CLAIMS

1. A method of wireless communication performed by a user equipment, UE, comprising:

transmitting, in a first part of two-part channel state information, CSI, a rank indication, RI, and an indication of one or more numbers of first transfer domain coefficients to be used to characterize compressed CSI for one or more layers (910);

transmitting, in a second part of the two-part CSI, an indication of one or more numbers of second transfer domain coefficients to be used to characterize compressed CSI for one or more beams for the one or more layers (920); and

characterized by:

receiving, from a base station, an indication of a single maximum total number of first transfer domain coefficients permitted for all layers of the one or more layers collectively, wherein a determination of the one or more numbers of first transfer domain coefficients is based at least in part on the indication of the single maximum total number of first transfer domain coefficients.

2. The method of claim 1, further comprising one of the following:

i) wherein a payload size of the second part of the two-part CSI is based at least in part on at least one of the RI or the one or more numbers of first transfer domain coefficients;

ii) wherein the one or more layers include a plurality of layers and wherein the method further comprises transmitting, for each layer of the plurality of layers, an indication of the first transfer domain coefficients associated with that layer, and wherein the indication comprises a number of first transfer domain coefficients for the layer and one or more indices of the first transfer domain coefficients for the layer;

iii) wherein the first transfer domain coefficients include compression bases used in the CSI compression for one or more layers;

iv) receiving, from a base station, an indication of a maximum number of first transfer domain coefficients permitted for each of the one or more layers individually, wherein a determination of the one or more numbers of first transfer domain coefficients is based at least in part on the indication;

v) receiving, from a base station, an indication of a maximum number of first transfer domain coefficients permitted for each of the one or more layers individually,

and wherein a determination of the one or more numbers of first transfer domain coefficients is based at least in part on the indication, wherein the maximum number of first transfer domain coefficients for a layer, of the one or more layers, is based at least in part on a number of spatial beams for the layer and a number of transfer domain bases for the layer

vi) wherein the one or more layers include a plurality of layers and wherein the one or more numbers of first transfer domain coefficients include a plurality of numbers of first transfer domain coefficients, each number of first transfer domain coefficients of the plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for a respective layer of the plurality of layers;

vii) wherein the one or more numbers of first transfer domain coefficients include only a single total number of first transfer domain coefficients to be used to characterize compressed CSI for all layers of the one or more layers collectively;

viii) determining a payload size of the second part of the two-part CSI based at least in part on a maximum total number of first transfer domain coefficients permitted for all layers configured for the UE;

ix) wherein a number of transfer domain bases, used to determine a plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for a corresponding plurality of layers, is layer-specific.

3. The method of claim 1, further comprising one of the following:

i) receiving an indication that a total number of reported first transfer domain coefficients for all layers collectively is to be equal to the single maximum total number of first transfer domain coefficients permitted for all layers of the one or more layers collectively;

ii) wherein receiving the indication of the single maximum total number of first transfer domain coefficients comprises receiving an indication of a configured number of first transfer domain coefficients, wherein the configured number applies to each individual layer of the one or more layers, wherein the single maximum total number of first transfer domain coefficients is based at least in part on the configured number;

iii) transmitting an indication of a total number of first transfer domain coefficients reported by the UE for all layers collectively, wherein the total number of first transfer domain coefficients is less than or equal to the single maximum total number of first transfer domain coefficients;

iv) transmitting an indication of a total number of first transfer domain coefficients reported by the UE for all layers collectively, wherein the total number of first transfer domain coefficients is less than or equal to the single maximum total number of first transfer domain coefficients, and wherein the indication of the total number of first transfer domain coefficients comprises one or more bits, wherein a length of the one or more bits is based on at least one of the single maximum total number of first transfer domain coefficients, a configured number of first transfer domain coefficients for each layer, or a maximum RI;

v) transmitting an indication of an average number of first transfer domain coefficients per layer of the one or more layers, wherein the average number of first transfer domain coefficients per layer is less than or equal to a configured number of first transfer domain coefficients per layer;

vi) transmitting an indication of an average number of first transfer domain coefficients per layer of the one or more layers, wherein the average number of first transfer domain coefficients per layer is less than or equal to a configured number of first transfer domain coefficients per layer, and wherein the indication of the average number of first transfer domain coefficients per layer comprises one or more bits, wherein a length of the one or more bits is based on at least one of the single maximum total number of first transfer domain coefficients, the configured number of first transfer domain coefficients per layer, or a maximum RI.

4. The method of claim 2, option ii), wherein,

i) the indications of the first transfer domain coefficients for the layers are transmitted in the second part of the two-part CSI,

ii) wherein a first number of first transfer domain coefficients for a first layer is different than a second number of first transfer domain coefficients for a second layer, or the first number of first transfer domain coefficients for the first layer is the same as the second number of first transfer domain coefficients for the second layer, or a total number of first transfer domain coefficients across all layers is equal to a reported total number of first transfer domain coefficients across all layers, or an average number of first transfer domain coefficients per layer is equal to a reported average number of first transfer domain coefficients per layer, or a combination thereof.

5. The method of claim 2, option vi), further comprising one of the following:

i) wherein the first part of the two-part CSI includes a set of bits that jointly indicate the RI and the plurality of numbers of first transfer domain coefficients;

ii) wherein the first part of the two-part CSI includes a set of bits that jointly indicate the RI and the plurality of numbers of first transfer domain coefficients, and wherein a reported value of the set of bits indicates, for each layer of the plurality of layers, an allocation of a number of first transfer domain coefficients from a maximum total number of first transfer domain coefficients permitted for all layers of the plurality of layers collectively; and

further comprising determining a payload size of the second part of the two-part CSI based at least in part on the reported value;

iii) wherein the first part of the two-part CSI includes a set of bits that jointly indicate the RI and the plurality of numbers of first transfer domain coefficients, and wherein a length of the set of bits is based at least in part on an application of a ceiling function to a binary logarithm of a summation, across all selectable RI values, of a plurality of selectable allocations of numbers of first transfer domain coefficients for each layer of the plurality of layers, each of the selectable allocations being from a maximum total number of first transfer domain coefficients permitted for all of the plurality of layers collectively;

iv) wherein the one or more numbers of second transfer domain coefficients include, for each layer of the plurality of layers, a respective set of numbers of second transfer domain coefficients for a corresponding set of beams for the layer

v) further comprising determining a payload size of the second part of the two-part CSI based at least in part on an application of a ceiling function to a binary logarithm of a number of selectable options for numbers of second transfer domain coefficients permitted across all layers of the plurality of layers collectively.

6. The method of claim 2, option vii), further comprising :

i) wherein the first part of the two-part CSI includes a first set of bits that indicate the RI and a second set of bits that indicate the single total number of first transfer domain coefficients for all layers of the one or more layers collectively;

ii) wherein the first part of the two-part CSI includes a first set of bits that indicate the RI and a second set of bits that indicate the single total number of first transfer

domain coefficients for all layers of the one or more layers collectively, and further comprising at least one of:

determining a length of the first set of bits based at least in part on an application of a ceiling function to a binary logarithm of a maximum RI value configured for the UE,

determining a length of the second set of bits based at least in part on an application of a ceiling function to a binary logarithm of a maximum total number of first transfer domain coefficients permitted for all layers of the one or more layers collectively, or

a combination thereof;

iii) wherein the one or more numbers of first transfer domain coefficients include a plurality of numbers of first transfer domain coefficients, wherein the one or more layers include a plurality of layers, and wherein the second part of the two-part CSI includes a joint indication of:

the numbers of first transfer domain coefficients of the plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for the respective layers of the plurality of layers, and

the one or more second transfer domain coefficients;

iv) further comprising at least one of:

determining a payload size of the second part of the two-part CSI based at least in part on the RI and the single total number of first transfer domain coefficients to be used to characterize compressed CSI for all layers of the one or more layers collectively, or

determining a payload size of the second part of the two-part CSI based at least in part on an application of a ceiling function to a binary logarithm of a number of possible selections of the single total number of first transfer domain coefficients to be used to characterize compressed CSI for all layers from an overall number of coefficients permitted to be reported for each layer;

v) wherein the second part of the two-part CSI includes:

a first sub-part that indicates a plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for a corresponding plurality of layers, and

a second sub-part that indicates the one or more second transfer domain coefficients, wherein a payload size of the second sub-part is determined based at least in part on the first sub-part.

7. The method of claim 6, option v), further comprising one of the following:

i) wherein the first sub-part indicates an allocation, to each layer of the plurality of layers, of a respective number of the first transfer domain coefficients from the single total number of first transfer domain coefficients for all layers of the plurality of layers;

ii) wherein the first sub-part indicates an allocation, to each layer of the plurality of layers, of a respective number of the first transfer domain coefficients from the single total number of first transfer domain coefficients for all layers of the plurality of layers, and wherein a length of the first sub-part is based at least in part on an application of a ceiling function to a binary logarithm of a number of selectable allocations of the first transfer domain coefficients, each of the selectable allocations being to a respective layer of the plurality of layers from the single total number of first transfer domain coefficients for all layers of the plurality of layers;

iii) wherein the one or more numbers of second transfer domain coefficients include, for each layer of the plurality of layers, a respective set of numbers of second transfer domain coefficients for a corresponding set of beams for the layer;

iv) further comprising determining the payload size of the second sub-part based at least in part on an application of a ceiling function to a binary logarithm of a number of selectable options, each selectable option representing a possible number of second transfer domain coefficients permitted across all layers of the plurality of layers collectively; or

v) wherein the first sub-part indicates the plurality of numbers of first transfer domain coefficients based at least in part on:

an explicit indication of a reference number of first transfer domain coefficients to be used to characterize the compressed CSI for a reference layer, and

for each layer other than the reference layer, an indication of a relationship between a number of first transfer domain coefficients to be used for the layer and either the reference number of first transfer domain coefficients or a number of first transfer domain coefficients for another layer of the one or more layers.

8. A method of wireless communication performed by base station, comprising:

receiving, in a first part of two-part channel state information, CSI, a rank indication, RI, and an indication of one or more numbers of first transfer domain coefficients to be used to characterize compressed CSI for one or more layers (1010);

receiving, in a second part of the two-part CSI, an indication of one or more numbers of second transfer domain coefficients to be used to characterize compressed CSI for one or more beams for the one or more layers (1020); and

characterized by:

transmitting an indication of a single maximum total number of first transfer domain coefficients permitted for all layers of the one or more layers collectively, wherein the one or more numbers of first transfer domain coefficients is based at least in part on the indication of the single maximum total number of first transfer domain coefficients.

9. The method of claim 8, further comprising one of the following:

i) configuring one or more beams based at least in part on the RI, the one or more numbers of first transfer domain coefficients, and the one or more numbers of second transfer domain coefficients;

ii) wherein a payload size of the second part of the two-part CSI is based at least in part on at least one of the RI or the one or more numbers of first transfer domain coefficients;

iii) wherein the one or more layers include a plurality of layers and wherein the method further comprises receiving, for each layer of the plurality of layers, an indication of the first transfer domain coefficients associated with that layer, wherein the indication comprises a number of first transfer domain coefficients for the layer and one or more indices of the first transfer domain coefficients for the layer;

iv) wherein the first transfer domain coefficients include compression bases used in the CSI compression for one or more layers;

v) transmitting an indication of a maximum number of first transfer domain coefficients permitted for each of the one or more layers individually, wherein the one or more numbers of first transfer domain coefficients is based at least in part on the indication;

vi) transmitting an indication of a maximum number of first transfer domain coefficients permitted for each of the one or more layers individually, wherein the one

or more numbers of first transfer domain coefficients is based at least in part on the indication, and wherein the maximum number of first transfer domain coefficients for a layer, of the one or more layers, is based at least in part on a number of spatial beams for the layer and a number of transfer domain bases for the layer;

vii) wherein the one or more layers include a plurality of layers and wherein the one or more numbers of first transfer domain coefficients include a plurality of numbers of first transfer domain coefficients, each number of first transfer domain coefficients of the plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for a respective layer of the plurality of layers;

viii) wherein the one or more numbers of first transfer domain coefficients include only a single total number of first transfer domain coefficients to be used to characterize compressed CSI for all layers of the one or more layers collectively;

ix) determining a payload size of the second part of the two-part CSI based at least in part on a maximum total number of first transfer domain coefficients permitted for all layers;

x) wherein a number of transfer domain bases, used to determine a plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for a corresponding plurality of layers, is layer-specific.

10. The method of claim 8, further comprising one of the following:

i) transmitting an indication that a total number of reported first transfer domain coefficients for all layers collectively is to be equal to the single maximum total number of first transfer domain coefficients permitted for all layers of the one or more layers collectively

ii) wherein transmitting the indication of the single maximum total number of first transfer domain coefficients comprises transmitting an indication of a configured number of first transfer domain coefficients, wherein the configured number applies to each individual layer of the one or more layers, wherein the single maximum total number of first transfer domain coefficients is based at least in part on the configured number;

iii) receiving an indication of a total number of first transfer domain coefficients reported for all layers collectively, wherein the total number of first transfer domain coefficients is less than or equal to the single maximum total number of first transfer domain coefficients;

iv) receiving an indication of a total number of first transfer domain coefficients reported for all layers collectively, wherein the total number of first transfer domain coefficients is less than or equal to the single maximum total number of first transfer domain coefficients, and wherein the indication of the total number of first transfer domain coefficients comprises one or more bits, wherein a length of the one or more bits is based on at least one of the single maximum total number of coefficients, a configured number of first transfer domain coefficients for each layer, or a maximum RI;

v) receiving an indication of a total number of first transfer domain coefficients reported for all layers collectively, wherein the total number of first transfer domain coefficients is less than or equal to the single maximum total number of first transfer domain coefficients; and receiving an indication of an average number of first transfer domain coefficients per layer of the one or more layers, wherein the average number of first transfer domain coefficients per layer is less than or equal to a configured number of first transfer domain coefficients per layer; and

vi) wherein the indication of the average number of first transfer domain coefficients per layer comprises one or more bits, wherein a length of the one or more bits is based on at least one of the single maximum total number of first transfer domain coefficients, the configured number of first transfer domain coefficients per layer, or a maximum RI.

11. The method of claim 9, option iii), wherein:

i) the indications of the first transfer domain coefficients for the layers are received in the second part of the two-part CSI;

ii) a first number of first transfer domain coefficients for a first layer is different from a second number of first transfer domain coefficients for a second layer;

iii) a first number of first transfer domain coefficients for a first layer is the same as a second number of first transfer domain coefficients for a second layer

iv) a total number of first transfer domain coefficients across all layers is equal to a reported total number of first transfer domain coefficients across all layers;

v) an average number of first transfer domain coefficients per layer is equal to a reported average number of first transfer domain coefficients per layer.

12. The method of claim 9, option vii), further comprising one of the following:

i) wherein the first part of the two-part CSI includes a set of bits that jointly indicate the RI and the plurality of numbers of first transfer domain coefficients;

ii) wherein the first part of the two-part CSI includes a set of bits that jointly indicate the RI and the plurality of numbers of first transfer domain coefficients, and wherein a reported value of the set of bits indicates, for each layer of the plurality of layers, an allocation of a number of first transfer domain coefficients from a maximum total number of first transfer domain coefficients permitted for all layers of the plurality of layers collectively; and

further comprising determining a payload size of the second part of the two-part CSI based at least in part on the reported value;

iii) wherein the first part of the two-part CSI includes a set of bits that jointly indicate the RI and the plurality of numbers of first transfer domain coefficients, and wherein a length of the set of bits is based at least in part on an application of a ceiling function to a binary logarithm of a summation, across all selectable RI values, of a plurality of selectable allocations of numbers of first transfer domain coefficients for each layer of the plurality of layers, each of the selectable allocations being from a maximum total number of first transfer domain coefficients permitted for all of the plurality of layers collectively;

iv) wherein the one or more numbers of second transfer domain coefficients include, for each layer of the plurality of layers, a respective set of numbers of second transfer domain coefficients for a corresponding set of beams for the layer;

v) determining a payload size of the second part of the two-part CSI based at least in part on an application of a ceiling function to a binary logarithm of a number of selectable options for numbers of second transfer domain coefficients permitted across all layers of the plurality of layers collectively.

13. The method of claim 9, option viii), further comprising one of the following:

i) wherein the first part of the two-part CSI includes a first set of bits that indicate the RI and a second set of bits that indicate the single total number of first transfer domain coefficients for all layers of the one or more layers collectively

ii) wherein the first part of the two-part CSI includes a first set of bits that indicate the RI and a second set of bits that indicate the single total number of first transfer domain coefficients for all layers of the one or more layers collectively, and determining

a length of the first set of bits based at least in part on an application of a ceiling function to a binary logarithm of a maximum RI value configured for the UE;

iii) wherein the first part of the two-part CSI includes a first set of bits that indicate the RI and a second set of bits that indicate the single total number of first transfer domain coefficients for all layers of the one or more layers collectively, and determining a length of the second set of bits based at least in part on an application of a ceiling function to a binary logarithm of a maximum total number of first transfer domain coefficients permitted for all layers of the one or more layers collectively;

iv) wherein the one or more numbers of first transfer domain coefficients include a plurality of numbers of first transfer domain coefficients, wherein the one or more layers include a plurality of layers, and wherein the second part of the two-part CSI includes a joint indication of:

the numbers of first transfer domain coefficients of the plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for the respective layers of the plurality of layers, and

the one or more second transfer domain coefficients;

v) determining a payload size of the second part of the two-part CSI based at least in part on the RI and the single total number of first transfer domain coefficients to be used to characterize compressed CSI for all layers of the one or more layers collectively;

vi) determining a payload size of the second part of the two-part CSI based at least in part on an application of a ceiling function to a binary logarithm of a number of possible selections of the single total number of first transfer domain coefficients to be used to characterize compressed CSI for all layers from an overall number of coefficients permitted to be reported for each layer;

vii) wherein the second part of the two-part CSI includes:

a first sub-part that indicates a plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for a corresponding plurality of layers, and

a second sub-part that indicates the one or more second transfer domain coefficients, wherein a payload size of the second sub-part is determined based at least in part on the first sub-part;

wherein the first sub-part indicates an allocation, to each layer of the plurality of layers, of a respective number of the first transfer domain coefficients from the single total number of first transfer domain coefficients for all layers of the plurality of layers; and

a) wherein a length of the first sub-part is based at least in part on an application of a ceiling function to a binary logarithm of a number of selectable allocations of the first transfer domain coefficients, each of the selectable allocations being to a respective layer of the plurality of layers from the single total number of first transfer domain coefficients for all layers of the plurality of layers

b) wherein the one or more numbers of second transfer domain coefficients include, for each layer of the plurality of layers, a respective set of numbers of second transfer domain coefficients for a corresponding set of beams for the layer;

viii) wherein the second part of the two-part CSI includes:

a first sub-part that indicates a plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for a corresponding plurality of layers, and

a second sub-part that indicates the one or more second transfer domain coefficients, wherein a payload size of the second sub-part is determined based at least in part on the first sub-part, and further comprising determining the payload size of the second sub-part based at least in part on an application of a ceiling function to a binary logarithm of a number of selectable options, each selectable option representing a possible number of second transfer domain coefficients permitted across all layers of the plurality of layers collectively;

ix) wherein the second part of the two-part CSI includes:

a first sub-part that indicates a plurality of numbers of first transfer domain coefficients to be used to characterize compressed CSI for a corresponding plurality of layers, and

a second sub-part that indicates the one or more second transfer domain coefficients, wherein a payload size of the second sub-part is determined based at least in part on the first sub-part, and

wherein the first sub-part indicates the plurality of numbers of first transfer domain coefficients based at least in part on:

an explicit indication of a reference number of first transfer domain coefficients to be used to characterize the compressed CSI for a reference layer, and

for each layer other than the reference layer, an indication of a relationship between a number of first transfer domain coefficients to be used for the layer and either the reference number of first transfer domain coefficients or a number of first transfer domain coefficients for another layer of the one or more layers.

14. An apparatus for wireless communication, comprising:

means for transmitting, in a first part of two-part channel state information, CSI, a rank indication, RI, and an indication of one or more numbers of first transfer domain coefficients to be used to characterize compressed CSI for one or more layers;

means for transmitting, in a second part of the two-part CSI, an indication of one or more numbers of second transfer domain coefficients to be used to characterize compressed CSI for one or more beams for the one or more layers; and

means for receiving, from a base station, an indication of a single maximum total number of first transfer domain coefficients permitted for all layers of the one or more layers collectively, wherein a determination of the one or more numbers of first transfer domain coefficients is based at least in part on the indication of the single maximum total number of first transfer domain coefficients.

15. An apparatus for wireless communication, comprising:

means for receiving, in a first part of two-part channel state information, CSI, a rank indication, RI, and an indication of one or more numbers of first transfer domain coefficients to be used to characterize compressed CSI for one or more layers;

means for receiving, in a second part of the two-part CSI, an indication of one or more numbers of second transfer domain coefficients to be used to characterize compressed CSI for one or more beams for the one or more layers; and

means for transmitting an indication of a single maximum total number of first transfer domain coefficients permitted for all layers of the one or more layers collectively, wherein the one or more numbers of first transfer domain coefficients is based at least in part on the indication of the single maximum total number of first transfer domain coefficients.