

【CLAIMS】

1. A method for transmitting a channel state information (CSI) by a user equipment (UE) in a wireless communication system, the method comprising:

determining a Precoding Matrix Indicator (PMI) using a codebook for 4 antenna ports in consideration of a rank indicator (RI); and

reporting the CSI to a base station (BS), wherein the CSI includes the PMI, the RI and a precoding type indicator (PTI),

wherein when the RI is 3 or 4, the PTI is set to 1 and the PMI is determined by using only 4 precoding matrices out of 16 precoding matrices in the codebook, where the 4 precoding matrices are as follows:

$$W_0 = \frac{1}{2} \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & 1 & -1 \\ 1 & -1 & -1 & 1 \end{bmatrix}, \quad W_2 = \frac{1}{2} \begin{bmatrix} 1 & -1 & 1 & -1 \\ -1 & 1 & 1 & -1 \\ 1 & 1 & 1 & 1 \\ -1 & -1 & 1 & 1 \end{bmatrix},$$
$$W_8 = \frac{1}{2} \begin{bmatrix} 1 & 1 & -1 & -1 \\ 1 & 1 & 1 & 1 \\ -1 & 1 & 1 & -1 \\ -1 & 1 & -1 & 1 \end{bmatrix}, \text{ and } W_{10} = \frac{1}{2} \begin{bmatrix} 1 & -1 & -1 & 1 \\ -1 & 1 & -1 & 1 \\ -1 & -1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}.$$

2. The method according to claim 1,

wherein when the RI is 3 or 4, only the PMI is reported as a single PMI, and

wherein when the RI is 1 or 2, the PMI and another PMI are reported as dual PMIs.

3. The method according to claim 1,

wherein the CSI is transmitted using a physical uplink control channel mode 2-1.

4. The method according to claim 1,

wherein when the RI is 1 or 2, the PTI is set to 0 or 1.

5. The method according to claim 1,

wherein when the RI is 3 or 4, a final PMI is determined as the PMI, and

wherein when the RI is 1 or 2, a final PMI is determined using the PMI and another PMI.

6. The method according to claim 1, further comprising:

receiving CSI configuration information for reporting the CSI from the BS.

7. The method according to claim 6,

wherein the CSI configuration information is transmitted using radio resource control (RRC) signaling.

8. A user equipment for transmitting a channel state information (CSI) in a wireless communication system, the user equipment comprising:

a radio frequency (RF) unit; and

a processor operably coupled with the RF unit and configured to:

determine a Precoding Matrix Indicator (PMI) using a codebook for 4 antenna ports in consideration of a rank indicator (RI); and

report the CSI to a base station (BS), wherein the CSI includes the PMI, the RI and a precoding type indicator (PTI),

wherein when the RI is 3 or 4, the PTI is set to 1 and the PMI is determined by using only 4 precoding matrices out of 16 precoding matrices in the codebook, where the 4 precoding matrices are as follows:

$$W_0 = \frac{1}{2} \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & 1 & -1 \\ 1 & -1 & -1 & 1 \end{bmatrix}, \quad W_2 = \frac{1}{2} \begin{bmatrix} 1 & -1 & 1 & -1 \\ -1 & 1 & 1 & -1 \\ 1 & 1 & 1 & 1 \\ -1 & -1 & 1 & 1 \end{bmatrix},$$

$$W_8 = \frac{1}{2} \begin{bmatrix} 1 & 1 & -1 & -1 \\ 1 & 1 & 1 & 1 \\ -1 & 1 & 1 & -1 \\ -1 & 1 & -1 & 1 \end{bmatrix}, \text{ and } W_{10} = \frac{1}{2} \begin{bmatrix} 1 & -1 & -1 & 1 \\ -1 & 1 & -1 & 1 \\ -1 & -1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}.$$

9. The user equipment according to claim 8,

wherein when the RI is 3 or 4, only the PMI is reported as a single PMI, and

wherein when the RI is 1 or 2, the PMI and another PMI are reported as dual PMIs.

10. The user equipment according to claim 8,
wherein the CSI is transmitted using a physical uplink control channel mode 2-1.
11. The user equipment according to claim 8,
wherein when the RI is 1 or 2, the PTI is set to 0 or 1.
12. The user equipment according to claim 8,
wherein when the RI is 3 or 4, a final PMI is determined as the PMI, and
wherein when the RI is 1 or 2, a final PMI is determined using the PMI and another PMI.
13. The user equipment according to claim 8,
wherein the processor is configured to receive CSI configuration information for reporting the CSI from the BS.
14. The user equipment according to claim 13,
wherein the CSI configuration information is transmitted using radio resource control (RRC) signaling.