

CLAIMS

WHAT IS CLAIMED IS:

1. A method of wireless communication by a user equipment (UE), comprising:
receiving a message from a base station during a random access channel (RACH) procedure;
determining beam information based on the received message during the RACH procedure; and
transmitting a second message to the base station during the RACH procedure that includes the determined beam information.
2. The method of claim 1, wherein the received message is beam-formed and the beam information comprises an index identifying a strongest received beam at the UE or a signal strength of the strongest received beam at the UE on which the beam-formed message was received.
3. The method of claim 1, wherein the determined beam information is included in a medium access control (MAC) control element (CE) (MAC-CE) of the second message.
4. The method of claim 1, wherein the determined beam information is included in a payload of the second message.
5. The method of claim 1, further comprising multiplexing the determined beam information as uplink control information (UCI) with a payload of the second message for transmission during the RACH procedure.
6. The method of claim 5, wherein the multiplexing comprises:
determining an offset value for multiplexing the determined beam information with the payload, the offset value indicating a ratio of UCI modulation symbols to payload modulation symbols to be transmitted in the second message; and
multiplexing the determined beam information based on the determined offset value.

7. The method of claim 6, wherein the offset value is a default value, based on physical broadcast channel parameters, or received from a network.
8. The method of claim 7, wherein the offset value is received from the base station in a RACH response message based on a physical RACH (PRACH) transmission by the UE.
9. The method of claim 1, wherein the message, received during the RACH procedure, comprises a value indicating a request for beam information during the RACH procedure, and wherein the second message is transmitted based on the request for beam information.
10. The method of claim 1, wherein the message is a random access response (RAR) message indicating a resource on a physical uplink shared channel (PUSCH) for transmitting the beam information, and wherein the beam information is transmitted on the resource indicated in the RAR message.
11. An apparatus for wireless communication, comprising:
 - means for receiving a message from a base station during a random access channel (RACH) procedure;
 - means for determining beam information based on the received message during the RACH procedure; and
 - means for transmitting a second message to the base station during the RACH procedure that includes the determined beam information.
12. The apparatus of claim 11, wherein the received message is beam-formed and the beam information comprises an index identifying a strongest received beam at the apparatus or a signal strength of the strongest received beam at the apparatus.
13. The apparatus of claim 11, wherein the determined beam information is included in a medium access control (MAC) control element (CE) (MAC-CE) of the second message.

14. The apparatus of claim 11, wherein the determined beam information is included in a payload of the second message.
15. The apparatus of claim 11, further comprising means for multiplexing the determined beam information as uplink control information (UCI) with a payload of the second message for transmission during the RACH procedure.
16. The apparatus of claim 15, wherein the means for multiplexing is configured to:
determine an offset value for multiplexing the determined beam information with the payload, the offset value indicating a ratio of UCI modulation symbols to payload modulation symbols to be transmitted in the second message; and
multiplex the determined beam information based on the determined offset value.
17. The apparatus of claim 16, wherein the offset value is a default value, based on physical broadcast channel parameters, or received from a network.
18. The apparatus of claim 17, wherein the offset value is received from the base station in a RACH response message based on a physical RACH (PRACH) transmission by the apparatus.
19. The apparatus of claim 11, wherein the message, received during the RACH procedure, comprises a value indicating a request for beam information during the RACH procedure, and wherein the second message is transmitted based on the request for beam information.
20. The apparatus of claim 11, wherein the message is a random access response (RAR) message indicating a resource on a physical uplink shared channel (PUSCH) for transmitting the beam information, and wherein the beam information is transmitted on the resource indicated in the RAR message.
21. An apparatus for wireless communication, comprising:
a memory; and
at least one processor coupled to the memory and configured to:

receive a message from a base station during a random access channel (RACH) procedure;

determine beam information based on the received message during the RACH procedure; and

transmit a second message to the base station during the RACH procedure that includes the determined beam information.

22. The apparatus of claim 21, wherein the received message is beam-formed and the beam information comprises an index identifying a strongest received beam at the UE or a signal strength of the strongest received beam at the UE.

23. The apparatus of claim 21, wherein the determined beam information is included in a medium access control (MAC) control element (CE) (MAC-CE) of the second message.

24. The apparatus of claim 21, wherein the determined beam information is included in a payload of the second message.

25. The apparatus of claim 21, wherein the at least one processor is further configured to multiplex the determined beam information as uplink control information (UCI) with a payload of the second message for transmission during the RACH procedure.

26. The apparatus of claim 25, wherein the at least one processor is configured to multiplex by:

determining an offset value for multiplexing the determined beam information with the payload, the offset value indicating a ratio of UCI modulation symbols to payload modulation symbols to be transmitted in the second message; and

multiplexing the determined beam information based on the determined offset value.

27. The apparatus of claim 26, wherein the offset value is a default value, based on physical broadcast channel parameters, or received from a network.

28. The apparatus of claim 27, wherein the offset value is received from the base station in a RACH response message based on a physical RACH (PRACH) transmission by the apparatus.

29. The apparatus of claim 21, wherein the message, received during the RACH procedure, comprises a value indicating a request for beam information during the RACH procedure, and wherein the second message is transmitted based on the request for beam information.

30. The apparatus of claim 21, wherein the message is a random access response (RAR) message indicating a resource on a physical uplink shared channel (PUSCH) for transmitting the beam information, and wherein the beam information is transmitted on the resource indicated in the RAR message.

31. A computer-readable medium of a user equipment (UE) storing computer executable code, comprising code to:

receive a message from a base station during a random access channel (RACH) procedure;

determine beam information based on the received message during the RACH procedure; and

transmit a second message to the base station during the RACH procedure that includes the determined beam information.