

CLAIMS

What is claimed is:

1. A method for transmitting a control channel, comprising:

generating at least one enhanced control channel element eCCE; and

transmitting the control channel through the at least one eCCE; wherein:

a process of generating each eCCE specifically comprises:

determining at least two physical resource block PRB pairs for transmitting the control channel, wherein each PRB pair of the at least two PRB pairs is corresponding to multiple enhanced resource element groups eREGs and the multiple eREGs have eREG attribute information that is not exactly the same; and

selecting an eREG from the multiple eREGs corresponding to each PRB pair, wherein the selected eREGs have different eREG attribute information, and forming an eCCE with the selected eREGs.

2. The method according to claim 1, wherein each eREG among the multiple eREGs comprises a specified number of resource elements REs, resource elements REs comprised in each PRB pair are divided according to the specified number to obtain multiple groups, and each group is corresponding to an eREG.

3. The method according to claim 1 or 2, wherein:

the eREG attribute information comprises resource location information, and that the selected eREGs have different eREG attribute information refers to that the selected eREGs have different resource location information; or

the eREG attribute information comprises resource port number information, and that the selected eREGs have different eREG attribute information refers to that the selected eREGs have different resource port number information; or

the eREG attribute information comprises resource location information and resource port number information, and that the selected eREGs have different eREG attribute information refers to that the selected eREGs have different resource location information, or that the selected eREGs have different resource port number information, or that the selected eREGs have different resource location information and resource port number information.

4. The method according to claim 3, wherein the eREG attribute information further comprises the number of punches of an RE; and

that the selected eREGs have different eREG attribute information further comprises that the selected eREGs have different numbers of punches.

5. The method according to any one of claims 1 to 4, further comprising:

selecting at least two eCCEs from the generated eCCEs, wherein among eREGs of the at least two eCCEs, eREGs belonging to a same PRB pair have different resource port number information; and

the transmitting the control channel through the at least one eCCE is specifically: transmitting the control channel through the selected at least two eCCEs.

6. An apparatus for transmitting a control channel, comprising:

a generation unit, configured to generate at least one enhanced control channel element eCCE; and

a transmission unit, configured to transmit the control channel through the at least one eCCE generated by the generation unit; wherein:

the generation unit is specifically configured to determine at least two physical resource block PRB pairs for transmitting the control channel when each eCCE is generated, wherein each PRB pair of the at least two PRB pairs is corresponding to multiple enhanced resource element groups eREGs and the multiple eREGs have eREG attribute information that is not exactly the same; and select an eREG from the multiple eREGs corresponding to each PRB pair, wherein the selected eREGs have different eREG attribute information, and form an eCCE with the selected eREGs.

7. The apparatus according to claim 6, wherein each eREG among the multiple eREGs comprises a specified number of resource elements REs, resource elements REs comprised in each PRB pair are divided according to the specified number to obtain multiple groups, and each group is corresponding to an eREG.

8. The apparatus according to claim 6 or 7, wherein:

the eREG attribute information comprises resource location information, and that the selected eREGs have different eREG attribute information refers to that the selected eREGs have different resource location information; or

the eREG attribute information comprises resource port number information, and that the selected eREGs have different eREG attribute information refers to that the selected eREGs have different resource port number information; or

the eREG attribute information comprises resource location information and resource port number information, and that the selected eREGs have different eREG attribute information refers to that the selected eREGs have different resource location information, or that the selected eREGs have different resource port number information, or that the selected eREGs have different resource location information and resource port number information.

9. The apparatus according to claim 7, wherein:
the eREG attribute information further comprises the number of punches of an RE; and
that the selected eREGs have different eREG attribute information further comprises that the
selected eREGs have different numbers of punches.

5 10. The apparatus according to any one of claims 6 to 9, further comprising:

a selection unit, configured to select at least two eCCEs from the eCCEs generated by the
generation unit, wherein among eREGs of the at least two eCCEs, eREGs belonging to a same PRB
pair have different resource port number information; and

10 the transmission unit is specifically configured to transmit the control channel through the at
least two eCCEs selected by the selection unit.

CLAIMS:

1. A method for transmitting a control channel, comprising:

generating at least one enhanced control channel element (eCCE);

transmitting the control channel through the at least one eCCE, wherein generating each eCCE comprises:

determining four physical resource block (PRB) pairs, wherein each PRB pair of the four PRB pairs comprises sixteen enhanced resource element groups (eREGs) twelve subcarriers in a frequency domain and fourteen Orthogonal Frequency Division Multiple (OFDM) symbols in a time domain;

144 resource elements (REs), comprising all REs except REs to which Demodulation Reference Signals (DMRSs) are mapped, are divided into sixteen eREGs, with each eREG comprising nine REs;

information of each RE comprises X and Z, where X indicates a number of eREGs, Z indicates resource location information and Z is 0, 1, 2, or 3;

the 144 REs are numbered, using the X, cyclically from the first integer of sixteen consecutive integers to the last integer of sixteen consecutive integers in an increasing order of frequency first and then time;

in a case where the X is equal to the first integer of the sixteen consecutive integers, the second integer of the sixteen consecutive integers, the third integer of the sixteen consecutive integers or the fourth integer of the sixteen consecutive integers, the Z is equal to 0;

in a case where the X is equal to the fifth integer of the sixteen consecutive integers, the sixth integer of the sixteen consecutive integers, the seventh integer of the sixteen consecutive integers or the eighth integer of the sixteen consecutive integers, the Z is equal to 1;

in a case where the X is equal to the ninth integer of the sixteen consecutive integers, the tenth integer of the sixteen consecutive integers, the eleventh integer of the sixteen consecutive integers or the twelfth integer of the sixteen consecutive integers, the Z is equal to 2;

in a case where the X is equal to the thirteenth integer of the sixteen consecutive integers, the fourteenth integer of the sixteen consecutive integers, the fifteenth integer of the sixteen consecutive integers or the last integer of the sixteen consecutive integers, the Z is equal to 3;

selecting four eREGs from the four PRB pairs respectively, wherein the resource location information of four selected eREGs are different from each other; and

generating one eCCE of the at least one eCCE with the four selected eREGs.

2. The method according to claim 1, wherein the four selected eREGs have different numbers of punches.

3. The method according to claim 1, wherein before transmitting the control channel through the at least one eCCE, the method further comprises:

selecting at least two eCCEs from the generated at least one eCCE, wherein among eREGs of the at least two eCCEs, eREGs belonging to a same PRB pair have different resource port number information; and

wherein the transmitting the control channel through the at least one eCCE comprises transmitting the control channel through the selected at least two eCCEs.

4. A device for transmitting a control channel, comprising:

a processor configured to generate at least one enhanced control channel element (eCCE); and a transmitter coupled to the processor and configured to transmit the control channel through the at least one eCCE generated by the processor, wherein the processor is configured to:

determine four physical resource block (PRB) pairs, wherein each PRB pair of the four PRB pairs comprises sixteen enhanced resource element groups (eREGs), twelve subcarriers in a frequency domain and fourteen Orthogonal Frequency Division Multiple (OFDM) symbols in a time domain;

144 resource elements (REs), comprising all REs except REs to which Demodulation Reference Signals (DMRSs) are mapped, are divided into the sixteen eREGs, with each eREG comprising nine REs;

information of each RE comprises X and Z, where X indicates a number of an eREG, Z indicates resource location information and Z is 0, 1, 2, or 3;

the 144 REs are numbered, using the X, cyclically from the first integer of sixteen consecutive integers to the last integer of sixteen consecutive integers in an increasing order of first frequency and then time;

in a case where the X is equal to the first integer of the sixteen consecutive integers, the second integer of the sixteen consecutive integers, the third integer of the sixteen consecutive integers or the fourth integer of the sixteen consecutive integers, the Z is equal to 0;

in a case where the X is equal to the fifth integer of the sixteen consecutive integers, the sixth integer of the sixteen consecutive integers, the seventh integer of the sixteen consecutive integers or the eighth integer of the sixteen consecutive integers, the Z is equal to 1;

in a case where the X is equal to the ninth integer of the sixteen consecutive integers, the tenth integer of the sixteen consecutive integers, the eleventh integer of the sixteen consecutive integers or the twelfth integer of the sixteen consecutive integers, the Z is equal to 2;

in a case where the X is equal to the thirteenth integer of the sixteen consecutive integers, the fourteenth integer of the sixteen consecutive integers, the fifteenth integer of the sixteen consecutive integers or the last integer of the sixteen consecutive integers, the Z is equal to 3;

select four eREGs from the four PRB pairs respectively to form an eCCE, wherein the resource location information of four selected eREGs are different from each other; and

generate one eCCE of the at least one eCCE with the four selected eREGs.

5. The device according to claim 4, wherein the four selected eREGs have different numbers of punches.

6. The device according to claim 4, wherein the processor is further configured to select at least two eCCEs from the generated at least one eCCE, wherein among eREGs of the at least two eCCEs, eREGs belonging to a same PRB pair have different resource port number information; and

the transmitter is specifically configured to transmit the control channel through the selected at least two eCCEs.

7. A non-transitory computer readable medium comprising processor-executable instructions, which when executed causes a processor to implement the following for transmitting a control channel:

generating at least one enhanced control channel element (eCCE);

transmitting the control channel through the at least one eCCE, wherein generating each eCCE comprises:

determining four physical resource block (PRB) pairs, wherein each PRB pair of the four PRB pairs comprises sixteen enhanced resource element groups (eREGs), twelve subcarriers in a frequency domain and fourteen Orthogonal Frequency Division Multiple (OFDM) symbols in a time domain;

144 resource elements (REs), comprising all REs except REs to which Demodulation Reference Signals (DMRSs) are mapped, are divided into sixteen eREGs, with each eREG comprising nine REs;

information of each RE comprises X and Z, where X indicates a number of eREGs, Z indicates resource location information and Z is 0, 1, 2, or 3;

the 144 REs are numbered, using the X, cyclically from the first integer of sixteen consecutive integers to the last integer of sixteen consecutive integers in an increasing order of frequency first and then time;

in a case where the X is equal to the first integer of the sixteen consecutive integers, the second integer of the sixteen consecutive integers, the third integer of the sixteen consecutive integers or the fourth integer of the sixteen consecutive integers, the Z is equal to 0;

in a case where the X is equal to the fifth integer of the sixteen consecutive integers, the sixth integer of the sixteen consecutive integers, the seventh integer of the sixteen consecutive integers or the eighth integer of the sixteen consecutive integers, the Z is equal to 1;

in a case where the X is equal to the ninth integer of the sixteen consecutive integers, the tenth integer of the sixteen consecutive integers, the eleventh integer of the sixteen consecutive integers or the twelfth integer of the sixteen consecutive integers, the Z is equal to 2;

in a case where the X is equal to the thirteenth integer of the sixteen consecutive integers, the fourteenth integer of the sixteen consecutive integers, the fifteenth integer of the sixteen consecutive integers or the last integer of the sixteen consecutive integers, the Z is equal to 3;

selecting four eREGs from the four PRB pairs respectively, wherein the resource location information of four selected eREGs are different from each other; and

generating one eCCE of the at least one eCCE with the four selected eREGs.

8. The non-transitory computer readable medium according to claim 7, wherein before transmitting the control channel through the at least one eCCE, the instructions further causes the processor to implement:

selecting at least two eCCEs from the generated at least one eCCE, wherein among eREGs of the at least two eCCEs, eREGs belonging to a same PRB pair have different resource port number information; and

wherein the transmitting the control channel through the at least one eCCE comprises transmitting the control channel through the selected at least two eCCEs.

9. The non-transitory computer readable medium according to claim 7, wherein the four selected eREGs have different numbers of punches