~~WHAT IS~~ CLAIM~~ED IS~~:

1. ~~A method for operating user equipment (UE), comprising:~~

~~generating, by the UE, a transmit precoding matrix indicator (TPMI) list comprising one or more TPMIs selected from a set of available TPMIs stored at a base station (BS);~~

~~transmitting, to the BS, data indicative of the TPMI list;~~

~~transmitting, to the BS, an index of the TPMI list;~~

~~receiving, from the BS, downlink control information (DCI) including an indication of at least one TPMI from the TPMI list based on the index; and~~

~~transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) using the at least one TPMI.~~

2. ~~The method of claim 1, wherein the index of the TPMI list is transmitted to the BS per frequency band per frequency band combination.~~

3. ~~The method of claim 1, wherein the TPMI list is transmitted to the BS in one or more capability reporting messages.~~

4. ~~The method of claim 1, further comprising:~~

~~altering, by the UE, the TPMI list to produce a second TPMI list, the second TPMI list comprising at least one TPMI from the set of available TPMIs that is different from the one or more TPMIs of the TPMI list; and~~

~~transmitting, to the BS, data indicative of the second TPMI list.~~

5. ~~The method of claim 1, wherein the one or more TPMIs are arbitrarily selected from the set of available TPMIs.~~

6. ~~The method of claim 1, wherein the TPMI list is stored as a TPMI group for the UE at the BS, and wherein the index comprises an index of the TPMI group.~~

7. The method of claim 1, wherein the TPMI list comprises a bitmap indicative of the one or more TPMIs.

8. The method of claim 1, wherein the one or more TPMIs in the TPMI list support full power transmission by the UE.

9. The method of claim 1, wherein the uplink data is transmitted at full power by the UE using the at least one TPMI.

10. A user equipment (UE), comprising:

one or more processors, and

memory storing instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

generating, by the UE, a transmit precoding matrix indicator (TPMI) list comprising one or more TPMIs selected from a set of available TPMIs stored at a base station (BS);

transmitting, to the BS, data indicative of the TPMI list;

transmitting, to the BS, an index of the TPMI list;

receiving, from the BS, downlink control information (DCI) including an indication of at least one TPMI from the TPMI list based on the index; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) using the at least one TPMI.

11. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform operations comprising:

generating, at a user equipment (UE), a transmit precoding matrix indicator (TPMI) list comprising one or more TPMIs selected from a set of available TPMIs stored at a base station (BS);

transmitting, to the BS, data indicative of the TPMI list;

transmitting, to the BS, an index of the TPMI list;

receiving, from the BS, downlink control information (DCI) including an indication of at least one TPMI from the TPMI list based on the index; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) using the at least one TPMI.

12. A method for operating a base station (BS), comprising:

receiving, from a user equipment (UE), data indicative of a transmit precoding matrix indicator (TPMI) list generated by the UE, the TPMI list comprising one or more TPMIs selected from a set of available TPMIs stored at the BS;

receiving, from the UE, an index of the TPMI list;

transmitting, to the UE, downlink control information (DCI) including an indication of at least one TPMI from the TPMI list based on the index; and

receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the at least one TPMI.

13. The method of claim 12, wherein the index of the TPMI list is received from the UE per frequency band per frequency band combination.

14. The method of claim 12, wherein the TPMI list is received in one or more capability reporting messages from the UE.

15. The method of claim 12, further comprising:

receiving, from the UE, a second TPMI list comprising at least one TPMI from the set of available TPMIs that is different from the one or more TPMIs of the TPMI list; and

transmitting, to the UE, the DCI including an indication of the at least one TPMI from the second TPMI list.

16. The method of claim 12, wherein the TMPI list generated by the UE is stored at the BS, and wherein the index of the TPMI list is received from the UE per frequency band per frequency band combination to indicate the at least one TPMI from the TPMI list supporting full power transmission.

17. The method of claim 12, wherein the TPMI list is stored as a TPMI group for the UE at the BS, and wherein the index comprises an index of the TPMI group.

18. The method of claim 12, wherein the TPMI list comprises a bitmap indicative of the one or more TPMIs.

19. The method of claim 12, wherein the one or more TPMIs in the TPMI list support full power transmission by the UE.

20. The method of claim 12, wherein the wherein the TPMI list is stored as a TPMI group for the UE at the BS, and wherein the index comprises an index of the TPMI group.

21. A base station (BS), comprising:

one or more processors; and

memory storing instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

receiving, from a user equipment (UE), data indicative of a transmit precoding matrix indicator (TPMI) list generated by the UE, the TPMI list comprising one or more TPMIs selected from a set of available TPMIs stored at the BS;

receiving, from the UE, an index of the TPMI list;

transmitting, to the UE, downlink control information (DCI) including an indication of at least one TPMI from the TPMI list based on the index; and

receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the at least one TPMI.

22. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform operations comprising:

receiving, from a user equipment (UE), data indicative of a transmit precoding matrix indicator (TPMI) list generated by the UE, the TPMI list comprising one or more TPMIs selected from a set of available TPMIs stored at the BS;

receiving, from the UE, an index of the TPMI list;

transmitting, to the UE, downlink control information (DCI) including an indication of at least one TPMI from the TPMI list based on the index; and

receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the at least one TPMI.

23. A method for operating user equipment (UE), comprising:

transmitting, to a base station (BS), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode without reporting a transmit precoding matrix indicator (TPMI) group for full power transmission;

receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message is determined based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message.

24. The method of claim 23, wherein the RRC message includes information for allocation of a SRS resource based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission.

25. The method of claim 24, wherein the SRS resource comprises a 1-port SRS to support rank one full power uplink transmission with antenna virtualization by the UE.

26. The method of claim 24, wherein the SRS resource comprises a 2-port SRS to support rank two full power uplink transmission with antenna virtualization by the UE.

27. The method of claim 23, wherein the RRC message includes indication of a TPMI for rank three full power transmission by the UE.

28. The method of claim 23, wherein the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission comprises an indication that no additional SRS resources are needed by the UE.

29. The method of claim 23, wherein the full power uplink transmission mode comprises a mode two full power uplink transmission mode.

30. A user equipment (UE), comprising:

one or more processors; and

memory storing instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

transmitting, to a base station (BS), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode without reporting a transmit precoding matrix indicator (TPMI) group for full power transmission;

receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message is determined based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message.

31. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform operations comprising:

transmitting, to a base station (BS), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode without reporting a transmit precoding matrix indicator (TPMI) group for full power transmission;

receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message is determined based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message.

32. A method for operating a base station (BS), comprising:

receiving, from a user equipment (UE), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode without reporting a transmit precoding matrix indicator (TPMI) group for full power transmission;

generating a radio resource control (RRC) message for configuring the UE for full power uplink transmission based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission;

transmitting, to the UE, the RRC message; and

receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the RRC message.

33. The method of claim 32, further comprising:

allocating a SRS resource in the RRC message based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission.

34. The method of claim 33, wherein the SRS resource comprises a 1-port SRS to support rank one full power uplink transmission with antenna virtualization by the UE.

35. The method of claim 33, wherein the SRS resource comprises a 2-port SRS to support rank two full power uplink transmission with antenna virtualization by the UE.

36. The method of claim 32, wherein the RRC message includes an indication of a TPMI for rank three full power transmission by the UE.

37. The method of claim 32, wherein generating the RRC message comprises determining that that no additional SRS resources are needed by the UE based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission.

38. The method of claim 32, wherein the full power uplink transmission mode comprises a mode two full power uplink transmission mode.

39. A base station (BS), comprising:

one or more processors; and

memory storing instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

receiving, from a user equipment (UE), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode without reporting a transmit precoding matrix indicator (TPMI) group for full power transmission;

generating a radio resource control (RRC) message for configuring the UE for full power uplink transmission based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission;

transmitting, to the UE, the RRC message; and

receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the RRC message.

40. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform operations comprising:

receiving, from a user equipment (UE), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode without reporting a transmit precoding matrix indicator (TPMI) group for full power transmission;

generating a radio resource control (RRC) message for configuring the UE for full power uplink transmission based on the indication that the UE is capable of operating in the full power uplink transmission mode without reporting the TPMI group for full power transmission;

transmitting, to the UE, the RRC message; and

receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the RRC message.

41. A method for operating user equipment (UE), comprising:

transmitting, to a base station (BS), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode and a bitmap indicating one or more transmit precoding matrix indicators (TPMIs) for full power transmission;

receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message is determined based

on the indication that the UE is capable of operating in the full power uplink transmission mode and the bitmap indicating one or more TPMIs for full power transmission; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message.

42. The method of claim 41, wherein the UE comprises two ports, and wherein the bitmap is (1, 1).

43. The method of claim 42, wherein the RRC message includes information for allocation of a SRS resource comprising a 1-port SRS to support rank one full power uplink transmission with antenna virtualization by the UE.

44. The method of claim 42, wherein the indication that the UE is capable of operating in the full power uplink transmission mode with the bitmap (1, 1) comprises an indication that no additional SRS resources are needed by the UE.

45. The method of claim 42, wherein the indication that the UE is capable of operating in the full power uplink transmission mode with the bitmap (1, 1) comprises an indication that UE requires power amplifier (PA) to physical layer (PHY) antenna switching or additional switching delay between TPMI, or both.

46. The method of claim 41, wherein the UE comprises two ports, and wherein the bitmap is (0, 0).

47. The method of claim 46, wherein the RRC message includes information for allocation of a SRS resource comprising a 1-port SRS to support rank one full power uplink transmission with antenna virtualization by the UE.

48. A user equipment (UE), comprising:

one or more processors; and

memory storing instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

transmitting, to a base station (BS), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode and a bitmap indicating one or more transmit precoding matrix indicators (TPMIs) for full power transmission;

receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message is determined based on the indication that the UE is capable of operating in the full power uplink transmission mode and the bitmap indicating one or more TPMIs for full power transmission; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message.

49. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform operations comprising:

transmitting, to a base station (BS), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode and a bitmap indicating one or more transmit precoding matrix indicators (TPMIs) for full power transmission;

receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message is determined based on the indication that the UE is capable of operating in the full power uplink transmission mode and the bitmap indicating one or more TPMIs for full power transmission; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message.

50. A method for operating a base station (BS), comprising:

receiving, from a user equipment (UE), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full

power uplink transmission mode and a bitmap indicating one or more transmit precoding matrix indicators (TPMIs) for full power transmission;

generating a radio resource control (RRC) message for configuring the UE for full power uplink transmission based on the indication that the UE is capable of operating in the full power uplink transmission mode and the bitmap indicating one or more TPMIs for full power transmission;

transmitting, to the UE, the RRC message; and

receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the RRC message.

51. The method of claim 50, wherein the UE comprises two ports, and wherein the bitmap is (1, 1).

52. The method of claim 51, further comprising:

allocating a SRS resource in the RRC message comprising a 1-port SRS to support rank one full power uplink transmission with antenna virtualization by the UE.

53. The method of claim 51, wherein the indication that the UE is capable of operating in the full power uplink transmission mode with the bitmap (1, 1) comprises an indication that no additional SRS resources are needed by the UE.

54. The method of claim 51, wherein the indication that the UE is capable of operating in the full power uplink transmission mode with the bitmap (1, 1) comprises an indication that UE requires power amplifier (PA) to physical layer (PHY) antenna switching or additional switching delay between TPMI, or both.

55. The method of claim 50, wherein the UE comprises two ports, and wherein the bitmap is (0, 0).

56. The method of claim 55, further comprising:

~~allocating a SRS resource in the RRC message comprising a 1-port SRS to support rank one full power uplink transmission with antenna virtualization by the UE.~~

~~57. A base station (BS), comprising:~~

~~one or more processors; and~~

~~memory storing instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:~~

~~receiving, from a user equipment (UE), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode and a bitmap indicating one or more transmit precoding matrix indicators (TPMIs) for full power transmission;~~

~~generating a radio resource control (RRC) message for configuring the UE for full power uplink transmission based on the indication that the UE is capable of operating in the full power uplink transmission mode and the bitmap indicating one or more TPMIs for full power transmission;~~

~~transmitting, to the UE, the RRC message; and~~

~~receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the RRC message.~~

~~58. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform operations comprising:~~

~~receiving, from a user equipment (UE), capability information for the UE, the capability information including an indication that the UE is capable of operating in a full power uplink transmission mode and a bitmap indicating one or more transmit precoding matrix indicators (TPMIs) for full power transmission;~~

~~generating a radio resource control (RRC) message for configuring the UE for full power uplink transmission based on the indication that the UE is capable of operating in the full power uplink transmission mode and the bitmap indicating one or more TPMIs for full power transmission;~~

~~transmitting, to the UE, the RRC message; and~~

~~receiving, from the UE, uplink data from a physical uplink shared channel (PUSCH) based on the RRC message.~~

~~59~~1. A method for operating user equipment (UE), comprising:

transmitting, to a base station (BS), capability information for the UE, the capability information including a first capability for a first number of ports and a second capability for a second number of ports, the second number of ports being less than the first number of ports;

receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message includes at least one sounding reference signal (SRS) resource including the second number of ports; and

transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message.

~~60~~2. The method of claim ~~59~~1, wherein the first capability comprises an indication of one or more transmit precoding matrix indicators (TPMIs) for full power transmission using the first number of ports, and wherein the second capability comprises an indication of one or more TPMIs for full power transmission using the second number of ports.

~~61~~3. The method of claim ~~59~~1, wherein the second capability comprises an indication of a TPMI group for the second number of ports, and wherein the SRS resource is mapped to the TPMI group.

~~62~~4. The method of claim ~~59~~1, wherein the RRC message configures the UE for full power uplink transmission based on the second capability.

~~63~~5. The method of claim ~~59~~1, wherein the RRC message includes a second SRS resource with the first number of ports.

6. The method of claim 1, wherein transmission of the second capability information for the second number of ports that is less than the first number of ports comprises an indication that the UE supports full power uplink transmission using the second number of ports.

7. The method of claim 1, wherein transmission of the second capability information for the second number of ports that is less than the first number of ports comprises an indication that the UE supports full power uplink transmission for multiple transmit precoding matrix indicators (TPMIs) of a particular rank or for a particular TPMI of the particular rank.

~~6~~8. A user equipment (UE), comprising:

one or more processors; and

memory storing instructions that, when executed by the one or more processors, cause the one or more processors to perform the method of any one of claims 1-7~~operations comprising:~~

~~transmitting, to a base station (BS), capability information for the UE, the capability information including a first capability for a first number of ports and a second capability for a second number of ports, the second number of ports being less than the first number of ports;~~

~~receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message includes at least one sounding reference signal (SRS) resource including the second number of ports; and~~

~~transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message~~.

~~6~~9. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform the method of any one of claims 1-7~~operations comprising:~~

~~transmitting, to a base station (BS), capability information for the UE, the capability information including a first capability for a first number of ports and a second capability for a second number of ports, the second number of ports being less than the first number of ports;~~

~~receiving, from the BS, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message includes at least one sounding reference signal (SRS) resource including the second number of ports; and~~

~~transmitting, to the BS, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message~~.

~~66~~10. A method for a base station (BS), comprising:

receiving, from a user equipment (UE), capability information for the UE, the capability information including a first capability for a first number of ports and a second capability for a second number of ports, the second number of ports being less than the first number of ports;

transmitting, to the UE, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message includes at least one sounding reference signal (SRS) resource including the second number of ports; and

receiving, from the UE, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message.

~~67~~11. The method of claim ~~66~~10, wherein the first capability comprises an indication of one or more transmit precoding matrix indicators (TPMIs) for full power transmission using the first number of ports, and wherein the second capability comprises an indication of one or more TPMIs for full power transmission using the second number of ports.

~~68~~12. The method of claim ~~66~~10, wherein the second capability comprises an indication of a TPMI group for the second number of ports, and wherein the SRS resource is mapped to the TPMI group.

~~69~~13. The method of claim ~~66~~10, wherein the RRC message configures the UE for full power uplink transmission based on the second capability.

~~70~~14. The method of claim ~~66~~10, wherein the RRC message includes a second SRS resource with the first number of ports.

15. The method of claim 10, comprising:

determining that the UE supports full power uplink transmission using the second number of ports based on receipt of the second capability information for the second number of ports that is less than the first number of ports.

16. The method of claim 15, wherein determining that the UE supports full power uplink transmission using the second number of ports includes determining that the UE supports full power uplink transmission for multiple transmit precoding matrix indicators (TPMIs) of a particular rank or for a particular TPMI of the particular rank.

~~71~~17. A base station (BS), comprising:

one or more processors; and

memory storing instructions that, when executed by the one or more processors, cause the one or more processors to perform the method of any one of claims 10-16 ~~operations comprising:~~

~~receiving, from a user equipment (UE), capability information for the UE, the capability information including a first capability for a first number of ports and a second capability for a second number of ports, the second number of ports being less than the first number of ports;~~

~~transmitting, to the UE, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message includes at least one sounding reference signal (SRS) resource including the second number of ports; and~~

~~receiving, from the UE, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message~~.

~~72~~18. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform the method of any one of claims 10-16~~operations comprising:~~

~~receiving, from a user equipment (UE), capability information for the UE, the capability information including a first capability for a first number of ports and a second capability for a second number of ports, the second number of ports being less than the first number of ports;~~

~~transmitting, to the UE, a radio resource control (RRC) message for configuring the UE for full power uplink transmission, wherein the RRC message includes at least one sounding reference signal (SRS) resource including the second number of ports; and~~

~~receiving, from the UE, uplink data using a physical uplink shared channel (PUSCH) based on the RRC message~~.