【CLAIMS】

【Claim 1】

A method for codebook-based transmission of a Physical Uplink Shared Channel, PUSCH, in a wireless communication system, the method performed in a User Equipment, UE, (1820) comprising:

receiving rank restriction information, from a network node (1810);

receiving, from the network node, downlink control information, DCI, for PUSCH transmission;

selecting a precoder based on a bit field of the DCI and the received rank restriction information; and

performing the PUSCH transmission using the precoder.

【Claim 2】

The method of claim 1, wherein the rank restriction information is received from the network node (1810) with codebook subset restriction information, and

wherein the precoder is selected using the bit field of the DCI and the received codebook subset restriction information and the rank restriction information.

【Claim 3】

The method of claim 2, wherein when the PUSCH is transmitted using four antenna ports, the precoder is selected, using the bit field of the DCI and the received codebook subset restriction information and the rank restriction information, in a codebook including:

a first group including non-coherent precoding matrixes for selecting only one port for each layer,

a second group including partial-coherent precoding matrixes for selecting two ports in at least one layer, and

a third group including full-coherence precoding matrixes for selecting all ports for each of the layers.

【Claim 4】

The method of claim 3,

wherein the non-coherent precoding matrices have one non-zero value in each column,

wherein the partial-coherent precoding matrices have two non-zero values in each column, and

wherein the full-coherence precoding matrices have only non-zero values.

【Claim 5】

The method of claim 4, wherein the codebook is a codebook based on Cyclic Prefix Orthogonal Frequency Division Multiplexing, CP-OFDM, waveform.

【Claim 6】

The method of any one of the preceding claims, wherein the bit field of the DCI includes a Transmitted Precoding Matrix Indicator, TPMI, which is information of an index of the precoder selected for the PUSCH transmission.

【Claim 7】

The method of claim 6, wherein the TPMI is joint-encoded with a Rank Indicator, RI, which is information of a number of layers used in the PUSCH transmission.

【Claim 8】

The method of claim 7, wherein the TPMI and the RI are commonly indicated for all Sounding Reference Signal, SRS, resources configured to the UE (1820).

【Claim 9】

The method of claim 7, wherein the TPMI and the RI are indicated for each SRS resource configured to the UE (1820).

【Claim 10】

The method of any one of claims 7-9, wherein a size of a predefined Demodulation Reference Signal, DMRS, field in the DCI is determined differently according to the RI joint-encoded with the TPMI.

【Claim 11】

The method of any one of claims 7-10, wherein a size of a field in which TPMI and RI are joint-encoded is decided based on the rank restriction information.

【Claim 12】

The method of any one of claims 7-11, wherein the rank restriction information is received from the network node (1810) with the codebook subset restriction information, and

wherein a size of a field in which TPMI and RI are joint-encoded is decided based on the codebook subset restriction information.

【Claim 13】

The method of any one of the preceding claims, further comprising

reporting, to a network node (1810), UE capability for codebook configuration for the PUSCH transmission, prior to receiving the rank restriction information.

【Claim 14】

A processor for a User Equipment, UE, in a wireless communication system, wherein the processor (1821), when coupled to a radio frequency, RF, unit (1823) of the UE (1820), is configured to control codebook-based transmission of a Physical Uplink Shared Channel, PUSCH, in accordance with a method as claimed in any one of the preceding claims.

【Claim 15】

A User Equipment, UE, for codebook-based transmission of a Physical Uplink Shared Channel, PUSCH, in a wireless communication system, the UE (1820) comprising:

a radio frequency, RF, unit (1823) for transmitting and receiving a radio signal; and

a processor (1821) for controlling the RF unit (1823),

wherein the processor (1821) is configured to perform a method as claimed in any one of claims 1-14.