

CLAIMS

~~WHAT IS CLAIMED IS:~~

1. A method of wireless communication of a user equipment (UE), comprising:
 - determining a set of parameters associated with each of a plurality of different operation modes supported by the UE, wherein ~~at least one of the plurality of different operation modes~~ comprises at least a power efficient mode and a spectrum efficient mode;
 - transmitting UE capability information to a base station, the UE capability information including the set of parameters; and
 - receiving configuration information for the UE based on the UE capability information, the configuration information including an indication of an operation mode of the plurality of different operation modes.
2. The method of claim 1, further comprising:
 - reporting at least one power efficient CSI to the base station, the at least one power efficient CSI corresponding to the power efficient mode.
3. The method of claim 2, where the at least one power efficient CSI is determined based on one or more of:
 - a clock frequency used by the UE in the power efficient mode,
 - a number of receive antennas used in the power efficient mode,
 - MIMO receiver complexity supported in the power efficient mode,
 - a throughput that the UE can support in the power efficient mode,
 - a number of decoder iterations that the UE can perform in the power efficient mode, or
 - a combination thereof.
4. The method of claim 2, wherein receiving the indication of the operation mode of the plurality of different operation modes to be used by the UE is further based on the at least one power efficient CSI reported by the UE, and wherein the operation mode is the power efficient mode.
5. The method of claim 2, wherein the indication is received via one of: semi-statically

through a radio resource connection (RRC) signal or in downlink control information (DCI).

6. The method of claim 2, wherein the indication is received via a power saving signal or through a power saving signal channel.

7. The method of claim 2, further comprising:
 reporting a plurality of CSIs, wherein each CSI of the plurality of CSIs corresponds to one of the plurality of different operation modes; and
 wherein the at least one power efficient CSI is one of the plurality of CSIs reported in addition to a spectrum efficient CSI reported by the UE.

8. The method of claim 1, wherein ~~the~~ a set of parameters associated with a given operation mode of the plurality of different operation modes comprises minimum processing timelines for the UE to respond in the given operation mode.

9. The method of claim 1, wherein ~~the~~ a set of parameters associated with a given operation mode of the plurality of different operation modes comprises a maximum multiple input multiple output (MIMO) rank that can be supported by the UE in the given operation mode.

10. The method of claim 9, wherein the set of parameters associated with the given operation mode of the plurality of different operation modes further comprises a number of UE antennas that can be used in the given operation mode.

11. The method of claim 1, wherein ~~the~~ a set of parameters associated with a given operation mode of the plurality of different operation modes comprises one or more of:

a maximum modulation order or modulation and coding scheme (MCS) that can be supported in the given operation mode,

a maximum resource block (RB) allocation for the given operation mode,

a preferred set of precoding matrix indicators (PMIs),

a number of blind decoding (BD) of a physical downlink control channel (PDCCH) the UE can perform in the given operation mode, or

a combination thereof.

12. The method of claim 1, further comprising:
 adjusting one or more parameters based on the indication to start operating in the operation mode, wherein the operation mode is the power efficient mode; and
 operating in the power efficient mode based on the one or more parameters adjusted based on the indication.
13. The method of claim 12, wherein a time gap between receipt of the indication and switching to the power efficient mode is based on UE type.
14. The method of claim 12, wherein the power efficient mode is switched within a same slot in which the indication is received.
15. The method of claim 12, wherein the power efficient mode is switched to a different power efficiency mode within a grace period based on UE capability.
16. The method of claim 12, wherein a processing time period between receipt of the indication and switching to the power efficient mode is based on UE capability.
- ~~14~~17. The method of claim ~~13~~16, further comprising:
 transmitting information indicating the processing time period to the base station as part of the UE capability information.
- ~~15. The method of claim 12, wherein a time gap between receipt of the indication and switching to the power efficient mode is based on UE type.~~
- ~~16. The method of claim 12, wherein the power efficient mode is switched within the same slot in which the indication is received.~~
- ~~17. The method of claim 12, wherein the power efficient mode is switched to a different power efficiency mode within a grace period based on UE capability.~~

18. The method of claim 1, further comprising:

receiving a configuration from the base station for a plurality of CSI processes, wherein a first CSI process is based on spectrum efficiency and a second CSI process is based on power efficiency.

19. The method of claim 1, wherein ~~the plurality of different operation modes comprise at least one power efficient mode and at least one spectrum efficient mode.~~

~~20. The method of claim 1, wherein~~ each of the plurality of different operation modes is associated with a different one of a plurality of different bandwidth parts (BWPs), an individual set of parameters corresponding to an individual operation mode being associated with a corresponding BWP of the plurality of different BWPs.

~~21~~20. The method of claim ~~20~~19, wherein the plurality of different BWPs are configured by the base station and correspond to different power efficient modes supported by the UE.

~~22~~21. The method of claim 1, wherein a mode of operation is selected from a set of preconfigured modes of operation, wherein different operation modes supported by the UE comprise a subset of the set of preconfigured modes of operation.

~~23~~22. A user equipment (UE), comprising:

means for determining a set of parameters associated with each of a plurality of different operation modes supported by the UE, wherein ~~at least one of the plurality of different operation modes comprises~~ at least a power efficient mode and a spectrum efficient mode;

means for transmitting UE capability information to a base station, the UE capability information including the set of parameters; and

means for receiving configuration information for the UE based on the UE capability information, the configuration information including an indication of an operation mode of the plurality of different operation modes.

~~24~~23. The UE of claim ~~23~~22, further comprising:

means for reporting at least one power efficient CSI to the base station, the at least one

power efficient CSI corresponding to the power efficient mode; ~~and,~~

wherein the at least one power efficient CSI is determined based on one or more of:

a clock frequency used by the UE in the power efficient mode,

a number of receive antennas used in the power efficient mode,

MIMO receiver complexity supported in the power efficient mode,

a throughput that the UE can support in the power efficient mode,

a number of decoder iterations that the UE can perform in the power efficient mode, or

a combination thereof.

~~25~~24. The UE of claim ~~24~~23, wherein the means for reporting is further configured to report a plurality of CSIs, wherein each CSI of the plurality of CSIs corresponds to one of the plurality of different operation modes; and

wherein the at least one power efficient CSI is one of the plurality of CSIs reported in addition to a spectrum efficient CSI reported by the UE.

~~26~~25. The UE of claim ~~23~~22, further comprising:

means for adjusting one or more parameters based on the indication to start operating in the operation mode, wherein the operation mode is the power efficient mode; and

means for operating in the power efficient mode based on the one or more parameters adjusted based on the indication.

~~27~~26. The UE of claim ~~26~~25, wherein a processing time period between receipt of the indication and switching to the power efficient mode is based on UE capability.

~~28~~27. The UE of claim ~~27~~26, wherein the means for transmitting is further configured to transmit information indicating the processing time period to the base station as part of the UE capability information.

~~29~~28. The UE of claim ~~23~~22, wherein the means for receiving is further configured to receive a configuration from the base station for a plurality of CSI processes, wherein a first CSI process is based on spectrum efficiency and a second CSI process is based on power efficiency.

~~3029~~. A user equipment (UE), comprising:

a memory; and

at least one processor coupled to the memory and configured to:

determine a set of parameters associated with each of a plurality of different operation modes supported by the UE, wherein ~~at least one of the~~ plurality of different operation modes comprises at least a power efficient mode and a spectrum efficient mode; and

transmit UE capability information to a base station, the UE capability information including the set of parameters; and

receive configuration information for the UE based on the UE capability information, the configuration information including an indication of an operation mode of the plurality of different operation modes.

~~3130~~. The UE of claim ~~3029~~, wherein the at least one processor is further configured to:

report at least one power efficient CSI to the base station, the at least one power efficient CSI corresponding to the power efficient mode.

~~3231~~. The UE of claim ~~3130~~, where the at least one power efficient CSI is determined based on one or more of:

a clock frequency used by the UE in the power efficient mode,

a number of receive antennas used in the power efficient mode,

MIMO receiver complexity supported in the power efficient mode,

a throughput that the UE can support in the power efficient mode,

a number of decoder iterations that the UE can perform in the power efficient mode, or

a combination thereof.

~~3332~~. The UE of claim ~~3130~~, wherein the indication of the operation mode of the plurality of different operation modes to be used by the UE is further based on the at least one power efficient CSI reported by the UE, and wherein the operation mode is the power efficient mode.

~~3433~~. The UE of claim ~~3130~~, wherein the indication is received via one of: semi-statically

through a radio resource connection (RRC) signal or in downlink control information (DCI).

~~35~~34. The UE of claim ~~34~~30, wherein the indication is received via a power saving signal or through a power saving signal channel.

~~36~~35. The UE of claim ~~34~~30, wherein the at least one processor is further configured to:
 report a plurality of CSIs, wherein each CSI of the plurality of CSIs corresponds to one of the plurality of different operation modes; and
 wherein the at least one power efficient CSI is one of the plurality of CSIs reported in addition to a spectrum efficient CSI reported by the UE.

~~37~~36. The UE of claim ~~30~~29, wherein the set of parameters associated with a given operation mode comprises minimum processing timelines for the UE to respond in the given operation mode.

~~38~~37. The UE of claim ~~30~~29, wherein ~~the~~a set of parameters associated with a given operation mode of the plurality of different operation modes comprises a maximum multiple input multiple output (MIMO) rank that can be supported by the UE in the given operation mode.

~~39~~38. The UE of claim ~~38~~37, wherein the set of parameters associated with the given operation mode of the plurality of different operation modes further comprises a number of UE antennas that can be used in the given operation mode.

~~40~~39. The UE of claim ~~30~~29, wherein ~~the~~a set of parameters associated with a given operation mode of the plurality of different operation modes comprises one or more of:

- a maximum modulation order or modulation and coding scheme (MCS) that can be supported in the given operation mode,
- a maximum resource block (RB) allocation for the given operation mode,
- a preferred set of precoding matrix indicators (PMIs),
- a number of blind decoding (BD) of a physical downlink control channel (PDCCH) the UE can perform in the given operation mode, or
- a combination thereof.

~~4140.~~ The UE of claim ~~3029~~, wherein the at least one processor is further configured to:
 adjust one or more parameters based on the indication to start operating in the operation mode, wherein the operation mode is the power efficient mode; and
 operate in the power efficient mode based on the one or more parameters adjusted based on the indication.

~~4241.~~ The UE of claim ~~4140~~, wherein a processing time period between receipt of the indication and switching to the power efficient mode is based on UE capability.

~~4342.~~ The UE of claim ~~4241~~, wherein the at least one processor is further configured to:
 transmit information indicating the processing time period to the base station as part of the UE capability information.

~~4443.~~ The UE of claim ~~4140~~, wherein a time gap between receipt of the indication and switching to the power efficient mode is based on UE type.

~~4544.~~ The UE of claim ~~4140~~, wherein the power efficient mode is switched within ~~the~~ same slot in which the indication is received.

~~4645.~~ The UE of claim ~~4140~~, wherein the power efficient mode is switched to a different power efficiency mode within a grace period based on UE capability.

~~4746.~~ The UE of claim ~~3029~~, wherein the at least one processor is further configured to:
 receive a configuration from the base station for a plurality of CSI processes, wherein a first CSI process is based on spectrum efficiency and a second CSI process is based on power efficiency.

~~48.~~ ~~The UE of claim 30, wherein the plurality of different operation modes comprise at least one power efficient mode and at least one spectrum efficient mode.~~

~~49.~~ ~~The UE of claim 30~~47. The UE of claim 29, wherein each of the plurality of

different operation modes is associated with a different one of a plurality of different bandwidth parts (BWPs), an individual set of parameters corresponding to an individual operation mode being associated with a corresponding BWP of the plurality of different BWPs.

~~5048~~. The UE of claim ~~4947~~, wherein the plurality of different BWPs are configured by the base station and correspond to different power efficient modes supported by the UE.

~~5149~~. The UE of claim ~~3029~~, wherein a mode of operation is selected from a set of preconfigured modes of operation, wherein different operation modes supported by the UE comprise a subset of the set of preconfigured modes of operation.

~~5250~~. A non-transitory computer-readable medium storing computer executable code, comprising code to:

determine a set of parameters associated with each of a plurality of different operation modes supported by a UE, wherein ~~at least one of the~~ plurality of different operation modes comprises at least a power efficient mode and a spectrum efficient mode;

transmit UE capability information to a base station, the capability UE information including the set of parameters; and

receive configuration information for the UE based on the UE capability information, the configuration information including an indication of an operation mode of the plurality of different operation modes.

~~5351~~. A method of wireless communication of a base station, comprising:

receiving UE capability information including a set of parameters associated with each of a plurality of different operation modes supported by a UE, wherein ~~at least one of the~~ plurality of different operation modes comprises at least a power efficient mode and a spectrum efficient mode;

determining an operation mode of the plurality of different operation modes for the UE based on the UE capability information; and

transmitting, to the UE, configuration information for the UE based on the UE capability information, the configuration information including an indication of the operation mode of the plurality of different operation modes.

~~54~~52. The method of claim ~~53~~51, further comprising:

receiving at least one power efficient CSI from the UE, the at least one power efficient CSI corresponding to the power efficient mode supported by the UE.

~~55~~53. The method of claim ~~54~~52, where the at least one power efficient CSI is determined based on one or more of:

- a clock frequency used by the UE in the power efficient mode,
- a number of receive antennas used in the power efficient mode,
- MIMO receiver complexity supported in the power efficient mode,
- a throughput that the UE can support in the power efficient mode,
- a number of decoder iterations that the UE can perform in the power efficient mode, or
- a combination thereof.

~~56~~54. The method of claim ~~54~~52, wherein the operation mode of the plurality of different operation modes to be used by the UE is further based on the at least one power efficient CSI, and wherein the operation mode comprises the power efficient mode.

~~57~~55. The method of claim ~~54~~52, wherein the indication is transmitted via one of: semi-statically through a radio resource connection (RRC) signal or in downlink control information (DCI).

~~58~~56. The method of claim ~~54~~52, wherein the indication is transmitted via a power saving signal or through a power saving signal channel.

~~59~~57. The method of claim ~~54~~52, wherein the at least one power efficient CSI is received in addition to a spectrum efficient CSI from the UE.

~~60~~58. The method of claim ~~53~~51, wherein the set of parameters associated with a given operation mode comprises minimum processing timelines for the UE to respond in the given operation mode.

~~64~~59. The method of claim ~~53~~51, wherein the set of parameters associated with a given operation mode comprises a maximum multiple input multiple output (MIMO) rank that can be supported by the UE in the given operation mode.

~~62~~60. The method of claim ~~64~~59, wherein the set of parameters associated with the given operation mode further comprises a number of UE antennas that can be used in the given operation mode.

~~63~~61. The method of claim ~~53~~51, wherein the set of parameters associated with a given operation mode comprises one or more of:

- a maximum modulation order or modulation and coding scheme (MCS) that can be supported in the given operation mode,
- a maximum resource block (RB) allocation for the given operation mode,
- a preferred set of precoding matrix indicators (PMIs),
- a number of blind decoding (BD) of a physical downlink control channel (PDCCH) the UE can perform in the given operation mode, or
- a combination thereof.

~~64~~62. The method of claim ~~53~~51, further comprising:

- receiving information indicating a processing time period between receipt of the indication at the UE and switching by the UE to the operation mode based on UE capability, wherein the operation mode is the power efficient mode.

~~65~~63. The method of claim ~~53~~51, further comprising:

- transmitting a configuration for a plurality of CSI processes, wherein a first CSI process is based on spectrum efficiency and a second CSI process is based on power efficiency.

~~66. The method of claim 53, wherein the plurality of different operation modes comprise at least one power efficient mode and at least one spectrum efficient mode.~~

~~67. The method of claim 5364. The method of claim 51, wherein each of the plurality of different operation modes is associated with a different one of a plurality of different bandwidth~~

parts (BWPs), an individual set of parameters corresponding to an individual operation mode being associated with a corresponding BWP of the plurality of different BWPs.

~~68~~65. The method of claim ~~67~~64, wherein the plurality of different BWPs are configured by the base station and correspond to different power efficient modes supported by the UE.

~~69~~66. The method of claim ~~53~~51, further comprising:

transmitting information indicating a set of preconfigured modes of operation to the UE, wherein the plurality of different operation modes supported by the UE comprise a subset of the set of preconfigured modes of operation.

~~70~~67. A base station, comprising:

means for receiving UE capability information including a set of parameters associated with each of a plurality of different operation modes supported by a UE, wherein ~~at least one of~~ the plurality of different operation modes comprises at least a power efficient mode and a spectrum efficient mode;

means for determining an operation mode of the plurality of different operation modes for the UE based on the UE capability information; and

means for transmitting, to the UE, configuration information for the UE based on the UE capability information, the configuration information including an indication of the operation mode of the plurality of different operation modes.

~~71~~68. The base station of claim ~~70~~67, wherein the means for receiving is further configured to receive at least one power efficient CSI from the UE, the at least one power efficient CSI corresponding to the power efficient mode supported by the UE; and

wherein the at least one power efficient CSI is determined based on one or more of:

a clock frequency used by the UE in the power efficient mode,

a number of receive antennas used in the power efficient mode,

MIMO receiver complexity supported in the power efficient mode,

a throughput that the UE can support in the power efficient mode,

a number of decoder iterations that the UE can perform in the power efficient

mode, or

a combination thereof.

~~7269~~. The base station of claim ~~7067~~, wherein the means for receiving is further configured to receive information indicating a processing time period between receipt of the indication at the UE and switching by the UE to the operation mode based on UE capability, wherein the operation mode is the power efficient mode.

~~7370~~. The base station of claim ~~7067~~, wherein the means for transmitting is further configured to transmit a configuration for a plurality of CSI processes, wherein a first CSI process is based on spectrum efficiency and a second CSI process is based on power efficiency.

~~7471~~. The base station of claim ~~7067~~, wherein the means for transmitting is further configured to transmit information indicating a set of preconfigured modes of operation to the UE, wherein the plurality of different operation modes supported by the UE comprise a subset of the set of preconfigured modes of operation.

~~7572~~. A base station, comprising:

a memory; and

at least one processor coupled to the memory and configured to:

receive UE capability information including a set of parameters associated with each of a plurality of different operation modes supported by a UE, wherein ~~at least one of the plurality of different operation modes comprises~~ at least a power efficient mode and a spectrum efficient mode;

determine an operation mode of the plurality of different operation modes for the UE based on the UE capability information; and

transmit, to the UE, configuration information for the UE based on the UE capability information, the configuration information including an indication of the operation mode of the plurality of different operation modes.

~~7673~~. The base station of claim ~~7572~~, wherein the at least one processor is further configured to:

receive at least one power efficient CSI from the UE, the at least one power efficient CSI

corresponding to the power efficient mode supported by the UE.

~~77~~74. The base station of claim ~~76~~73, where the at least one power efficient CSI is determined based on one or more of:

- a clock frequency used by the UE in the power efficient mode,
- a number of receive antennas used in the power efficient mode,
- MIMO receiver complexity supported in the power efficient mode,
- a throughput that the UE can support in the power efficient mode,
- a number of decoder iterations that the UE can perform in the power efficient mode, or
- a combination thereof.

~~78~~75. The base station of claim ~~76~~73, wherein the operation mode of the plurality of different operation modes to be used by the UE is further based on the at least one power efficient CSI, and wherein the operation mode comprises the power efficient mode.

~~79~~76. The base station of claim ~~76~~73, wherein the indication is transmitted via one of: semi-statically through a radio resource connection (RRC) signal or in downlink control information (DCI).

~~80~~77. The base station of claim ~~76~~73, wherein the indication is transmitted via a power saving signal or through a power saving signal channel.

~~81~~78. The base station of claim ~~76~~73, wherein the at least one power efficient CSI is received in addition to a spectrum efficient CSI from the UE.

~~82~~79. The base station of claim ~~75~~72, wherein the set of parameters associated with a given operation mode comprises minimum processing timelines for the UE to respond in the given operation mode.

~~83~~80. The base station of claim ~~75~~72, wherein the set of parameters associated with a given operation mode comprises a maximum multiple input multiple output (MIMO) rank that can be supported by the UE in the given operation mode.

~~8481.~~ The base station of claim ~~8380~~, wherein the set of parameters associated with the given operation mode further comprises a number of UE antennas that can be used in the given operation mode.

~~8582.~~ The base station of claim ~~7572~~, wherein the set of parameters associated with a given operation mode comprises one or more of:

- a maximum modulation order or modulation and coding scheme (MCS) that can be supported in the given operation mode,
- a maximum resource block (RB) allocation for the given operation mode,
- a preferred set of precoding matrix indicators (PMIs),
- a number of blind decoding (BD) of a physical downlink control channel (PDCCH) the UE can perform in the given operation mode, or
- a combination thereof.

~~8683.~~ The base station of claim ~~7572~~, wherein the at least one processor is further configured to:

- receive information indicating a processing time period between receipt of the indication at the UE and switching by the UE to the operation mode based on UE capability, wherein the operation mode is the power efficient mode.

~~8784.~~ The base station of claim ~~7572~~, wherein the at least one processor is further configured to:

- transmit a configuration for a plurality of CSI processes, wherein a first CSI process is based on spectrum efficiency and a second CSI process is based on power efficiency.

~~8885.~~ The base station of claim ~~75~~, ~~wherein the plurality of different operation modes comprise at least one power efficient mode and at least one spectrum efficient mode.~~

~~89.~~ ~~The base station of claim ~~7572~~, wherein each of the plurality of different operation modes is associated with a different one of a plurality of different bandwidth parts (BWPs), an individual set of parameters corresponding to an individual operation mode being associated with~~

a corresponding BWP of the plurality of different BWPs.

~~9086~~. The base station of claim ~~8985~~, wherein the plurality of different BWPs are configured by the base station and correspond to different power efficient modes supported by the UE.

~~9187~~. The base station of claim ~~7572~~, wherein the at least one processor is further configured to:

transmit information indicating a set of preconfigured modes of operation to the UE, wherein the plurality of different operation modes supported by the UE comprise a subset of the set of preconfigured modes of operation.

~~9288~~. A non-transitory computer-readable medium storing computer executable code, comprising code to:

receive UE capability information including a set of parameters associated with each of a plurality of different operation modes supported by a UE, wherein ~~at least one of the plurality of~~ different operation modes comprises at least a power efficient mode and a spectrum efficient mode;

determine an operation mode of the plurality of different operation modes for the UE based on the UE capability information; and

transmit, to the UE, configuration information for the UE based on the UE capability information, the configuration information including an indication of the operation mode of the plurality of different operation modes.