

WHAT IS CLAIMED IS:

1. A terminal device comprising:
 - at least one processor; and
 - at least one memory including program codes;the at least one memory and the program codes are configured to, with the at least one processor, cause the terminal device at least to:
 - detect a beam failure on one or more serving cells for the terminal device;
 - obtain information concerning one or more candidate beams and the one or more serving cells, each of the one or more candidate beams associated with a respective one of the one or more serving cells; and
 - transmit, to a network device associated with the one or more serving cells, a truncated beam failure recovery (BFR) report in a medium access control (MAC) control element (CE), which contains only a portion of the information.
2. The terminal device of Claim 1, wherein the information comprises a bitmap including a plurality of bits corresponding to a plurality of serving cells for the terminal device, and wherein a bit of the plurality of bits corresponding to each of the one or more serving cell is assigned with a predetermined value.
3. The terminal device of Claim 1, wherein the information comprises a bitmap including a plurality of bits corresponding to a plurality of serving cells for the terminal device, and wherein a bit of the plurality of bits is assigned with a predetermined value if the corresponding serving cell satisfies one of the following:
 - that a candidate beam for the corresponding serving cell has a quality above a threshold; or
 - that an indication of a candidate beam for the corresponding serving cell is included in the transmitted portion.
4. The terminal device of Claim 1, wherein the terminal device is caused to transmit at the truncated BFR report after determining that a resource allocated for transmitting the information in full is insufficient.
5. The terminal device of claim 4, wherein a full BFR MAC CE is otherwise transmitted which contains the information in full.

6. The terminal device of Claim 1, wherein the terminal device is further caused to select at least one candidate beam of the one or more candidate beams; and include an indication of the selected at least one candidate beam in the portion of the information.

7. The terminal device of Claim 6, wherein the at least one candidate beam is associated with a secondary cell of the one or more serving cells, wherein the one or more serving cells are indicated by one or more indices, and the at least one candidate beam is selected based at least on one of the following criteria:

- a signal quality of the first candidate beam exceeds a threshold quality,
- the secondary cell has the lowest index of the indices of the one or more serving cells,
- the secondary cell has the highest index of the indices of the one or more serving cells,
- the secondary cell belongs to a same group with a primary cell for the terminal device,
- the secondary cell is associated with a plurality of further secondary cells,
- the secondary cell is configured with intra-band carriers, or
- a transmission has been scheduled on the secondary cell.

8. The terminal device of Claim 1, wherein the portion of the information includes information concerning at least one of the one or more candidate beams, which is selected based on a priority order of the one or more candidate beams.

9. The terminal device of Claim 8, wherein the priority order is based on an ascending order of indices of the one or more serving cells.

10. The terminal device of Claim 1, wherein the one or more serving cells include a serving cell, and wherein the terminal device is caused to obtain the information by:

- determining signal qualities of a plurality of candidate reference signals configured for the serving cell;

- detecting from the plurality of candidate reference signals a candidate reference signal having a signal quality above a threshold quality; and

- generating an indication of the detected candidate reference signal as at least part of information concerning the one or more candidate beams.

11. The terminal device of Claim 10, wherein the terminal device is further caused to:
generate an indication of a candidate reference signal, which is identified from the plurality of candidate reference signals, as having the highest signal quality of the signal qualities of the plurality of candidate reference signals, and wherein the indication is included in information concerning the one or more candidate beams.

12. The terminal device of Claim 1, wherein the terminal device is further caused to:
transmit an indication that the information is partially transmitted.

13. The terminal device of Claim 1, wherein the terminal device is further caused to:
transmit a remaining portion of the information to the network device.

14. A network device, comprising:
at least one processor; and
at least one memory including program codes;
the at least one memory and the program codes are configured to, with the at least one processor, cause the network device at least to:
receive, from a terminal device, a truncated beam failure recovery (BFR) report in a medium access control (MAC) control element (CE), which contains only a portion of information, wherein the information concerns one or more candidate beams and one or more serving cells on which a beam failure is detected, each of the one or more candidate beams associated with a respective one of the one or more serving cells; and
determine, based on the portion of the information, that at least one beam failure is reported for the one or more serving cells.

15. The network device of Claim 14, wherein the information comprises a bitmap including a plurality of bits corresponding to a plurality of serving cells for the terminal device, and wherein a bit of the plurality of bits corresponding to each of the one or more serving cell is assigned with a predetermined value.

16. The network device of Claim 14, wherein the information comprises a bitmap including a plurality of bits corresponding to a plurality of serving cells for the terminal device, and wherein a bit of the plurality of bits is assigned with a predetermined value if the corresponding serving cell satisfies one of the following:

that a candidate beam for the corresponding serving cell has a quality above a threshold; or

that an indication of a candidate beam for the corresponding serving cell is included in the portion of the information.

17. The network device of Claim 14, wherein the network device is caused to receive the truncated BFR report in an instance in which a resource allocated for transmitting the information in full is insufficient.

18. The network device of claim 17, wherein a full BFR MAC CE is otherwise received which contains the information in full.

19. The network device of Claim 14, wherein the portion of the information comprises an indication of at least one candidate beam of the one or more candidate beams, and the network device is further caused to:

determine, from the one or more serving cells, at least one serving cell associated with the at least one candidate beam.

20. The network device of Claim 19, wherein a first candidate beam of the at least one candidate beam is associated with a secondary cell of the one or more serving cells, wherein the one or more serving cells are indicated by one or more indices, and the network device is configured to determine the secondary cell as one of the at least one serving cell if:

the secondary cell has the lowest index of the indices of the one or more serving cells,
the secondary cell has the highest index of the indices of the one or more serving cells,
the secondary cell belongs to a same group with a primary cell for the terminal device,
the secondary cell is associated with a plurality of further secondary cells,
the secondary cell is configured with intra-band carriers, or
a transmission has been scheduled on the secondary cell.

21. The network device of Claim 14, wherein the portion of the information includes information concerning at least one of the one or more candidate beams which is selected based on a priority order of the one or more candidate beams.

22. The network device of Claim 21, wherein the priority order is based on an

ascending order of indices of the serving cells.

23. The network device of Claim 14, wherein the network device is further caused to: receive an indication that the information is partially transmitted.

24. The network device of Claim 14, wherein the network device is further caused to: receive a remaining portion of the information from the terminal device.

25. A method comprising:

detecting, at a terminal device, a beam failure on one or more serving cells for the terminal device;

obtaining information concerning one or more candidate beams and the one or more serving cells, each of the one or more candidate beams associated with a respective one of the one or more serving cells; and

transmitting to a network device associated with the one or more serving cells, a truncated beam failure recovery (BFR) report in a medium access control (MAC) control element (CE), which contains only a portion of the information.

26. The method of Claim 25, wherein the information comprises a bitmap including a plurality of bits corresponding to a plurality of serving cells for the terminal device, and wherein a bit of the plurality of bits corresponding to each of the one or more serving cell is assigned with a predetermined value.

27. The method of Claim 25, wherein the information comprises a bitmap including a plurality of bits corresponding to a plurality of serving cells for the terminal device, and wherein a bit of the plurality of bits is assigned with a predetermined value if the corresponding serving cell satisfies one of the following:

that a candidate beam for the corresponding serving cell has a quality above a threshold; or

that an indication of a candidate beam for the corresponding serving cell is included in the transmitted portion.

28. The method of Claim 25, further comprising determining that a resource allocated for transmitting the information in full is insufficient.

29. The method of claim 28, wherein a full BFR MAC CE is otherwise transmitted which contains the information in full.

30. The method of Claim 25, further comprising:
selecting at least one candidate beam of the one or more candidate beams; and
including an indication of the selected at least one candidate beam
in the portion of the information.

31. The method of Claim 30, wherein the at least one candidate beam is associated with a secondary cell of the one or more serving cells, wherein the one or more serving cells are indicated by one or more indices, and the at least one candidate beam is selected based at least on one of the following criteria:

- a signal quality of the first candidate beam exceeds a threshold quality,
- the secondary cell has the lowest index of the indices of the one or more serving cells,
- the secondary cell has the highest index of the indices of the one or more serving cells,
- the secondary cell belongs to a same group with a primary cell for the terminal device,
- the secondary cell is associated with a plurality of further secondary cells,
- the secondary cell is configured with intra-band carriers, or
- a transmission has been scheduled on the secondary cell.

32. The method of Claim 25, wherein the portion of the information includes information concerning at least one of the one or more candidate beams, which is selected based on a priority order of the one or more candidate beams.

33. The method of Claim 32, wherein the priority order is based on an ascending order of indices of the one or more serving cells.

34. The method of Claim 25, wherein the one or more serving cells include a serving cell, and obtaining the information comprising:

- determining signal qualities of a plurality of candidate reference signals configured for the serving cell;

- detecting from the plurality of candidate reference signals a candidate reference signal with a signal quality above a threshold quality; and

generating an indication of the detected candidate reference signal as at least part of information concerning the one or more candidate beams.

35. The method of Claim 34, further comprising:

generating an indication of the candidate reference signal, which is identified from the plurality of the candidate reference signals having the highest signal quality of the signal qualities of the plurality of candidate reference signals, and wherein the indication is included in information concerning the one or more candidate beams.

36. The method of Claim 25, further comprising:

transmitting an indication that the information is partially transmitted.

37. The method of Claim 25, further comprising:

transmitting a remaining portion of the information to the network device.

38. A method comprising:

receiving, at a network device and from a terminal device, a truncated beam failure recovery (BFR) report in a medium access control (MAC) control element (CE), which contains only a portion of information, wherein the information concerns one or more candidate beams and one or more serving cells on which a beam failure is detected, each of the one or more candidate beams associated with a respective one of the one or more serving cells; and

determining, based on the portion of the information, that at least one beam failure is reported for the one or more serving cells,

wherein the portion of information comprises a truncated beam failure recovery (BFR) report.

39. The method of Claim 38, wherein the information comprises a bitmap including a plurality of bits corresponding to a plurality of serving cells for the terminal device, and wherein a bit of the plurality of bits corresponding to each of the one or more serving cell is assigned with a predetermined value.

40. The method of Claim 38, wherein the information comprises a bitmap including a plurality of bits corresponding to a plurality of serving cells for the terminal device, and wherein a bit of the plurality of bits is assigned with a predetermined value if the corresponding serving

cell satisfies one of the following:

that a candidate beam for the corresponding serving cell has a quality above a threshold; or

that an indication of a candidate beam for the corresponding serving cell is included in the portion of the information.

41. The method of Claim 38 comprising:

receiving the truncated BFR report in an instance in which a resource allocated for transmitting the information in full is insufficient.

42. The method of claim 41, otherwise receiving a full BFR MAC CE, which contains the information in full.

43. The method of Claim 38, wherein the portion of the information comprises an indication of at least one candidate beam of the one or more candidate beams, the method further comprising:

determining, from the one or more serving cells, at least one serving cell associated with the at least one candidate beam.

44. The method of Claim 43, wherein a first candidate beam of the at least one candidate beam is associated with a secondary cell of the one or more serving cells, wherein the one or more serving cells are indicated by one or more indices, and wherein the secondary cell is determined as one of the at least one serving cell if:

the secondary cell has the lowest index of the indices of the one or more serving cells,
the secondary cell has the highest index of the indices of the one or more serving cells,
the secondary cell belongs to a same group with a primary cell for the terminal device,
the secondary cell is associated with a plurality of further secondary cells,
the secondary cell is configured with intra-band carriers, or
a transmission has been scheduled on the secondary cell.

45. The method of Claim 38, wherein the portion of the information includes information concerning at least one of the one or more candidate beams which is selected based on a priority order of the one or more candidate beams.

46. The method of Claim 45, wherein the priority order is based on an ascending order of indices of the one or more serving cells.

47. The method of Claim 38, further comprising:
receiving an indication that the information is partially transmitted.

48. The method of Claim 38, further comprising:
receiving a remaining portion of the information from the terminal device.

49. An apparatus, comprising:
means for detecting, at a terminal device, a beam failure on one or more serving cells of the terminal device;
means for obtaining information concerning one or more candidate beams and the one or more serving cells, each of the one or more candidate beams associated with a respective one of the one or more serving cells; and
means for transmitting to a network device associated with the one or more serving cells, a truncated beam failure recovery (BFR) report in a medium access control (MAC) control element (CE), which contains only a portion of the information.

50. An apparatus, comprising:
means for receiving, at a network device and from a terminal device, a truncated beam failure recovery (BFR) report in a medium access control (MAC) control element (CE), which contains only a portion of information, wherein the information concerns one or more candidate beams and one or more serving cells on which a beam failure is detected, each of the one or more candidate beams associated with a respective one of the one or more serving cells; and
means for determining, based on the portion of the information, that at least one beam failure is reported for the one or more serving cells.

51. A non-transitory computer readable medium comprising program instructions for causing an apparatus to perform at least the method of any of claims 25-37.

52. A non-transitory computer readable medium comprising program instructions for causing an apparatus to perform at least the method of any of claims 38-48.