

CLAIMS

WHAT IS CLAIMED IS:

1. A method of wireless communication for a base station, the method comprising:
communicating with a user equipment (UE) through a first active beam;
determining that beam tracking is to be performed with the UE, the beam tracking including identifying a new beam for communication between the UE and the base station;
performing beam tracking with the UE based on the determination that beam tracking is to be performed; and
communicating with the UE through a second active beam based on the beam tracking.
2. The method of claim 1, wherein the determining that beam tracking is to be performed for the UE comprises:
determining a time at which the UE is to transition from an inactive cycle of discontinuous reception (DRX) to an active cycle of DRX,
wherein the performing of the beam tracking is based on the determined time.
3. The method of claim 1, wherein the performing the beam tracking comprises one or more of:
transmitting at least one beam reference signal (BRS);
receiving, from the UE, a first indication of a first beam index based on the BRS;
transmitting, based on the first indication of the first beam index, at least one beam refinement reference signal (BRRS); and
receiving, based on the at least one beam refinement reference signal (BRRS), a second indication of a second beam index, the second beam index corresponding to the second active beam.
4. The method of claim 1, wherein the performing the beam tracking comprises one or more of:
receiving, from the UE, a request for beam tracking;

transmitting, based on the request for beam tracking, at least one beam refinement reference signal (BRRS); and

receiving, based on the at least one BRRS, an indication of a beam index, the beam index corresponding to the second active beam.

5. The method of claim 1, wherein the communicating with the UE through the first active beam comprises sending a reference signal to the UE to determine if the first active beam is failing, and wherein the determining that beam tracking is to be initiated for the UE comprises:

receiving a response from the UE based on the reference signal; and
detecting a radio link failure based on the received response.

6. The method of claim 5, wherein the communicating with the UE through the first active beam is performed with a first radio access technology (RAT), and wherein the response is received through a second RAT, the second RAT having a lower carrier frequency than the first RAT.

7. The method of claim 5, wherein the reference signal is one of a channel state information reference signal (CSI-RS), a cell-specific reference signal (CRS), a secondary synchronization signal (SSS), a mobility reference signal (MRS), a demodulation reference signal (DMRS), or a beam reference signal (BRS), and the response includes at least one of a channel quality information (CQI), a signal-to-interference-plus-noise ratio (SINR), a signal-to-noise ratio (SNR), a received signal strength indicator (RSSI), a reference signal received power (RSRP), or a reference signal received quality (RSRQ).

8. The method of claim 1, wherein the performing beam tracking with the UE comprises:

sending a message to the UE indicating that beam tracking is to be performed, wherein the message is sent on a physical downlink control channel (PDCCH) or a physical downlink shared channel (PDSCH).

9. The method of claim 8, wherein the message is sent through downlink control information (DCI) in the PDCCH.
10. The method of claim 1, wherein the determining that beam tracking is to be initiated for the UE comprises:
 - determining an absence of communication with the UE through the first active beam.
11. The method of claim 10, wherein the determination of the absence of the communication with the UE through the first active beam is based on an absence of data carried on a physical uplink control channel (PUCCH), an absence of data carried on a physical uplink shared channel (PUSCH), or an absence of acknowledgement/negative acknowledgement (ACK/NACK) messages from the UE.
12. A method of wireless communication for a user equipment (UE), the method comprising:
 - communicating with a base station through a first active beam;
 - receiving a signal from the base station associated with beam tracking, the beam tracking including identifying a new beam for communication between the UE and the base station; and
 - communicating with the base station through a second active beam based on the signal associated with beam tracking.
13. The method of claim 12, wherein the signal comprises a beam refinement reference signal (BRRS), and the method further comprising:
 - sending, to the base station, a beam index corresponding to the second active beam based on the BRRS.
14. The method of claim 12, wherein the signal comprises a beam reference signal (BRS), the method further comprising:
 - sending, to the base station, a beam index corresponding to a coarse beam.
15. The method of claim 12, further comprising:

sending, to the base station, a request to perform beam tracking based on the signal.

16. The method of claim 15, wherein the communicating with the base station through the first active beam comprises receiving a reference signal, and wherein the method further comprises:

detecting a radio link failure based on the reception of the reference signal; and
sending an indication to the base station based on the detected radio link failure.

17. The method of claim 16, wherein the reference signal is one of a channel state information reference signal (CSI-RS), a cell-specific reference signal (CRS), a secondary synchronization signal (SSS), a mobility reference signal (MRS), a demodulation reference signal (DMRS), or a beam reference signal (BRS), and the indication includes at least one of a channel quality information (CQI), a signal-to-interference-plus-noise ratio (SINR), a signal-to-noise ratio (SNR), a received signal strength indicator (RSSI), a reference signal received power (RSRP), or a reference signal received quality (RSRQ).

18. The method of claim 16, wherein the communicating with the base station through the first active beam is performed with a first radio access technology (RAT), and wherein the indication is sent through a second RAT, the first RAT having a higher carrier frequency than the second RAT.

19. The method of claim 12, further comprising:
performing beam tracking with the base station.

20. The method of claim 19, wherein the performing the beam tracking comprises one or more of:
receiving, from the base station, at least one beam reference signal (BRS);
transmitting, to the base station, a first indication of a first beam index based on the BRS;
receiving at least one beam refinement reference signal (BRRS); and
transmitting, based on the at least one BRRS, a second indication of a second beam index.

21. The method of claim 12, wherein the signal is received on a physical downlink control channel (PDCCH) or a physical downlink shared channel (PDSCH).
22. The method of claim 21, wherein the signal is received through downlink control information (DCI) on the PDCCH.
23. A base station comprising:
means for communicating with a user equipment (UE) through a first active beam;
means for determining that beam tracking is to be performed with the UE, the beam tracking including identifying a new beam for communication between the UE and the base station;
means for performing beam tracking with the UE based on the determination that beam tracking is to be performed; and
means for communicating with the UE through a second active beam based on the beam tracking.
24. The base station of claim 23, wherein the means for determining that beam tracking is to be performed for the UE is configured to determine a time at which the UE is to transition from an inactive cycle of discontinuous reception (DRX) to an active cycle of DRX, and wherein the means for performing the beam tracking is configured to perform the beam tracking based on the determined time.
25. The base station of claim 23, wherein the means for performing the beam tracking is configured for one or more of:
transmission of at least one beam reference signal (BRS);
reception, from the UE, of a first indication of a first beam index based on the at least one BRS;
transmission, based on the first indication of the first beam index, of at least one beam refinement reference signal (BRRS); and
reception, based on the at least one BRRS, of a second indication of a second beam index, the second beam index corresponding to the second active beam.

26. The base station of claim 23, wherein the means for performing the beam tracking is configured for one or more of:
- reception, from the UE, of a request for beam tracking;
 - transmission, based on the request for beam tracking, of at least one beam refinement reference signal (BRRS); and
 - reception, based on the at least one BRRS, of an indication of a beam index, the beam index corresponding to the second active beam.
27. A UE comprising:
- means for communicating with a base station through a first active beam;
 - means for receiving a signal from the base station associated with beam tracking, the beam tracking including identifying a new beam for communication between the UE and the base station; and
 - means for communicating with the base station through a second active beam based on the signal associated with beam tracking.
28. The UE of claim 27, wherein the signal comprises a beam refinement reference signal (BRRS), and the UE further comprising:
- means for sending, to the base station, a beam index corresponding to the second active beam based on the BRRS.
29. The UE of claim 27, wherein the signal comprises a beam reference signal (BRS), the UE further comprising:
- means for sending, to the base station, a beam index corresponding to a coarse beam.
30. The UE of claim 27, further comprising:
- means for sending, to the base station, a request to perform beam tracking based on the signal.