

CLAIMS

What is claimed is:

1. A method used in a wireless communications system, comprising:
identifying at least two groups of user equipment (UEs);
signaling a different number of antennas ports to the least two group of UEs; and
creating antenna ports corresponding to each group of UEs, wherein each antenna port includes a subset of a number of physical transmit antennas and a number of antenna ports is the number of signaled antenna ports to that group of UEs.
2. The method of claim 1, wherein some of the antenna ports for different group of UEs are the same.
3. The method of claim 1, wherein a linear combination is employed to physical antennas to obtain some of the antenna ports.
4. The method of claim 3, wherein the linear combination is chosen to convert transmit diversity to frequency diversity.
5. The method of claim 3, wherein the linear combination is frequency dependent.
6. The method of claim 3, wherein the linear combination is cyclic delay diversity (CDD).
7. The method of claim 3, wherein the linear combination employed for different antenna ports for a particular group of UEs are linearly independent.
8. The method of claim 1, wherein a linear combination of the antenna ports corresponding to a first group of UEs with a larger number of advertised antenna ports is used as an antenna port for a second group of UEs with a smaller number of antenna ports.

9. The method of claim 8, further comprising communicating the linear combination and delay to the first group of UEs.
10. The method of claim 1, further comprising transmitting at least one of Reference Signals (RS), Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Channel (PHICH), and Physical Downlink Control Channel (PDCCH) and PDSCH to a group of UEs using the antenna ports advertised to the group of UEs.
11. The method of claim 1, further comprising sending PCFICH, PHICH, PDCCH, to one group of UEs using the antenna ports advertised to a second group of UEs.
12. The method of claim 1, further comprising a group of UEs providing feedback to a base station, wherein the feedback is related to at least one channel quality conditions for the antenna ports advertised to only a subset of group of UEs.
13. The method of claim 1, further comprising:
 - scheduling transmission to an UE on Physical Downlink Shared Channel (PDSCH) resources that are frequency distributed; and
 - transmitting PDSCH to a UE using the antenna ports corresponding to group of UEs to which the UE belongs.
14. The method of claim 1, further comprising transmitting reference signal to a group of UEs, wherein the reference signal relates to at least one corresponding advertised antenna ports.
15. The method of claim 14, wherein the transmitted reference signal to different group of UEs have different patterns, different density and different periodicity.
16. A wireless communications apparatus, comprising:
 - at least one processor configured to:
 - identify at least two groups of user equipment (UEs);
 - signal a different number of antennas ports to the least two group of UEs;

create at least one antenna ports corresponding to each group of UEs, wherein each antenna port includes a subset of a number of physical transmit antennas and a number of antenna ports is the number of signaled antenna ports to that group of UEs; and a memory coupled to the at least one processor.

17. The wireless communications apparatus of claim 16, wherein some of the antenna ports for different group of UEs are the same.
18. The wireless communications apparatus of claim 16, wherein a linear combination is employed on physical antennas to obtain some of the antenna ports.
19. The wireless communications apparatus of claim 18, wherein the linear combination is chosen to convert transmit diversity to frequency diversity.
20. The wireless communications apparatus of claim 18, wherein the linear combination is frequency dependent.
21. The wireless communications apparatus of claim 18, wherein the linear combination is cyclic delay diversity (CDD).
22. The wireless communications apparatus of claim 18, wherein the linear combination employed for different antenna ports created for a particular group of UEs are linearly independent.
23. The wireless communications apparatus of claim 16, wherein a linear combination of the antenna ports corresponding a first group of UEs with a larger number of advertised antenna ports is used as an antenna port for a second group of UEs with a smaller number of antenna ports.
24. The wireless communications apparatus of claim 23, further comprising at least one processor configured to communicate the linear combination and delay to the first group of UEs.

25. The wireless communications apparatus of claim 16, further comprising at least one processor configured to transmit at least one of Reference Signals (RS), Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Channel (PHICH), and Physical Downlink Control Channel (PDCCH), and PDSCH to a group of UEs using the antenna ports advertised to the group of UEs.

26. The wireless communications apparatus of claim 16, further comprising at least one processor configured to send PCFICH, PHICH, PDCCH to one group of UEs using the antenna ports advertised to a second group of UEs.

27. The wireless communications apparatus of claim 16, further comprising at least one processor configured to provide feedback from a group of UEs, wherein the feedback is related to at least one channel quality conditions for the antenna ports advertised to only a subset of group of UEs.

28. The wireless communications apparatus of claim 16, further comprising:
at least one processor configured to schedule transmission to an UE on Physical Downlink Shared Channel (PDSCH) resources that are frequency distributed; and
at least one processor configured to transmit PDSCH to a UE using the antenna ports corresponding to group of UEs to which the UE belongs.

29. The wireless communications apparatus of claim 16, further comprising at least one processor configured to transmit reference signal to a group of UEs, wherein the reference signal relates to at least one corresponding advertised antenna ports.

30. The wireless communications apparatus of claim 29, wherein the transmitted reference signal to different group of UEs have different patterns, different density and different periodicity.

31. A wireless communications apparatus that optimizes configuration of transmit antennas, comprising:
means for identifying at least two groups of user equipment (UEs);

means for signaling a different number of antennas ports to the least two group of UEs; and

means for creating antenna ports corresponding to each group of UEs, wherein each antenna port includes a subset of a number of physical transmit antennas and a number of antenna ports is the number of signaled antenna ports to that group of UEs.

32. The wireless communications apparatus of claim 31, wherein some of the antenna ports for different group of UEs are the same.

33. The wireless communications apparatus of claim 31, wherein a linear combination is employed on physical antennas to obtain some of the antenna ports.

34. The wireless communications apparatus of claim 33, wherein the linear combination is chosen to convert transmit diversity to frequency diversity.

35. The wireless communications apparatus of claim 33, wherein the linear combination is frequency dependent.

36. The wireless communications apparatus of claim 33, wherein the linear combination is cyclic delay diversity (CDD).

37. The wireless communications apparatus of claim 33, wherein the linear combination employed for different antenna ports created for a particular group of UEs are linearly independent.

38. The wireless communications apparatus of claim 31, wherein a linear combination of the antenna ports corresponding a first group of UEs with a larger number of advertised antenna ports is used as an antenna port for a second group of UEs with a smaller number of antenna ports.

39. The wireless communications apparatus of claim 38, further comprising means for communicating the linear combination and delay to the first group of UEs.

40. The wireless communications apparatus of claim 31, further comprising means for transmitting at least one of Reference Signals (RS), Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Channel (PHICH), and Physical Downlink Control Channel (PDCCH), and PDSCH to a group of UEs using the antenna ports advertised to the group of UEs.

41. The wireless communications apparatus of claim 31, further comprising means for sending PCFICH, PHICH, PDCCH, to one group of UEs using the antenna ports advertised to a second group of UEs.

42. The wireless communications apparatus of claim 31, further comprising means for providing feedback from a group of UEs, wherein the feedback is related to at least one channel quality conditions for the antenna ports advertised to only a subset of group of UEs.

43. The wireless communications apparatus of claim 31, further comprising:
means for scheduling transmission to an UE on Physical Downlink Shared Channel (PDSCH) resources that are frequency distributed; and
means for transmitting PDSCH to a UE using the antenna ports corresponding to group of UEs to which the UE belongs.

44. The wireless communications apparatus of claim 31, further comprising means for transmitting a reference signal to a group of UEs, wherein the reference signal relates to at least one corresponding advertised antenna ports.

45. The wireless communications apparatus of claim 44, wherein the transmitted reference signal to different group of UEs have different patterns, different density and different periodicity.

46. A computer program product, comprising:
a computer-readable medium comprising:
code for causing at least one computer to identify at least two groups of user equipment (UEs);
code for causing at least one computer to signal a different number of antennas ports to the least two group of UEs;
code for causing at least one computer to create antenna ports corresponding to each group of UEs, wherein each antenna port includes a subset of a number of physical transmit antennas and a number of antenna ports is the number of signaled antenna ports to that group of UEs.
47. The computer program product of claim 46, wherein some of the antenna ports for different group of UEs are the same.
48. The computer program product of claim 46, wherein a linear combination is employed on physical antennas to obtain some of the antenna ports.
49. The computer program product of claim 48, wherein the linear combination is chosen to convert transmit diversity to frequency diversity.
50. The computer program product of claim 48, wherein the linear combination is frequency dependent.
51. The computer program product of claim 48, wherein the linear combination is cyclic delay diversity (CDD).
52. The computer program product of claim 48, wherein the linear combination employed for different antenna ports created for a particular group of UEs are linearly independent.
53. The computer program product of claim 46, wherein a linear combination of the antenna ports corresponding a first group of UEs with a larger number of advertised

antenna ports is used as an antenna port for a second group of UEs with a smaller number of antenna ports.

54. The computer program product of claim 53, further comprising the computer-readable medium comprising code for causing at least one computer to communicate the linear combination and delay to the first group of UEs.

55. The computer program product of claim 46, further comprising the computer-readable medium comprising code for causing at least one computer to transmit at least one of Reference Signals (RS), Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Channel (PHICH), and Physical Downlink Control Channel (PDCCH), and PDSCH to a group of UEs using the antenna ports advertised to the group of UEs.

56. The computer program product of claim 46, further comprising the computer-readable medium comprising code for causing at least one computer to send PCFICH, PHICH, PDCCH, to one group of UEs using the antenna ports advertised to a second group of UEs.

57. The computer program product of claim 46, further comprising the computer-readable medium comprising code for causing at least one computer to provide feedback from a group of UEs, wherein the feedback is related to at least one channel quality conditions for the antenna ports advertised to only a subset of group of UEs.

58. The computer program product of claim 46, further comprising the computer-readable medium comprising:

- code for causing at least one computer to schedule transmission to an UE on Physical Downlink Shared Channel (PDSCH) resources that are frequency distributed;
- and
- code for causing at least one computer to transmit PDSCH to a UE using the antenna ports corresponding to group of UEs to which the UE belongs.

59. The computer program product of claim 46, further comprising the computer-readable medium comprising code for causing at least one computer to transmit reference signal to a group of UEs, wherein the reference signal relates to at least one corresponding advertised antenna ports.

60. The computer program product of claim 58, wherein the transmitted reference signal to different group of UEs have different patterns, different density and different periodicity.

61. A method used in a wireless communications system that facilitates identifying a set of antenna ports, comprising:

receiving a mapping information that includes at least one of a delay and a linear combination employed to transmit a reference signal related to the set of antenna ports;

receiving a reference signal related to the antenna ports; and

decoding the reference signal related to the set of antenna ports in order to identify each antenna port, wherein the decoding utilizes the mapping information.

62. The method of claim 61, further comprising estimating a channel corresponding to each of a transmit antenna ports.

63. The method of claim 61, further comprising:

receiving the mapping information that relates to at least one physical transmit antennas to antenna ports of a group of UEs; and

estimating channel of the physical transmit antennas.

64. The method of claim 61, wherein the linear combination is cyclic delay diversity (CDD).

65. A method used in wireless communication systems, comprising

utilizing a transmitted reference signal for antenna ports of a first group of UEs for at least one of a measurement, a feedback to a base station, or a demodulation technique; and

utilizing a transmitted reference signals for antenna ports of a second group of UEs for a measurement and a feedback to a base station.

66. The method of claim 65, wherein the feedback comprises at least one of a Channel quality, a precoding matrix, a rank information, or a channel directionality information.

67. A wireless communications apparatus, comprising:
at least one processor configured to:

receive a mapping information that includes at least one of a delay and a linear combination employed to transmit a reference signal related to a set of antenna ports;

receive a reference signal related to the antenna ports;

decode the reference signal related to the set of antenna ports in order to identify each antenna port, wherein the decoding utilizes the mapping information; and

a memory coupled to the at least one processor.

68. The wireless communications apparatus of claim 67, further comprising at least one processor configured to:

receive the mapping information related to at least one physical transmit antennas to antenna ports of a group of UEs; and

estimate channel of the physical transmit antennas.

69. The wireless communications apparatus of claim 67, further comprising at least one processor configured to estimate a channel corresponding to each of a transmit antenna ports.

70. The wireless communications apparatus of claim 67, wherein the linear combination is cyclic delay diversity (CDD).
71. A wireless communications apparatus, comprising:
at least one processor configured to:
 utilize a transmitted reference signal for antenna ports of a first group of UEs for at least one of a measurement, a feedback to a base station, or a demodulation technique; and
 utilize a transmitted reference signals for antenna ports of a second group of UEs for a measurement and a feedback to a base station; and
a memory coupled to the at least one processor
72. The wireless communications apparatus of claim 71, wherein the feedback comprises at least one of a Channel quality, a precoding matrix, a rank information, or a channel directionality information.
73. A wireless communications apparatus that identifying a set of antenna ports within a wireless communications environment, comprising:
 means for receiving a mapping information that includes at least one of a delay and a linear combination employed to transmit a reference signal related to the set of antenna ports; means for receiving a reference signal related to the antenna ports; and
 means for decoding the reference signal related to the set of antenna ports in order to identify each antenna port, wherein the decoding utilizes the mapping information.
74. The wireless communications apparatus of claim 73, further comprising:
 means for receiving the mapping information related to at least one physical transmit antennas to antenna ports of a group of UEs; and
 means for estimating channel of the physical transmit antennas.
75. The wireless communications apparatus of claim 73, further comprising means for estimating a channel corresponding to each of a transmit antenna ports.

76. The wireless communications apparatus of claim 73, wherein the linear combination is cyclic delay diversity (CDD).

77. A wireless communications apparatus within a wireless communications environment, comprising:

means for utilizing a transmitted reference signal for antenna ports of a first group of UEs for at least one of a measurement, a feedback to a base station, or a demodulation technique; and

means for utilizing a transmitted reference signals for antenna ports of a second group of UEs for a measurement and a feedback to a base station.

78. The wireless communications apparatus of claim 77, wherein the feedback comprises at least one of a Channel quality, a precoding matrix, a rank information, or a channel directionality information.

79. A computer program product, comprising:
a computer-readable medium comprising:

code for causing at least one computer to receive a mapping information that includes at least one of a delay and a linear combination employed to transmit a reference signal related to a set of antenna ports;

code for causing at least one computer to receive a reference signal related to the antenna ports; and

code for causing at least one computer to decode the reference signal related to the set of antenna ports in order to identify each antenna port, wherein the decoding utilizes the mapping information.

80. The computer program product of claim 79, further comprising the computer-readable medium comprising:

code for causing at least one computer to receive the mapping information related to at least one physical transmit antennas to antenna ports of a group of UEs; and

code for causing at least one computer to estimate channel of the physical transmit antennas.

81. The computer program product of claim 79, further comprising the computer-readable medium comprising code for causing at least one computer to estimate a channel corresponding to each of a transmit antenna ports.
82. The computer program product of claim 79, wherein the linear combination is cyclic delay diversity (CDD).
83. A computer program product, comprising:
a computer-readable medium comprising:
code for causing at least one computer to utilize a transmitted reference signal for antenna ports of a first group of UEs for at least one of a measurement, a feedback to a base station, or a demodulation technique; and
code for causing at least one computer to utilize a transmitted reference signals for antenna ports of a second group of UEs for a measurement and a feedback to a base station.
84. The computer program product of claim 83, wherein the feedback comprises at least one of a Channel quality, a precoding matrix, a rank information, or a channel directionality information.
85. A method used in a wireless communications system, comprising:
identifying at least two groups of user equipment (UEs);
creating UE specific antenna ports corresponding to a specific group of UEs;
transmitting at least one reference signal related to the UE specific antenna ports in a Physical Downlink Shared Channel (PDSCH) region assigned to at least one specific group of UEs;
employing the UE specific antenna ports along with respective antenna ports defined for a disparate group of UEs to create beams for transmitting PDSCH to the specific group of UEs; and
estimating a channel from the antenna ports based on at least one of the following:

a reference signal related to at least one of the UE specific antenna ports or a disparate antenna port; or

a mapping information that relates the reference signal to a beam direction used for transmission of PDSCH.

86. The method of claim 85, wherein the created UE specific antenna ports are created dynamically over time and can be based upon feedback from the UE.

87. The method of claim 85, wherein an eNodeB provides information to the UE related to a mapping of antenna ports to transmission beams used for PDSCH.

88. The method of claim 85, wherein only UE specific antenna ports are used for data transmission and mapping from UE specific antenna ports to beam directions is fixed.

89. A wireless communications apparatus, comprising:
at least one processor configured to:

identify at least two groups of user equipment (UEs);

create UE specific antenna ports corresponding to a specific group of UEs;

transmit at least one reference signal related to the UE specific antenna ports in a Physical Downlink Shared Channel (PDSCH) region assigned to at least one specific group of UEs;

employ the UE specific antenna ports along with respective antenna ports defined for a disparate group of UEs to create beams for transmitting PDSCH to the specific group of UEs;

estimate a channel from the antenna ports based on at least one of the following:

a reference signal related to at least one of the UE specific antenna ports or a disparate antenna port; or

a mapping information that relates the reference signal to a beam direction used for transmission of PDSCH, and

a memory coupled to the at least one processor.

90. The wireless communications apparatus of claim 89, wherein the created UE specific antenna ports are created dynamically over time and can be based upon feedback from the UE.

91. The wireless communications apparatus of claim 89, wherein an eNodeB provides information to the UE related to a mapping of antenna ports to transmission beams used for PDSCH.

92. The wireless communications apparatus of claim 89, wherein only UE specific antenna ports are used for data transmission and mapping from UE specific antenna ports to beam directions is fixed.

93. A wireless communications apparatus within a wireless communications environment, comprising:

- means for identifying at least two groups of user equipment (UEs);

- means for creating UE specific antenna ports corresponding to a specific group of UEs;

- means for transmitting at least one reference signal related to the UE specific antenna ports in a Physical Downlink Shared Channel (PDSCH) region assigned to at least one specific group of UEs;

- means for employing the UE specific antenna ports along with respective antenna ports defined for a disparate group of UEs to create beams for transmitting PDSCH to the specific group of UEs; and

- means for estimating a channel from the antenna ports based on at least one of the following:

- a reference signal related to at least one of the UE specific antenna ports or a disparate antenna port; or

- a mapping information that relates the reference signal to a beam direction used for transmission of PDSCH.

94. The wireless communications apparatus of claim 93, wherein the created UE specific antenna ports are created dynamically over time and can be based upon feedback from the UE.

95. The wireless communications apparatus of claim 93, wherein an eNodeB provides information to the UE related to a mapping of antenna ports to transmission beams used for PDSCH.

96. The wireless communications apparatus of claim 93, wherein only UE specific antenna ports are used for data transmission and mapping from UE specific antenna ports to beam directions is fixed.

97. A computer program product, comprising:
a computer-readable medium comprising:
code for causing at least one computer to identify at least two groups of user equipment (UEs);
code for causing at least one computer to create UE specific antenna ports corresponding to a specific group of UEs;
code for causing at least one computer to transmit at least one reference signal related to the UE specific antenna ports in a Physical Downlink Shared Channel (PDSCH) region assigned to at least one specific group of UEs;
code for causing at least one computer to employ the UE specific antenna ports along with respective antenna ports defined for a disparate group of UEs to create beams for transmitting PDSCH to the specific group of UEs; and
code for causing at least one computer to estimate a channel from the antenna ports based on at least one of the following:
a reference signal related to at least one of the UE specific antenna ports or a disparate antenna port; or
a mapping information that relates the reference signal to a beam direction used for transmission of PDSCH.

98. The computer program product of claim 97, wherein the created UE specific antenna ports are created dynamically over time and can be based upon feedback from the UE.

99. The computer program product of claim 97, wherein an eNodeB provides information to the UE related to a mapping of antenna ports to transmission beams used for PDSCH.

100. The computer program product of claim 97, wherein only UE specific antenna ports are used for data transmission and mapping from UE specific antenna ports to beam directions is fixed.

CLAIMS

1. A method used in a wireless communications system, comprising:
 - identifying at least two groups of user equipment (UEs);
 - signaling a different number of antenna ports to the least two groups of UEs;
 - creating a number of antenna ports for each group of UEs, wherein each antenna port corresponds to a linear combination of a subset of a number of physical transmit antennas and the number of created antenna ports is the number of antenna ports signaled to that group of UEs, and wherein the linear combination employed for different antenna ports for a particular group of UEs is linearly independent; and
 - transmitting a first reference signal for each of the antenna ports signaled to a first group of UEs using the linearly independent combination of transmit antennas associated with each antenna port for the first group of UEs and transmitting a second reference signal for each of the antenna ports signaled to a second group of UEs using the linearly independent combination of transmit antennas associated with each antenna port for the second group of UEs,
- wherein the first group of UEs comprises at least one non-legacy UE and the second group of UEs comprises at least one legacy UE, wherein the first group of UEs supports a greater number of antenna ports than the second group of UEs.

2. The method of claim 1, wherein some of the antenna ports for different groups of UEs are the same.

3. The method of claim 1, wherein the linear combination is chosen to convert transmit diversity to frequency diversity.

4. The method of claim 1, wherein the linear combination is frequency dependent.

5. The method of claim 1, wherein the linear combination is cyclic delay diversity (CDD).

6. The method of claim 1, wherein the linear combination employed for different antenna ports for a particular group of UEs are linearly independent.

7. The method of claim 1, wherein a linear combination of the antenna ports corresponding to the first group of UEs with a larger number of signaled antenna ports is used as an antenna port for the second group of UEs with a smaller number of antenna ports.

8. The method of claim 7, further comprising communicating the linear combination and delay to the first group of UEs.

9. The method of claim 1, further comprising transmitting at least one of the reference signals, Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Channel (PHICH), and Physical Downlink Control Channel (PDCCH) and PDSCH to one of the groups of UEs using the antenna ports previously signaled to the second group of UEs.

10. The method of claim 1, further comprising sending PCFICH, PHICH, PDCCH, to one of the groups of UEs using the antenna ports previously signaled to the other group of UEs.

11. The method of claim 1, further comprising one of the groups of UEs providing feedback to a base station, wherein the feedback is related to at least one channel quality conditions for the antenna ports previously signaled only to a subset of one of the other groups of UEs.

12. The method of claim 1, further comprising:
scheduling transmission to an UE on Physical Downlink Shared Channel (PDSCH) resources that are frequency distributed; and
transmitting PDSCH to a UE using the antenna ports corresponding to one of the groups of UEs to which the UE belongs.

13. The method of claim 1, wherein the second reference signal relates to at least one corresponding antenna ports previously signaled to one of the groups of UEs.

14. The method of claim 13, wherein the transmitted reference signal to different groups of UEs have different patterns, different tone density per resource block and different periodicity.

15. A wireless communications apparatus, comprising:
at least one processor configured to:
identify at least two groups of user equipment (UEs);
signal a different number of antenna ports to the least two groups of UEs;
create a number of antenna ports for each group of UEs, wherein each antenna port corresponds to a linear combination of a subset of a number of physical transmit antennas and the number of created antenna ports is the number of antenna ports signaled to that group of UEs, and wherein the linear combination employed for different antenna ports for a particular group of UEs is linearly independent; and

transmit a first reference signal for each of the antenna ports signaled to a first group of UEs using the linearly independent combination of transmit antennas associated with each antenna port for the first group of UEs and transmitting a second reference signal for each of the antenna ports signaled to a second group of UEs using the linearly independent combination of transmit antennas associated with each antenna port for the second group of UEs, wherein the first group of UEs comprises at least one non-legacy UE and the second group of UEs comprises at least one legacy UE, wherein the first group of UEs supports a greater number of antenna ports than the second group of UEs; and
a memory coupled to the at least one processor.

16. The wireless communications apparatus of claim **15**, wherein some of the antenna ports for different groups of UEs are the same.

17. The wireless communications apparatus of claim **15**, wherein the linear combination is chosen to convert transmit diversity to frequency diversity.

18. The wireless communications apparatus of claim **15**, wherein the linear combination is frequency dependent.

19. The wireless communications apparatus of claim **15**, wherein the linear combination is cyclic delay diversity (CDD).

20. The wireless communications apparatus of claim **15**, wherein the linear combination employed for different antenna ports created for a particular group of UEs are linearly independent.

21. The wireless communications apparatus of claim 15, wherein a linear combination of the antenna ports corresponding the first group of UEs with a larger number of advertised antenna ports is used as an antenna port for the second group of UEs with a smaller number of antenna ports.

22. The wireless communications apparatus of claim 21, wherein the at least one processor is further configured to communicate the linear combination and delay to the first group of UEs.

23. The wireless communications apparatus of claim 15, wherein the at least one processor is further configured to transmit at least one of the reference signals, Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Channel (PHICH), and Physical Downlink Control Channel (PDCCH), and PDSCH to one of the groups of UEs using the antenna ports previously signaled to the second group of UEs.

24. The wireless communications apparatus of claim 15, wherein the at least one processor is further configured to send PCFICH, PHICH, PDCCH, to one of the groups of UEs using the antenna ports previously signaled to the other group of UEs.

25. The wireless communications apparatus of claim 15, wherein the at least one processor is further configured to provide feedback from one of the groups of UEs, wherein the feedback is related to at least one channel quality conditions for the antenna ports previously signaled only to a subset of one of the other groups of UEs.

26. The wireless communications apparatus of claim 15, wherein the at least one processor is further configured to:

schedule transmission to an UE on Physical Downlink Shared Channel (PDSCH) resources that are frequency distributed; and

transmit PDSCH to a UE using the antenna ports corresponding to one of the groups of UEs to which the UE belongs.

27. The wireless communications apparatus of claim **15**, wherein the second reference signal relates to at least one corresponding antenna ports previously signaled to one of the groups of UEs.

28. The wireless communications apparatus of claim **27**, wherein the reference signals transmitted to different groups of UEs have different patterns, different tone density per resource block and different periodicity.

29. A wireless communications apparatus that optimizes configuration of transmit antennas, comprising:

means for identifying at least two groups of user equipment (UEs);

means for signaling a different number of antenna ports to the least two groups of UEs;

means for creating a number of antenna ports for each group of UEs, wherein each antenna port corresponds to a linear combination of a subset of a number of physical transmit antennas and the number of created antenna ports is the number of antenna ports signaled to that group of UEs, and wherein the linear combination employed for different antenna ports for a particular group of UEs is linearly independent; and

means for transmitting a first reference signal for each of the antenna ports signaled to a first group of UEs using the linearly independent combination of transmit antennas associated with each antenna port for the first group of UEs and transmitting a second reference signal for each of the antenna ports signaled to a second group of UEs using the linearly independent combination of transmit antennas associated with each antenna port for

the second group of UEs, wherein the first group of UEs comprises at least one non-legacy UE and the second group of UEs comprises at least one legacy UE, wherein the first group of UEs supports a greater number of antenna ports than the second group of UEs.

30. The wireless communications apparatus of claim **29**, wherein some of the antenna ports for different groups of UEs are the same.

31. The wireless communications apparatus of claim **29**, wherein the linear combination is chosen to convert transmit diversity to frequency diversity.

32. The wireless communications apparatus of claim **29**, wherein the linear combination is frequency dependent.

33. The wireless communications apparatus of claim **29**, wherein the linear combination is cyclic delay diversity (CDD).

34. The wireless communications apparatus of claim **29**, wherein the linear combination employed for different antenna ports created for a particular group of UEs are linearly independent.

35. The wireless communications apparatus of claim **29**, wherein a linear combination of the antenna ports corresponding the first group of UEs with a larger number of advertised antenna ports is used as an antenna port for the second group of UEs with a smaller number of antenna ports.

36. The wireless communications apparatus of claim **35**, further comprising means for communicating the linear combination and delay to the first group of UEs.

37. The wireless communications apparatus of claim **29**, further comprising means for transmitting at least one of the reference signals, Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Channel (PHICH), and Physical Downlink Control Channel (PDCCH), and PDSCH

to one of the groups of UEs using the antenna ports previously signaled to the second group of UEs.

38. The wireless communications apparatus of claim **29**, further comprising means for sending PCFICH, PHICH, PDCCH, to one of the groups of UEs using the antenna ports previously signaled to the other group of UEs.

39. The wireless communications apparatus of claim **29**, further comprising means for providing feedback from one of the groups of UEs, wherein the feedback is related to at least one channel quality conditions for the antenna ports previously signaled only to a subset of one of the other groups of UEs.

40. The wireless communications apparatus of claim **29**, further comprising:

means for scheduling transmission to an UE on Physical Downlink Shared Channel (PDSCH) resources that are frequency distributed; and

means for transmitting PDSCH to a UE using the antenna ports corresponding to one of the groups of UEs to which the UE belongs.

41. The wireless communications apparatus of claim **29**, wherein the second reference signal relates to at least one corresponding antenna ports previously signaled to one of the groups of UEs.

42. The wireless communications apparatus of claim **41**, wherein the reference signals transmitted to different groups of UEs have different patterns, different tone density per resource block and different periodicity.

43. A computer program product, comprising:

a non-transitory computer-readable medium comprising:

code for causing at least one computer to identify at least two groups of user equipment (UEs);

code for causing at least one computer to signal a different number of antenna ports to the least two groups of

UEs;

code for causing at least one computer to create a number of antenna ports for each group of UEs, wherein each antenna port corresponds to a linear combination of a subset of a number of physical transmit antennas and the number of created antenna ports is the number of antenna ports signaled to that group of UEs, and wherein the linear combination employed for different antenna ports for a particular group of UEs is linearly independent; and

code for causing at least one computer to transmit a first reference signal for each of the antenna ports signaled to a first group of UEs using the linearly independent combination of transmit antennas associated with each antenna port for the first group of UEs and transmitting a second reference signal for each of the antenna ports signaled to a second group of UEs using the linearly independent combination of transmit antennas associated with each antenna port for the second group of UEs, wherein the first group of UEs comprises at least one non-legacy UE and the second group of UEs comprises at least one legacy UE, wherein the first group of UEs supports a greater number of antenna ports than the second group of UEs.

44. The computer program product of claim **43**, wherein some of the antenna ports for different groups of UEs are the same.

45. The computer program product of claim **43**, wherein the linear combination is chosen to convert transmit diversity to frequency diversity.

46. The computer program product of claim **43**, wherein the linear combination is frequency dependent.

47. The computer program product of claim **43**, wherein the linear combination is cyclic delay diversity (CDD).

48. The computer program product of claim **43**, wherein the linear combination employed for different antenna ports created for a particular group of UEs are linearly independent.

49. The computer program product of claim **43**, wherein a linear combination of the antenna ports corresponding the first group of UEs with a larger number of advertised antenna ports is used as an antenna port for the second group of UEs with a smaller number of antenna ports.

50. The computer program product of claim **49**, wherein the computer-readable medium further comprises code for causing at least one computer to communicate the linear combination and delay to the first group of UEs.

51. The computer program product of claim **43**, wherein the computer-readable medium further comprises code for causing at least one computer to transmit at least one of the reference signals, Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Channel (PHICH), and Physical Downlink Control Channel (PDCCH), and PDSCH to one of the groups of UEs using the antenna ports previously signaled to the second group of UEs.

52. The computer program product of claim **43**, wherein the computer-readable medium further comprises code for causing at least one computer to send PCFICH, PHICH, PDCCH, to one of the groups of UEs using the antenna ports previously signaled to the other group of UEs.

53. The computer program product of claim **43**, wherein the computer-readable medium further comprises code for causing at least one computer to provide feedback from one of the groups of UEs, wherein the feedback is related to at least one channel quality conditions for the antenna ports previously signaled only to a subset of one of the other groups of UEs.

54. The computer program product of claim **43**, wherein the computer-readable medium further comprises:

code for causing at least one computer to schedule transmission to an UE on Physical Downlink Shared Channel (PDSCH) resources that are frequency distributed; and code for causing at least one computer to transmit PDSCH to a UE using the antenna ports corresponding to one of the groups of UEs to which the UE belongs.

55. The computer program product of claim **43**, wherein the second reference signal relates to at least one corresponding antenna ports previously signaled to one of the groups of UEs.

56. The computer program product of claim **54**, wherein the reference signals transmitted to different groups of UEs have different patterns, different tone density per resource block and different periodicity.

57. A method used in a wireless communications system, comprising:

identifying a group of legacy user equipments (UEs) and a group of non-legacy UEs;

signaling a different number of antenna ports to the group of legacy UEs and the group of non-legacy UEs;

creating a number of antenna ports for each group of UEs, wherein each antenna port corresponds to a linear combination of a subset of a number of physical transmit antennas and the number of created antenna ports is the number of antenna ports signaled to that group of UEs, and wherein the linear combination employed for different antenna ports for a particular group of UEs is linearly independent; and

transmitting a first reference signal for each of the antenna ports signaled to the group of non-legacy UEs using the linearly independent combination of transmit antennas associated with each antenna port for the group of non-legacy UEs and transmitting a second reference signal for each of the antenna ports signaled to the group of legacy UEs using the linearly independent combination of transmit antennas associated with each antenna port for the group of legacy UEs; wherein the first group of UEs comprises at least one non-legacy UE and the second group of UEs comprises at least one legacy UE, wherein the first group of UEs supports a greater number of antenna ports than the second group of UEs.