number of the one or more DM-RS symbols is two, wherein the one or more locations comprise a first location at a beginning of physical downlink shared channel (PDSCH) and a second location in a middle of the PDSCH, the first location and the second location being separated by at least one symbol.

25. An apparatus for wireless communication, the apparatus being a base station, comprising: means for determining at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols; means for transmitting the at least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols to a user equipment (UE); means for determining a resource allocation scheme for a phase noise compensation reference signal (PC-RS) in relation to the one or more DM-RS symbols in the subframe, wherein the PC-RS is conveyed from the base station to the UE for the UE to estimate a phase noise of the UE; and means for transmitting the resource allocation scheme for the PC-RS to the UE.

26. The apparatus of claim 25, wherein the means for transmitting the resource allocation scheme for the PC-RS to the UE is configured to send the resource allocation scheme for the PC-RS to the UE dynamically via physical downlink control channel (PDCCH).

27. The apparatus of claim 26, wherein one or more bits are reserved in downlink control information (DCI) to identify the resource allocation scheme for the PC-RS.

28. The apparatus of claim 25, wherein the means for transmitting the resource allocation scheme for the PC-RS to the UE is configured to send the resource allocation scheme for the PC-RS to the UE via radio resource control (RRC) signaling.

29. The apparatus of claim 25, wherein the resource allocation scheme informs the UE to rate match the PC-RS around subcarriers of the one or more DM-RS symbols.

30. The apparatus of claim 25, wherein the resource allocation scheme informs the UE to puncture the one or more DM-RS symbols in subcarriers that are reserved for the PC-RS.

31. The apparatus of claim 25, wherein the resource allocation scheme informs the UE to puncture the PC-RS in the one or more DM-RS symbols.

32. An apparatus for wireless communication, the apparatus being a base station, comprising: means for determining information to be conveyed by a physical downlink control channel (PDCCH); means for allocating a phase noise compensation reference signal (PC-RS) in relation to one or more demodulation reference signal (DM-RS) symbols; and means for transmitting the information to a user equipment (UE) via the PDCCH, wherein the PDCCH is punctured to accommodate the PC-RS conveyed from the base station to the UE for the UE to estimate a phase noise of the UE.

33. The apparatus of claim 32, wherein the information comprises at least one of a number of the one or more DM-RS symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols.

34. The apparatus of claim 33, wherein one or more bits are reserved in downlink control information (DCI) to identify the at least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols.

35. The apparatus of claim 33, wherein the number of the one or more DM-RS symbols is one, wherein the one or more locations comprise a first symbol of physical downlink shared channel (PDSCH).

36. The apparatus of claim 33, wherein the number of the one or more DM-RS symbols is two, wherein the one or more locations comprise a first location at a beginning of physical downlink shared channel (PDSCH) and a second location in a middle of the PDSCH, the first location and the second location being separated by at least one symbol.

37. An apparatus for wireless communication, the apparatus being a user equipment (UE), comprising: means for receiving at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols from a base station; means for decoding the one or more DM-RS symbols from the subframe based on the at least one of the number of the one or more DM-RS symbols or the one or more locations; means for receiving a resource allocation scheme for a phase noise compensation reference signal (PC-RS); and means for decoding the PC-RS from the subframe based on the resource allocation scheme for the PC-RS.

38. The apparatus of claim 37, wherein the resource allocation scheme for the PC-RS is determined with regard to the one or more DM-RS symbols.

39. The apparatus of claim 37, wherein the means for receiving the resource allocation scheme for the PC-RS is configured to receive the resource allocation scheme for the PC-RS dynamically

via physical downlink control channel (PDCCH).

40. The apparatus of claim 39, wherein one or more bits are reserved in downlink control information (DCI) to identify the resource allocation scheme for the PC-RS.

41. The apparatus of claim 37, wherein the means for receiving the resource allocation scheme for the PC-RS is configured to receive the resource allocation scheme for the PC-RS via radio resource control (RRC) signaling.

42. The apparatus of claim 37, wherein the resource allocation scheme informs the UE to rate match the PC-RS around subcarriers of the one or more DM-RS symbols.

43. The apparatus of claim 37, wherein the resource allocation scheme informs the UE to puncture the one or more DM-RS symbols in subcarriers that are reserved for the PC-RS.

44. The apparatus of claim 37, wherein the resource allocation scheme informs the UE to puncture the PC-RS in the one or more DM-RS symbols.

45. An apparatus for wireless communication, the apparatus being a user equipment (UE), comprising: means for receiving a first information via a physical downlink control channel (PDCCH) from a base station, wherein the PDCCH is punctured to accommodate a phase noise compensation reference signal (PC-RS) conveyed from the base station to the UE for the UE to estimate a phase noise of the UE, wherein the first information comprises at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols from the base station; and decoding the one or more DM-RS symbols from the subframe based on the at least one of the number of the one or more DM-RS symbols or the one or more locations.

46. The apparatus of claim 45, wherein one or more bits are reserved in downlink control information (DCI) to identify the at least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols.

47. The apparatus of claim 45, wherein the number of the one or more DM-RS symbols is one, wherein the one or more locations comprise a first symbol of physical downlink shared channel (PDSCH).

48. The apparatus of claim 45, wherein the number of the one or more DM-RS symbols is two, wherein the one or more locations comprise a first location at a beginning of physical downlink shared channel (PDSCH) and a second location in a middle of the PDSCH, the first location and the second location being separated by at least one symbol.

49. An apparatus for wireless communication, the apparatus being a base station, comprising: a memory; and at least one processor coupled to the memory and configured to: determine at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols; transmit the at

least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols to a user equipment (UE); determine a resource allocation scheme for a phase noise compensation reference signal (PC-RS) in relation to the one or more DM-RS symbols in the subframe, wherein the PC-RS is conveyed from the base station to the UE for the UE to estimate a phase noise of the UE; and transmit the resource allocation scheme for the PC-RS to the UE.

50. The apparatus of claim 49, wherein, to transmit the resource allocation scheme for the PC-RS to the UE, the at least one processor is configured to send the resource allocation scheme for the PC-RS to the UE dynamically via physical downlink control channel (PDCCH).

51. The apparatus of claim 50, wherein one or more bits are reserved in downlink control information (DCI) to identify the resource allocation scheme for the PC-RS.

52. The apparatus of claim 49, wherein, to transmit the resource allocation scheme for the PC-RS to the UE, the at least one processor is configured to send the resource allocation scheme for the PC-RS to the UE via radio resource control (RRC) signaling.

53. The apparatus of claim 49, wherein the resource allocation scheme informs the UE to rate match the PC-RS around subcarriers of the one or more DM-RS symbols.

54. The apparatus of claim 49, wherein the resource allocation scheme informs the UE to puncture the one or more DM-RS symbols in subcarriers that are reserved for the PC-RS.

55. The apparatus of claim 49, wherein the resource allocation scheme informs the UE to puncture the PC-RS in the one or more DM-RS symbols.

56. An apparatus for wireless communication, the apparatus being a base station, comprising: a memory; and at least one processor coupled to the memory and configured to: determine information to be conveyed by a physical downlink control channel (PDCCH); allocate a phase noise compensation reference signal (PC-RS) in relation to one or more demodulation reference signal (DM-RS) symbols; and transmit the information to a user equipment (UE) via the PDCCH, wherein the PDCCH is punctured to accommodate the PC-RS conveyed from the base station to the UE for the UE to estimate a phase noise of the UE.

57. The apparatus of claim 56, wherein the information comprises at least one of a number of the one or more DM-RS symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols.

58. The apparatus of claim 57, wherein one or more bits are reserved in downlink control information (DCI) to identify the at least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols.

59. The apparatus of claim 57, wherein the number of the one or more DM-RS symbols is one, wherein the one or more locations comprise a first symbol of physical downlink shared channel

(PDSCH).

60. The apparatus of claim 57, wherein the number of the one or more DM-RS symbols is two, wherein the one or more locations comprise a first location at a beginning of physical downlink shared channel (PDSCH) and a second location in a middle of the PDSCH, the first location and the second location being separated by at least one symbol.

61. An apparatus for wireless communication, the apparatus being a user equipment (UE), comprising: a memory; and at least one processor coupled to the memory and configured to: receive at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols from a base station; decode the one or more DM-RS symbols from the subframe based on the at least one of the number of the one or more DM-RS symbols or the one or more locations; receive a resource allocation scheme for a phase noise compensation reference signal (PC-RS); and decode the PC-RS from the subframe based on the resource allocation scheme for the PC-RS.

62. The apparatus of claim 61, wherein the resource allocation scheme for the PC-RS is determined with regard to the one or more DM-RS symbols.

63. The apparatus of claim 61, wherein, to receive the resource allocation scheme for the PC-RS, the at least one processor is configured to receive the resource allocation scheme for the PC-RS dynamically via physical downlink control channel (PDCCH).

64. The apparatus of claim 63, wherein one or more bits are reserved in downlink control information (DCI) to identify the resource allocation scheme for the PC-RS.

65. The apparatus of claim 61, wherein, to receive the resource allocation scheme for the PC-RS, the at least one processor is configured to receive the resource allocation scheme for the PC-RS via radio resource control (RRC) signaling.

66. The apparatus of claim 61, wherein the resource allocation scheme informs the UE to rate match the PC-RS around subcarriers of the one or more DM-RS symbols.

67. The apparatus of claim 61, wherein the resource allocation scheme informs the UE to puncture the one or more DM-RS symbols in subcarriers that are reserved for the PC-RS.

68. The apparatus of claim 61, wherein the resource allocation scheme informs the UE to puncture the PC-RS in the one or more DM-RS symbols.

69. An apparatus for wireless communication, the apparatus being a user equipment (UE), comprising: a memory; and at least one processor coupled to the memory and configured to: receive a first information via a physical downlink control channel (PDCCH) from a base station, wherein the PDCCH is punctured to accommodate a phase noise compensation reference signal (PC-RS) conveyed from the base station to the UE for the UE to estimate a phase noise of the UE, wherein the first information comprises at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for

transmission of the one or more DM-RS symbols from the base station; and decode the one or more DM-RS symbols from the subframe based on the at least one of the number of the one or more DM-RS symbols or the one or more locations.

70. The apparatus of claim 69, wherein one or more bits are reserved in downlink control information (DCI) to identify the at least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols.

71. The apparatus of claim 69, wherein the number of the one or more DM-RS symbols is one, wherein the one or more locations comprise a first symbol of physical downlink shared channel (PDSCH).

72. The apparatus of claim 69, wherein the number of the one or more DM-RS symbols is two, wherein the one or more locations comprise a first location at a beginning of physical downlink shared channel (PDSCH) and a second location in a middle of the PDSCH, the first location and the second location being separated by at least one symbol.

73. A non-transitory computer-readable medium storing computer executable code, comprising code to: determine at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols; transmit the at least one of the number of the one or more DM-RS symbols or the one or more locations within the subframe for the transmission of the one or more DM-RS symbols to a user equipment (UE); determine a resource allocation scheme for a phase noise compensation reference signal (PC-RS) in relation to the one or more DM-RS symbols in the subframe, wherein the PC-RS is conveyed from a base station to the UE for the UE to estimate a phase noise of the UE; and transmit the resource allocation scheme for the PC-RS to the UE.

74. A non-transitory computer-readable medium storing computer executable code, comprising code to: determine information to be conveyed by a physical downlink control channel (PDCCH); allocate a phase noise compensation reference signal (PC-RS) in relation to one or more demodulation reference signal (DM-RS) symbols; and transmit the information to a user equipment (UE) via the PDCCH, wherein the PDCCH is punctured to accommodate the PC-RS conveyed from a base station to the UE for the UE to estimate a phase noise of the UE.

75. A non-transitory computer-readable medium storing computer executable code, comprising code to: receive at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols from a base station; decode the one or more DM-RS symbols from the subframe based on the at least one of the number of the one or more DM-RS symbols or the one or more locations; receive a resource allocation scheme for a phase noise compensation reference signal (PC-RS); and decode the PC-RS from the subframe based on the resource allocation scheme for the PC-RS.

76. A non-transitory computer-readable medium storing computer executable code, comprising code to: receive a first information via a physical downlink control channel (PDCCH) from a

base station, wherein the PDCCH is punctured to accommodate a phase noise compensation reference signal (PC-RS) conveyed from the base station to user equipment (UE) for the UE to estimate a phase noise of the UE, wherein the first information comprises at least one of a number of one or more demodulation reference signal (DM-RS) symbols or one or more locations within a subframe for transmission of the one or more DM-RS symbols from the base station; and decode the one or more DM-RS symbols from the subframe based on the at least one of the number of the one or more DM-RS symbols or the one or more locations.