Claims

1. A method performed by a wireless device for handling downlink and uplink Transmission Configuration Indicator, TCI, states, the method comprising:

receiving (1000) a Downlink Control Information, DCI, comprising an indication that indicates a selected TCI field codepoint among:

a first subset of TCI field codepoints each associated with a respective downlink TCI state;

a second subset of TCI field codepoints each associated with a respective uplink TCI state; and

a third subset of TCI field codepoints each associated with a respective downlink TCI state and a respective uplink TCI state; and

performing (1002) one or more actions based on the selected TCI field codepoint, and

wherein the wireless device is configured by a Medium Access Control, MAC, Control Element, CE, and the MAC CE is configured to:

associate each of the first subset of TCI field codepoints with the respective downlink TCI state;

associate each of the second subset of TCI field codepoints with the respective uplink TCI state; and

associate each of the third subset of TCI field codepoints with the respective downlink TCI state and the respective uplink TCI state, and

wherein for each TCI state activated via the MAC CE, an associated field is included in the MAC CE to indicate whether the activated TCI state applies to uplink only, downlink only, or both downlink and uplink.

2. The method of claim 1, wherein:

receiving (1000) the DCI comprising the indication comprises receiving (1000-1) the indication that indicates the selected TCI field codepoint in the first subset of TCI field codepoints; and

performing (1002) the one or more actions comprises updating (1002-1a) a downlink receive spatial filter based on the respective downlink TCI state associated with the selected TCI field codepoint.

3. The method of claim 2, wherein the downlink receive spatial filter is updated to a downlink receive spatial filter used to receive a downlink source reference signal in a respective downlink TCI state associated with the selected TCI field codepoint.

4. The method of claim 2 or 3, wherein performing (1002) the one or more actions further comprises maintaining (1002-1b) an existing uplink transmit spatial filter.

5. The method of claim 1, wherein:

receiving (1000) the DCI comprising the indication comprises receiving (1000-2) the indication that indicates the selected TCI field codepoint in the second subset of TCI field codepoints; and

performing (1002) the one or more actions comprises updating (1002-2a) an uplink transmit spatial filter based on the respective uplink TCI state associated with the selected TCI field codepoint.

6. The method of claim 5, wherein the uplink transmit spatial filter is updated to one of:

an uplink transmit spatial filter used to transmit an uplink source reference signal in the respective uplink TCI state associated with the selected TCI field codepoint; and

a downlink receive spatial filter used to receive a downlink source reference signal in the respective uplink TCI state associated with the selected TCI field codepoint.

7. The method of claim 5 or 6, wherein performing (1002) one or more actions further comprises maintaining (1002-2b) an existing downlink receive spatial filter.

8. The method of claim 1, wherein:

receiving (1000) the indication comprises receiving (1000-3) the indication that indicates the selected TCI field codepoint in the third subset of TCI field codepoints; and

performing (1002) the one or more actions comprises performing (1002-3a) a separate-TCI scheme to thereby update a downlink receive spatial filter and an uplink transmit spatial filter based on the respective downlink TCI state and the respective uplink TCI state associated with the selected TCI field codepoint, respectively.

9. The method of claim 8, wherein:

the downlink receive spatial filter is updated to a downlink receive spatial filter used to receive a downlink source reference signal in a respective downlink TCI state associated with the selected TCI field codepoint; and

the uplink transmit spatial filter is updated to one of:

an uplink transmit spatial filter used to transmit an uplink source reference signal in the respective uplink TCI state associated with the selected TCI field codepoint; and

a downlink receive spatial filter used to receive a downlink source reference signal in the respective uplink TCI state associated with the selected TCI field codepoint.

10. The method of claim 8 or 9, wherein performing (1002) one or more actions further comprises updating (1002-3b) the downlink receive spatial filter and the uplink transmit spatial filter simultaneously.

11. A wireless device (2200) comprising processing circuitry (2202) configured to cause the wireless device (2200) to:

receive (1000) a Downlink Control Information, DCI, comprising an indication that indicates a selected TCI field codepoint among:

a first subset of TCI field codepoints each associated with a respective downlink TCI state;

a second subset of TCI field codepoints each associated with a respective uplink TCI state; and

a third subset of TCI field codepoints each associated with a respective downlink TCI state and a respective uplink TCI state; and

perform (1002) one or more actions based on the selected TCI field codepoint; and

wherein the processing circuitry (2202) is further configured to cause the wireless device (2200) to be configured by a Medium Access Control, MAC, Control Element, CE, and the MAC CE is configured to:

associate each of the first subset of TCI field codepoints with the respective downlink TCI state;

associate each of the second subset of TCI field codepoints with the respective uplink TCI state; and

associate each of the third subset of TCI field codepoints with the respective downlink TCI state and the respective uplink TCI state; and

wherein for each TCI state activated via the MAC CE, an associated field is included in the MAC CE to indicate whether the activated TCI state applies to uplink only, downlink only, or both downlink and uplink.

12. The wireless device (2200) of claim 11, wherein the processing circuitry (2202) is further configured to cause the wireless device (2200) to perform any step in any of claims 2 to 10.

13. A method performed by a base station for handling downlink and uplink Transmission Configuration Indicator, TCI, states, the method comprising:

transmitting (1100) a Downlink Control Information, DCI, comprising an indication that indicates a selected TCI field codepoint among:

a first subset of TCI field codepoints each associated with a respective downlink TCI state;

a second subset of TCI field codepoints each associated with a respective uplink TCI state; and

a third subset of TCI field codepoints each associated with a respective downlink TCI state and a respective uplink TCI state, and

wherein the base station configures a wireless device via a Medium Access Control, MAC, Control Element, CE, and the MAC CE is configured to:

associate each of the first subset of TCI field codepoints with the respective downlink TCI state;

associate each of the second subset of TCI field codepoints with the respective uplink TCI state; and

associate each of the third subset of TCI field codepoints with the respective downlink TCI state and the respective uplink TCI state; and

wherein for each TCI state activated via the MAC CE, an associated field is included in the MAC CE to indicate whether the activated TCI state applies to uplink only, downlink only, or both downlink and uplink.

14. The method of claim 13, wherein transmitting (1100) the DCI comprising the indication comprises transmitting (1100-1) the indication that indicates the selected TCI field codepoint in the first subset of TCI field codepoints.

15. The method of claim 13, wherein transmitting (1100) the DCI comprising the indication comprises transmitting (1100-2) the indication that indicates the selected TCI field codepoint in the second subset of TCI field codepoints.

16. The method of claim 13, wherein transmitting (1100) the DCI comprising the indication comprises transmitting (1100-3) the indication that indicates the selected TCI field codepoint in the third subset of TCI field codepoints.

17. A base station (1900) comprising processing circuitry (1902) configured to cause the base station (1900) to:

transmit (1100) a Downlink Control Information, DCI, comprising an indication that indicates a selected TCI field codepoint among:

a first subset of TCI field codepoints each associated with a respective downlink TCI state;

a second subset of TCI field codepoints each associated with a respective uplink TCI state; and

a third subset of TCI field codepoints each associated with a respective downlink TCI state and a respective uplink TCI state; and

wherein the processing circuitry (1902) is further configured to cause the base station (1900) to configure a wireless device via a Medium Access Control, MAC, Control Element, CE, and the MAC CE is configured to:

associate each of the first subset of TCI field codepoints with the respective downlink TCI state;

associate each of the second subset of TCI field codepoints with the respective uplink TCI state; and

associate each of the third subset of TCI field codepoints with the respective downlink TCI state and the respective uplink TCI state; and

wherein for each TCI state activated via the MAC CE, an associated field is included in the MAC CE to indicate whether the activated TCI state applies to uplink only, downlink only, or both downlink and uplink.

18. The base station (1900) of claim 17, wherein the processing circuitry (1902) is further configured to cause the base station (1900) to perform any step in any of claims 14 to 16.