CLAIMS

What is claimed is:

1. A transceiving apparatus comprising:

a transceiver, which in operation, receives signals from multiple transmission and reception points (M-TRPs) in a network on at least physical downlink shared channels (PDSCHs); and

circuitry, which in operation, performs beam failure recovery (BFR) by evaluating beam failure detection (BFD) and candidate new beam detection (CBD) for the signals from a first one of the M-TRPs, wherein the signals from the first one of the M-TRPs comprise signals received on a physical downlink control channel (PDCCH), and wherein the circuitry determines to skip evaluation of one or both of the BFD and the CBD for one or more additional ones of the M-TRPs in response to one or more conditions.

2. The transceiving apparatus in accordance with Claim 1 wherein the one or more conditions comprise a duration of operating time for the one or more additional ones of the M-TRPs determined by the circuitry in response to a duration of operation time for performing BFR for the signals from the one or more additional ones of the M-TRPs.

3. The transceiving apparatus in accordance with Claim 2 wherein the duration of operating time for the one or more additional ones of the M-TRPs is indicated from one of the M-TRPs by using at least one of a downlink control information (DCI) message, a medium access control layer control element (MAC CE) message or a radio resource control (RRC) message.

~~4. The transceiving apparatus in accordance with Claim 2 wherein the one or more conditions comprise the duration of operating time for the one or more additional ones of the M-TRPs determined in response to a duration of operating time for the first one of the M-TRPs to perform BFR and an offset value.~~

~~5. The transceiving apparatus in accordance with Claim 4 wherein the one or more conditions comprise the duration of operating time for the one or more additional ones of the M-TRPs determined by the circuitry further in response to a PDCCH transmission time.~~

~~6. The transceiving apparatus in accordance with any of Claims 2 to 5 wherein the circuitry skips evaluation of both of the BFD and the CBD for the one or more additional ones of the M-TRPs in response to the duration of operating time being not greater than the time for evaluation of the BFD.~~

~~7. The transceiving apparatus in accordance with any of Claims 2 to 5 wherein the circuitry skips evaluation of the CBD and performs evaluation of the BFD for the one or more additional ones of the M-TRPs in response to the duration of operating time being greater than the time for evaluation of the BFD and not greater than the time for evaluation of the CBD.~~

~~8. The transceiving apparatus in accordance with any of the preceding claims wherein the transceiver declares a beam failure event and transmits a beam failure recovery request (BFRQ) to one or more of the M-TRPs, and wherein the BFRQ~~

~~identifies one or more beam failure (BF) events and reports content for one or more of M-TRPs including BF information and CBD information, wherein, for each of the M-TRPs, the BF information includes a beam failure index, a TRP index or a configuration index, and the CBD information includes the corresponding new beam information when present and default information when no new beam information is present.~~

~~9. The transceiving apparatus in accordance with any of the preceding claims wherein the circuitry declares a beam failure event and generates report content for beam failure for one or more of the M-TRPs, and wherein the transceiver transmits the report content to the network via at least one of an uplink control information (UCI) message, a medium access control layer control element (MAC CE) message or a radio resource control (RRC) message.~~

~~10. The transceiving apparatus in accordance with Claim 9 wherein the report content generated by the circuitry includes beam failure information of one or more of the additional ones of the M-TRPs when identified, as well as CBD information consisting of new beam information for the first one of the M-TRPs when present and default information when no new beam information is present for the one or more additional ones of the M-TRPs.~~

~~11. The transceiving apparatus of any of the preceding claims wherein the one or more conditions further comprise a duration of operating time for each individual TRP of the M-TRPs.~~

~~12. The transceiving apparatus in accordance with Claim 1 wherein the one or more conditions comprise information received by the transceiving apparatus.~~

~~13. The transceiving apparatus in accordance with Claim 12 wherein the information is indicated by using at least one of a downlink control information (DCI) message, a medium access control layer control element (MAC CE) message or a radio resource control (RRC) message.~~

~~14. The transceiving apparatus in accordance with either Claim 12 or Claim 13 wherein the information comprises a BFD parameter and/or a CBD parameter corresponding to one or more of the additional ones of the M-TRPs, and wherein the circuitry skips evaluation of the BFD in response to the BFD parameter corresponding to the one or more of the M-TRPs and/or skips evaluation of the CBD in response to the CBD parameter corresponding to the one or more of the additional ones of the M-TRPs.~~

~~15. The transceiving apparatus in accordance with Claim 14 wherein the one or more conditions comprise not receiving reference signals for BFD and/or CBD for the one or more of the additional ones of the M-TRPs and instead receiving the BFD parameter and/or the CBD parameter,~~

~~16. The transceiving apparatus in accordance with either Claim 14 or Claim 15 wherein either or both of the BFD parameter and the CBD parameter are indicated independently for each of the M-TRPs.~~

~~17. The transceiving apparatus in accordance with either Claim 14 or Claim 15 wherein either or both of the BFD parameter and the CBD parameter are common to all of the M-TRPs.~~

~~18. The transceiving apparatus in accordance with either Claim 12 or Claim 13 wherein the information comprises a timer value corresponding to one of the one or more additional ones of the M-TRPs, and wherein the circuitry skips evaluation of the BFD and/or the CBD for the one of the one or more additional ones of the M-TRPs in response to the timer value corresponding to the one of the M-TRPs.~~

~~19. The transceiving apparatus in accordance with Claim 18 wherein the timer value comprises a finite value, and wherein the transceiving apparatus is deactivated when the timer is expired.~~

~~20. The transceiving apparatus in accordance with either Claim 12 or Claim 13 wherein the information comprises a value corresponding to a maximum number of TRPs that the transceiving apparatus has the capability to be associated with, and wherein the circuitry skips evaluation of the BFD and/or the CBD for one or more of the M-TRPs in response to the value corresponding to the maximum number of TRPs that the transceiving apparatus has the capability to be associated with.~~

~~21. The system in accordance with either Claim 12 or Claim 13 wherein the information comprise a value corresponding to a number of TRPs which are required to be evaluated by the transceiving apparatus, and wherein the circuitry skips evaluation of the BFD and/or the CBD for one or more of the M-TRPs in response to the value~~

~~corresponding to the number of TRPs which are required to be evaluated by the transceiving apparatus.~~

~~22. The transceiving apparatus in accordance with either Claim 20 or Claim 21 wherein a list of M-TRPs, which are evaluated by the transceiving apparatus, is selected by a configured rule, such as list of M-TRPs with strongest RSRPs, indices in ascending /descending order, or up to implementation of the transceiving apparatus.~~

~~23. The transceiving apparatus in accordance with any of the preceding claims wherein the circuitry identifies the first one of the M-TRPs in response to signals received on a PDCCH in accordance with a radio resource control (RRC) configuration of the network.~~

~~24. The transceiving apparatus in accordance with any of the preceding claims wherein the transceiver simultaneously receives PDSCH from two or more of the M-TRPs, where the PDSCH received from each of the two or more of the M-TRPs are received in different layers.~~

~~25. The transceiving apparatus in accordance any of the preceding claims wherein the transceiver receives signals comprising a single DCI-based M-TRP transmission.~~

~~26. The transceiving apparatus in accordance any of Claims 1 to 24 wherein the transceiver receives signals comprising a multiple DCI based M-TRP transmission.~~

~~27. A system comprising:~~

~~a network comprising multiple transmission and reception points (M-TRPs) for transmitting and receiving signals; and~~

~~a transceiving apparatus comprising:~~

~~a transceiver, which in operation, receives signals from one or more of the M-TRPs; and~~

~~circuitry, which in operation, performs beam failure recovery (BFR) by evaluating beam failure detection (BFD) and candidate new beam detection (CBD) for the signals from a first one of the M-TRPs,~~

~~wherein the network generates one or more values for performing BFD and CBD for one or more of M-TRPs and transmits the one or more values to the transceiving apparatus, and wherein the circuitry skips evaluation of one or both of the BFD and the CBD for one or more additional ones of the M-TRPs in response to one of the one or more values corresponding to the one or more additional ones of the M-TRPs.~~

~~28. The system in accordance with Claim 27 wherein the one or more values corresponding to the one or more of M-TRPs can be indicated by using at least one of a downlink control information (DCI) message, a medium access control layer control element (MAC-CE) message or a radio resource control (RRC) message.~~

~~29. The system in accordance with either Claim 27 or Claim 28 wherein the network generates the one or more values for performing BFD and CBD for the one or more of M-TRPs in response to network implementation.~~

~~30. The system apparatus in accordance any of Claims 27 to 29 wherein the transceiver receives the signals from the one or more M-TRPs as single DCI based M-TRP transmissions.~~

~~31. The system apparatus in accordance any of Claims 27 to 29 wherein the transceiver receives the signals from the one or more M-TRPs as multiple DCI based M-TRP transmissions.~~

~~32. The system in accordance with Claim 31 wherein the one or more values comprise a duration of operating time for each individual TRP or information for each individual TRP received by the transceiver of the transceiving apparatus.~~

CLAIMS

1. A transceiving apparatus comprising:

a transceiver, which in operation, receives a first set of reference signal configuration relating to a first transmission and reception point (TRP) and a second set of reference signal configuration relating to a second TRP; and

circuitry, which in operation, performs at least one of beam failure detection (BFD) and candidate new beam detection (CBD) based on the first set of reference signal configuration and the second set of reference signal configuration. .

2. The transceiving apparatus in accordance with Claim 1, wherein the first set of reference signal configuration and the second set of reference signal configuration are indicated by a Medium Access Control Control Element (MAC CE) or an Radio Resource Control (RRC) signaling.

3. The transceiving apparatus in accordance with Claim 1 wherein the reference signal configuration is a configuration of channel state information (CSI) reference signal and/or a configuration of synchronization signal block (SSB).

4. The transceiving apparatus in accordance with Claim 1 wherein at least one of a first BFD and a first CBD is performed based on the first set of reference signal configuration, and at least one of a second BFD and a second CBD is performed based on the second set of reference signal configuration.

5. The transceiving apparatus in accordance with claim 1, wherein the transceiver, which in operation, reports to a base station contents including at least one result of the BFD and the CBD relating to the first set of reference signal configuration and at least one result of the BFD and the CBD relating to the second set of reference signal configuration.

6. The transceiving apparatus in accordance with claim 1, wherein whether both of the BFD based on the first set of reference signal configuration and the BFD based on the second set of reference signal configuration are performed is determined by a transmission configuration indication (TCI) state of downlink control information (DCI).

7. A communication method performed by a communication apparatus comprising:

receiving a first set of reference signal configuration relating to a first transmission and reception point (TRP) and a second set of reference signal configuration relating to a second TRP; and

transmitting a result of at least one of beam failure detection (BFD) and candidate new beam detection (CBD) based on the first set of reference signal configuration and the second set of reference signal configuration. .

8. The communication method in accordance with Claim 7, wherein the first set of reference signal configuration and the second set of reference signal configuration are indicated by a Medium Access Control Control Element (MAC CE) or an Radio Resource Control (RRC) signaling.

9. The communication method in accordance with Claim 7, wherein the reference signal configuration is a configuration of channel state information (CSI) reference signal and/or a configuration of synchronization signal block (SSB).

10. The communication method in accordance with Claim 7, further transmitting at least one result of a first BFD and a first CBD which is performed based on the first set of reference signal configuration, and at least one result of a second BFD and a second CBD which is performed based on the second set of reference signal configuration.

11. The communication method in accordance with claim 7, further transmitting contents including at least one result of the BFD and the CBD relating to the first set of reference signal configuration and at least one result of the BFD and the CBD relating to the second set of reference signal configuration.

12. The communication method in accordance with claim 7, further determining, by a transmission configuration indication (TCI) state of downlink control information (DCI), whether both of the BFD based on the first set of reference signal configuration and the BFD based on the second set of reference signal configuration are performed.

13. A base station comprising:

a transmitter, which in operation, transmits a first set of reference signal configuration relating to a first transmission and reception point (TRP) and a second set of reference signal configuration relating to a second TRP; and

a receiver, which in operation, receives a result of at least one of beam failure detection (BFD) and candidate new beam detection (CBD) based on the first set of reference signal configuration and the second set of reference signal configuration.

14. The base station in accordance with Claim 13, wherein the first set of reference signal configuration and the second set of reference signal configuration are indicated by a Medium Access Control Control Element (MAC CE) or an Radio Resource Control (RRC) signaling.

15. The base station in accordance with Claim 13, wherein the reference signal configuration is a configuration of channel state information (CSI) reference signal and/or a configuration of synchronization signal block (SSB).

16. The base station in accordance with Claim 13, wherein the receiver, which in operation, receives at least one result of a first BFD and a first CBD which is performed based on the

first set of reference signal configuration, and at least one result of a second BFD and a second CBD which is performed based on the second set of reference signal configuration.

17. The base station in accordance with claim 13, wherein the receiver, which in operation, receives contents including at least one result of the BFD and the CBD relating to the first set of reference signal configuration and at least one result of the BFD and the CBD relating to the second set of reference signal configuration.

18. The base station in accordance with claim 13, wherein the transmitter, which in operation, transmits downlink control information (DCI) including a transmission configuration indication (TCI) state, which indicates whether both of the BFD based on the first set of reference signal configuration and the BFD based on the second set of reference signal configuration are performed is determined.

19. A communication method performed by a base station comprising:

transmitting a first set of reference signal configuration relating to a first transmission and reception point (TRP) and a second set of reference signal configuration relating to a second TRP; and

receiving a result of at least one of beam failure detection (BFD) and candidate new beam detection (CBD) based on the first set of reference signal configuration and the second set of reference signal configuration.

20. The communication method in accordance with Claim 19, wherein the first set of reference signal configuration and the second set of reference signal configuration are indicated by a Medium Access Control Control Element (MAC CE) or an Radio Resource Control (RRC) signaling.

21. The communication method in accordance with Claim 19, wherein the reference signal configuration is a configuration of channel state information (CSI) reference signal and/or a configuration of synchronization signal block (SSB).

22. The communication method in accordance with Claim 19, further receiving at least one result of a first BFD and a first CBD which is performed based on the first set of reference signal configuration, and at least one result of a second BFD and a second CBD which is performed based on the second set of reference signal configuration.

23. The communication method in accordance with claim 19, further receiving contents including at least one result of the BFD and the CBD relating to the first set of reference signal configuration and at least one result of the BFD and the CBD relating to the second set of reference signal configuration.

24. The communication method in accordance with claim 19, further transmitting downlink control information (DCI) including a transmission configuration indication (TCI) state, which indicates whether both of the BFD based on the first set of reference signal configuration and the BFD based on the second set of reference signal configuration are performed is determined.

25. An integrated circuit comprising:

transceiver circuitry, which in operation, controls receiving a first set of reference signal configuration relating to a first transmission and reception point (TRP) and a second set of reference signal configuration relating to a second TRP; and

execution circuitry, which in operation, controls performing at least one of beam failure detection (BFD) and candidate new beam detection (CBD) based on the first set of reference signal configuration and the second set of reference signal configuration. .

26. An integrated circuit comprising:

transmission circuitry, which in operation, controls transmitting a first set of reference signal configuration relating to a first transmission and reception point (TRP) and a second set of reference signal configuration relating to a second TRP; and

reception circuitry, which in operation, controls receiving a result of at least one of beam failure detection (BFD) and candidate new beam detection (CBD) based on the first set of reference signal configuration and the second set of reference signal configuration.