CLAIMS

1. A method of wireless communication, comprising: determining to provide a multi-user multiple-input-multiple-output (MU-MIMO) transmission to a plurality of user equipments (UEs) over a same set of resource blocks; generating a downlink control information (DCI) message for each UE of the plurality of UEs indicating a downlink (DL) grant of the set of resource blocks, each DCI message comprising an MU-MIMO assistance information field; and transmitting the generated DCI messages to the plurality of UEs; wherein each DCI message indicates a spatial layer assignment for a corresponding UE in the MU-MIMO transmission; and wherein the MU-MIMO assistance information field indicates, for the corresponding UE, whether one or more other spatial layers are assigned to at least one other UE.

2. The method of claim 1, wherein each DCI message indicates an orthogonal cover coding (OCC) for the corresponding UE in the MU-MIMO transmission, and wherein the MU-MIMO assistance information field provides the corresponding UE with interference information to perform data reception.

3. The method of claim 2, wherein the MU-MIMO assistance information field further indicates a modulation order for each other spatial layer of the one or more other spatial layers of the MU-MIMO transmission.

4. The method of claim 3, wherein the MU-MIMO assistance information field comprises a set of bits indicating whether the one or more other spatial layers are assigned to the at least one other UE and the modulation order for each other spatial layer of the one or more other spatial layers assigned to the at least one other UE, and wherein the modulation order for each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 QAM, or 256 QAM.

5. The method of claim 3, wherein the MU-MIMO assistance information field comprises a set of bits indicating whether the one or more other spatial layers are assigned to the at least one other UE and the modulation order for each other spatial

layer of the one or more other spatial layers assigned to the at least one other UE, and wherein the modulation order for each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 or higher QAM.

6. The method of claim 5, wherein the one or more other spatial layers comprise two or fewer other spatial layers assigned to the at least one other UE, and the modulation order for each other spatial layer of the two or fewer other spatial layers indicates one of QPSK modulation, 16 QAM, 64 QAM, or 256 QAM.

7. The method of claim 2, wherein the MU-MIMO assistance information field comprises a set of bits indicating whether the one or more other spatial layers are assigned to the at least one other UE.

8. The method of claim 7, wherein the one or more other spatial layers comprise one other spatial layer, and the set of bits further indicate whether the one other spatial layer is assigned and indicate a modulation order of the one other spatial layer for MU-MIMO transmission.

9. The method of claim 1, wherein the MU-MIMO assistance information field comprises a set of bits indicating whether one or more other spatial layers are assigned to at least one other UE and a modulation order for each other spatial layer, including other spatial layers associated with a different scrambling identity, in the MU-MIMO transmission, and wherein the modulation order for each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 QAM, or 256 QAM.

10. The method of claim 1, wherein the MU-MIMO assistance information field indicates a usage of a non-orthogonal demodulation reference signal (DMRS) port.

11. The method of claim 10, wherein the MU-MIMO assistance information field comprises a set of bits, each bit of the set of bits indicating the usage of one non-orthogonal DMRS port, or comprises 1 bit indicating whether any non-orthogonal DMRS port is used.

12. A method of wireless communication by a user equipment (UE), comprising: receiving a downlink control information (DCI) message indicating a downlink (DL) grant of a set of resource blocks shared by other UEs for a multi-user multiple-input-multiple-output (MU-MIMO) transmission, the DCI message comprising an MU-MIMO assistance information field; receiving the set of resource blocks on at least one spatial layer of the MU-MIMO transmission based on the DL grant; and processing the set of resource blocks based on the MU-MIMO assistance information field; wherein the DCI message indicates an assignment of the at least one spatial layer for the UE in the MU-MIMO transmission; and wherein the MU-MIMO assistance information field indicates whether one or more other spatial layers of the MU-MIMO transmission are assigned to at least one other UE.

13. The method of claim 12, wherein the DCI message indicates an assignment of an orthogonal cover coding (OCC) for the UE in the MU-MIMO transmission.

14. The method of claim 13, wherein the MU-MIMO assistance information field further indicates a modulation order for each other spatial layer of the one or more other spatial layers assigned to the at least one other UE for the MU-MIMO transmission.

15. The method of claim 14, wherein the modulation order for the each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 QAM, or 256 QAM.

16. The method of claim 14, wherein the modulation order for the each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 or higher QAM.

17. The method of claim 16, wherein the one or more other spatial layers comprise two or fewer other spatial layers assigned to the at least one other UE, and the modulation order for each other spatial layer of the two or fewer other spatial layers indicates one of QPSK modulation, 16 QAM, 64 QAM, or 256 QAM.

18. The method of claim 13, wherein the MU-MIMO assistance information field

comprises 3 bits indicating whether the one or more other spatial layers are assigned to the at least one other UE.

19. The method of claim 18, wherein the one or more other spatial layers comprise one other spatial layer, and the 3 bits further indicate whether the one other spatial layer is assigned and the modulation order of the other spatial layer for MU-MIMO transmission.

20. The method of claim 12, wherein the MU-MIMO assistance information field indicates whether one or more other spatial layers are assigned to at least one other UE and a modulation order for each other spatial layer of the one or more other spatial layers, including other spatial layers associated with a different scrambling identity, in the MU-MIMO transmission, and wherein the modulation order for each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 QAM, or 256 QAM.

21. The method of claim 12, wherein the MU-MIMO assistance information field indicates a usage of a non-orthogonal demodulation reference signal (DMRS) port.

22. The method of claim 21, wherein the MU-MIMO assistance field comprises a set of bits, a bit of the set of bits indicating the usage of one non-orthogonal DMRS port or comprises 1 bit to indicate whether any non-orthogonal DMRS port is used.

23. The method of claim 12, wherein the at least one spatial layer comprises a demodulation reference signal, and wherein the processing comprises: performing channel estimation based on the received demodulation reference signal and the MU-MIMO assistance information field.

24. An apparatus for wireless communication, comprising: a memory; and at least one processor coupled to the memory and configured to: determine to provide a multi-user multiple-input-multiple-output (MU-MIMO) transmission to a plurality of user equipments (UEs) over a same set of resource blocks; generate a downlink control information (DCI) message for each UE of the plurality of UEs indicating a downlink (DL) grant of the set of resource blocks, each DCI message comprising an MU-MIMO

assistance information field; and transmit the generated DCI messages to the plurality of UEs; wherein each DCI message indicates a spatial layer assignment for a corresponding UE in the MU-MIMO transmission; and wherein the MU-MIMO assistance information field indicates, for the corresponding UE, whether one or more other spatial layers are assigned to at least one other UE.

25. The apparatus of claim 24, wherein each DCI message indicates an orthogonal cover coding (OCC) for the corresponding UE in the MU-MIMO transmission, and wherein the MU-MIMO assistance information field provides the corresponding UE with interference information to perform data reception.

26. The apparatus of claim 25, wherein the MU-MIMO assistance information field further indicates a modulation order for each other spatial layer of the one or more other spatial layers of the MU-MIMO transmission.

27. The apparatus of claim 26, wherein the MU-MIMO assistance information field comprises a set of bits indicating whether the one or more other spatial layers are assigned to the at least one other UE and the modulation order for each other spatial layer of the one or more other spatial layers assigned to the at least one other UE, and wherein the modulation order for each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 QAM, or 256 QAM.

28. The apparatus of claim 26, wherein the MU-MIMO assistance information field comprises a set of bits indicating whether the one or more other spatial layers are assigned to the at least one other UE and the modulation order for each other spatial layer of the one or more other spatial layers assigned to the at least one other UE, and wherein the modulation order for each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 or higher QAM.

29. The apparatus of claim 28, wherein the one or more other spatial layers comprise two or fewer other spatial layers assigned to the at least one other UE, and the modulation order for each other spatial layer of the two or fewer other spatial layers

indicates one of QPSK modulation, 16 QAM, 64 QAM, or 256 QAM.

30. The apparatus of claim 28, wherein the MU-MIMO assistance information field comprises a set of bits indicating whether the one or more other spatial layers are assigned to the at least one other UE.

31. The apparatus of claim 30, wherein the one or more other spatial layers comprise one other spatial layer, and the set of bits further indicate whether the one other spatial layer is assigned and the modulation order of the one other spatial layer for MU-MIMO transmission.

32. The apparatus of claim 24, wherein the MU-MIMO assistance information field comprises a set of bits indicating whether one or more other spatial layers are assigned to at least one other UE and a modulation order for each other spatial layer, other including spatial layers associated with a different scrambling identity, in the MU-MIMO transmission, and wherein the modulation order for each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 QAM, or 256 QAM.

33. The apparatus of claim 24, wherein the MU-MIMO assistance information field indicates a usage of a non-orthogonal demodulation reference signal (DMRS) port.

34. The apparatus of claim 33, wherein the MU-MIMO assistance information field comprises a set of bits, each bit of the set of bits indicating the usage of one non-orthogonal DMRS port, or comprises 1 bit indicating whether any non-orthogonal DMRS port is used.

35. A user equipment (UE) for wireless communication, comprising: a memory; and at least one processor coupled to the memory and configured to: receive a downlink control information (DCI) message indicating a downlink (DL) grant of a set of resource blocks shared by other UEs for multi-user multiple-input-multiple-output (MU-MIMO) transmission, the DCI message comprising an MU-MIMO assistance information field; receive the set of resource blocks on at least one spatial layer of the MU-MIMO transmission based on the DL grant; and process the set of resource blocks based on the

MU-MIMO assistance information field; wherein the DCI message indicates an assignment of the at least one spatial layer for the UE in the MU-MIMO transmission; and wherein the MU-MIMO assistance information field indicates whether one or more other spatial layers of the MU-MIMO transmission are assigned to at least one other UE.

36. The UE of claim 35, wherein the DCI message indicates an orthogonal cover coding (OCC) for the UE in the MU-MIMO transmission.

37. The UE of claim 36, wherein the MU-MIMO assistance information field further indicates a modulation order for each other spatial layer of the one or more other spatial layers assigned to the at least one other UE for the MU-MIMO transmission.

38. The UE of claim 37, wherein the modulation order for the each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 QAM, or 256 QAM.

39. The UE of claim 37, wherein the modulation order for the each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 or higher QAM.

40. The UE of claim 39, wherein the one or more other spatial layers comprise two or fewer other spatial layers assigned to the at least one other UE, and the modulation order for each other spatial layer of the two or fewer other spatial layers indicates one of QPSK modulation, 16 QAM, 64 QAM, or 256 QAM.

41. The UE of claim 36, wherein the MU-MIMO assistance information field comprises 3 bits indicating whether the one or more other spatial layers are assigned to the at least one other UE.

42. The UE of claim 41, wherein the one or more spatial layers comprise one spatial layer, and the 3 bits further indicate whether the one spatial layer is assigned and the modulation order of the spatial layer for MU-MIMO transmission.

43. The UE of claim 35, wherein the MU-MIMO assistance information field indicates whether one or more other spatial layers are assigned to at least one other UE and a modulation order for each other spatial layer of the one or more other spatial layers, including other spatial layers associated with a different scrambling identity, in the MU-MIMO transmission, and wherein the modulation order for each other spatial layer indicates one of quadrature phase shift keying (QPSK) modulation, 16 quadrature amplitude modulation (QAM), 64 QAM, or 256 QAM.

44. The UE of claim 35, wherein the MU-MIMO assistance information field indicates a usage of a non-orthogonal demodulation reference signal (DMRS) port.

45. The UE of claim 44, wherein the MU-MIMO assistance field comprises a set of bits, a bit of the set of bits indicating the usage of one non-orthogonal DMRS port or comprises 1 bit to indicate whether any non-orthogonal DMRS port is used.

46. The UE of claim 35, wherein the at least one spatial layer comprises demodulation reference signal, and wherein the at least one processor is configured to process by: performing channel estimation based on the received demodulation reference signal and the MU-MIMO assistance information field.

47. An apparatus for wireless communication, comprising: means for determining to provide a multi-user multiple-input-multiple-output (MU-MIMO) transmission to a plurality of user equipments (UEs) over a same set of resource blocks; means for generating a downlink control information (DCI) message for each UE of the plurality of UEs indicating a downlink (DL) grant of the set of resource blocks, each DCI message comprising an MU-MIMO assistance information field; and means for transmitting the generated DCI messages to the plurality of UEs; wherein each DCI message indicates a spatial layer assignment for a corresponding UE in the MU-MIMO transmission; and wherein the MU-MIMO assistance information field indicates, for the corresponding UE, whether one or more other spatial layers are assigned to at least one other UE.

48. A user equipment (UE) for wireless communication, comprising: means for receiving a downlink control information (DCI) message indicating a downlink (DL)

grant of a set of resource blocks shared by other UEs for a multi-user multiple-input-multiple-output (MU-MIMO) transmission, the DCI message comprising an MU-MIMO assistance information field; means for receiving the set of resource blocks on at least one spatial layer of the MU-MIMO transmission based on the DL grant; and means for processing the set of resource blocks based on the MU-MIMO assistance information field; wherein the DCI message indicates an assignment of the at least one spatial layer for the UE in the MU-MIMO transmission; and wherein the MU-MIMO assistance information field indicates whether one or more other spatial layers of the MU-MIMO transmission are assigned to at least one other UE.

49. A non-transitory computer-readable medium storing computer executable code, comprising code to: determine to provide a multi-user multiple-input-multiple-output (MU-MIMO) transmission to a plurality of user equipments (UEs) over a same set of resource blocks; generate a downlink control information (DCI) message for each UE of the plurality of UEs indicating a downlink (DL) grant of the set of resource blocks, each DCI message comprising an MU-MIMO assistance information field; and transmit the generated DCI messages to the plurality of UEs; wherein each DCI message indicates a spatial layer assignment for a corresponding UE in the MU-MIMO transmission; and wherein the MU-MIMO assistance information field indicates, for the corresponding UE, whether one or more other spatial layers are assigned to at least one other UE.

50. A non-transitory computer-readable medium of a user equipment (UE) storing computer executable code, comprising code to: receive a downlink control information (DCI) message indicating a downlink (DL) grant of a set of resource blocks shared by other UEs for a multi-user multiple-input-multiple-output (MU-MIMO) transmission, the DCI message comprising an MU-MIMO assistance information field; receive the set of resource blocks on at least one spatial layer of the MU-MIMO transmission based on the DL grant; and process the set of resource blocks based on the MU-MIMO assistance information field; wherein the DCI message indicates an assignment of the at least one spatial layer for the UE in the MU-MIMO transmission; and wherein the MU-MIMO assistance information field indicates whether one or more other spatial layers of the MU-MIMO transmission are assigned to at least one other UE.