CLAIMS

[Claim 1]

A terminal device (1), comprising:

a transmission unit (107) configured to transmit, to a base station device (3), a Rank Indicator, RI, determined by the terminal device (1), the RI corresponding to a number of useful layers and corresponding to Physical Downlink Shared CHannel, PDSCH, transmission in a first downlink component carrier corresponding to a first bandwidth class of a first band in a first band combination; and

a reception unit (105) configured to receive a PDSCH from the base station device (3),

wherein the transmission unit (107) is configured to transmit, to the base station device (3), capability information, the capability information including first information second information and third information, or the capability information including the first information and the second information,

the reception unit (105) is configured to receive, from the base station device (3), fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination,

the first information indicates a User Equipment, UE, category corresponding to a first maximum number of the layers supported by the terminal device (1) in a downlink,

the second information indicates the first bandwidth class of the first band in the first band combination and corresponding to a number of downlink component carriers supported by the terminal device (1),

the third information indicates a second maximum number of the layers supported by the terminal device (1) in the downlink, the second maximum number of the layers being for all of one or more downlink component carriers corresponding to the first bandwidth class of the first band in the first combination,

the fifth information indicates a fourth maximum number of the layers configured for the terminal device,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not received, a fifth maximum number of the layers assumed for

determining a bit width for the RI is given by referring to any one of the first information and the third information, and

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is received, the fifth maximum number of the layers assumed for determining the bit width for the RI is given by referring to the fifth information.

[Claim 2]

The terminal device (1) according to claim 1, wherein,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not received; a first transmission mode for the PDSCH transmission is configured for the first downlink component carrier; and the third information is included in the capability information,

the fifth maximum number of the layers assumed for determining the bit width for the RI is determined according to a minimum of a configured number of first ports and the second maximum number of the layers indicated by the third information, the first port being a transmit antenna port for a Channel State Information-Reference Signal, CSI-RS.

[Claim 3]

The terminal device (1) according to claim 1, wherein,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not received; a first transmission mode for the PDSCH transmission is configured for the first downlink component carrier; and the third information is not included in the capability information,

the fifth maximum number of the layers assumed for determining the bit width for the RI is determined according to a minimum of a configured number of first ports and the first maximum number of the layers corresponding to the first information, the first port being a transmit antenna port for a Channel State Information-Reference Signal, CSI-RS.

[Claim 4]

The terminal device according to claim 1, wherein,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not received, and a second transmission mode for the PDSCH transmission is configured for the first downlink component carrier,

the fifth maximum number of the layers assumed for determining the bit width for the RI is determined according to a minimum of a number of second ports and the first maximum number of the layers corresponding to the first information, the second port being a transmit antenna port for a Physical Broadcast CHannel, PBCH.

[Claim 5]

The terminal device according to claim 1, wherein the transmission unit (107) is configured to transmit the RI on a Physical Uplink Shared CHannel, PUSCH.

[Claim 6]

A base station device (3), comprising:

a reception unit (305) configured to receive, from a terminal device (1), a Rank Indicator, RI, determined by the terminal device (1), the RI corresponding to a number of useful layers and corresponding to Physical Downlink Shared CHannel, PDSCH, transmission in a first downlink component carrier corresponding to a first bandwidth class of a first band in a first band combination; and

a transmission unit (307) configured to transmit a PDSCH to the terminal device (1),

wherein the reception unit (305) is configured to receive, from the terminal device (1), capability information, the capability information including first information, second information and third information, or the capability information including the first information and the second information,

the transmission unit (307) is configured to transmit, to the terminal device (1), fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination,

the first information indicates a User Equipment, UE, category corresponding to a first maximum number of the layers supported by the terminal device (1) in a downlink,

the second information indicates the first bandwidth class of the first band in the first band combination and corresponding to a number of downlink component carriers supported by the terminal device (1),

the third information indicates a second maximum number of the layers supported by the terminal device (1) in the downlink, the second maximum number of the layers being for all of one or more downlink component carriers corresponding to the first bandwidth class of the first band in the first combination,

the fifth information indicates a fourth maximum number of the layers configured for the terminal device,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not transmitted to the terminal device (1), a fifth maximum number of the layers assumed for determining a bit width for the RI is given by referring to any one of the first information and the third information, and

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is transmitted to the terminal device (1), the fifth maximum number of the layers assumed for determining the bit width for the RI is given by referring to the fifth information.

[Claim 7]

The base station device (3) according to claim 6, wherein,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not transmitted to the terminal device (1); a first transmission mode for the PDSCH transmission for the first downlink component carrier is configured for the terminal device; and the third information is included in the capability information,

the fifth maximum number of the layers assumed for determining the bit width for the RI is determined according to a minimum of a configured number of first ports and the second maximum number of the layers indicated by the third information, the first port being a transmit antenna port for a Channel State Information-Reference Signal, CSI-RS.

[Claim 8]

The base station device (3) according to claim 6, wherein,

. in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not transmitted to the terminal device (1); a first transmission mode for the PDSCH transmission for the first downlink component carrier is configured for the terminal device (1); and the third information is not included in the capability information,

the fifth maximum number of the layers assumed for determining the bit width for the RI is determined according to a minimum of a configured number of first ports and the first maximum number of the layers corresponding to the first information, the first port being a transmit antenna port for a Channel State Information-Reference Signal, CSI-RS.

[Claim 9]

The base station device (3) according to claim 6, wherein,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not transmitted to the terminal device (1), and a second transmission mode for the PDSCH transmission for the first downlink component carrier is configured for the terminal device (1),

the fifth maximum number of the layers assumed for determining the bit width for the RI is determined according to a minimum of a number of second ports and the first maximum number of the layers corresponding to the first information, the second port being a transmit antenna port for a Physical Broadcast CHannel, PBCH.

[Claim 10]

The base station device (3) according to claim 6, wherein the reception unit (305) is configured to receive the RI on a Physical Uplink Shared CHannel, PUSCH.

[Claim 11]

A communication method performed by a terminal device (1), the method comprising the steps of:

transmitting, to a base station device (3), a Rank Indicator, RI, determined by the terminal device (1), the RI corresponding to a number of useful layers and corresponding to Physical Downlink Shared CHannel, PDSCH, transmission in a

first downlink component carrier corresponding to a first bandwidth class of a first band in a first band combination;

receiving a PDSCH from the base station device (3);

transmitting, to the base station device (3), capability information, the capability information including first information, second information and third information, or the capability information including the first information and the second information; and

receiving, from the base station device (3), fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination,

wherein the first information indicates a User Equipment, UE, category corresponding to a first maximum number of the layers supported by the terminal device (1) in a downlink,

the second information indicates the first bandwidth class of the first band in the first band combination and corresponding to a number of downlink component carriers supported by the terminal device (1),

the third information indicates a second maximum number of the layers supported by the terminal device (1) in the downlink, the second maximum number of the layers being for all of one or more downlink component carriers corresponding to the first bandwidth class of the first band in the first combination,

the fifth information indicates a fourth maximum number of the layers configured for the terminal device,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not received, a fifth maximum number of the layers assumed for determining a bit width for the RI is given by referring to any one of the first information and the third information, and

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is received, the fifth maximum number of the layers assumed for determining the bit width for the RI is given by referring to the fifth information.

[Claim 12]

A communication method performed by a base station device (3), the method comprising the steps of:

receiving, from a terminal device (1), a Rank Indicator, RI, determined by the terminal device (1), the RI corresponding to a number of useful layers and corresponding to Physical Downlink Shared CHannel, PDSCH, transmission in a first downlink component carrier corresponding to a first bandwidth class of a first band in a first band combination;

transmitting a PDSCH to the terminal device (1);

receiving, from the terminal device (1), capability information, the capability information including first information, second information and third information, or the capability information including the first information and the second information; and

transmitting, to the terminal device (1), fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination,

wherein the first information indicates a User Equipment, UE, category corresponding to a first maximum number of the layers supported by the terminal device (1) in a downlink,

the second information indicates the first bandwidth class of the first band in the first band combination and corresponding to a number of downlink component carriers supported by the terminal device (1),

the third information indicates a second maximum number of the layers supported by the terminal device (1) in the downlink, the second maximum number of the layers being for all of one or more downlink component carriers corresponding to the first bandwidth class of the first band in the first combination,

the fifth information indicates a fourth maximum number of the layers configured for the terminal device,

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is not transmitted to the terminal device (1), a fifth maximum number of the layers assumed for determining a bit width for the RI is given by referring to any one of the first information and the third information, and

in a case that the fifth information for the first downlink component carrier corresponding to the first bandwidth class of the first band in the first band combination is configured for the terminal device, the fifth maximum number of the layers assumed for determining the bit width for the RI is given by referring to the fifth information.