CLAIMS

1. A method for wireless communications by a user equipment (UE), comprising: receiving remaining minimum system information (RMSI) configuring the UE with one or more parameters to support selecting between a two-step random access channel (RACH) procedure and a four-step RACH procedure, wherein the one or more parameters include at least a first reference signal receive power (RSRP) threshold for the two-step RACH procedure and a second RSRP threshold for the four-step RACH procedure different from the first RSRP threshold; initiating, based on the first RSRP threshold, the two-step random access channel (RACH) procedure including sending a first message to a base station, the first message comprising at least a preamble portion, including a RACH preamble, and a payload portion, including a payload, wherein sending the first message includes applying a power offset to the payload portion of the first message; receiving a random access response (RAR) message from the base station, wherein the RAR message indicates successful reception, by the base station, of both the RACH preamble and the payload when the response message is of a first format; and transitioning to the four-step RACH procedure before successful completion of the two-step RACH procedure when the RAR message is of a second format.

2. The method of claim 1, wherein the RAR message that triggers the transition to the four-step RACH procedure has a random access preamble identifier (RAPID) field that indicates the base station, at least, successfully detected the RACH preamble of the first message.

3. The method of claim 2, wherein: the UE begins the four-step RACH procedure by sending a message with an indication of an identifier (ID) of the UE.

4. The method of claim 1, wherein the RAR message is broadcast to a plurality of UEs with a same random access radio network temporary identity (RA-RNTI).

5. The method of claim 1, wherein the RAR message is sent as a unicast message to the UE.

6. The method of claim 1, wherein: the UE is configured with separate transmit power control parameters for the two-step and four-step RACH procedures; and the power control parameters comprise at least a preamble received target power and a power ramping step size.

7. The method of claim 1, wherein the UE initiates the four-step RACH procedure with a transmit power level dependent on a current transmit power level of the two-step RACH procedure prior to the transition.

8. The method of claim 7, wherein the UE initiates the four-step RACH procedure with a transmit power level with additional power ramping relative to the current transmit power level of the two-step RACH procedure prior to the transition.

9. The method of claim 1, wherein the UE is configured to select between the two-step RACH procedure and the four-step RACH procedure based on a measurement of channel loading or occupancy.

10. The method of claim 1, wherein the UE applies an additional power offset to the payload portion of the first message when re-transmitted in the four-step RACH procedure.

11. The method of claim 1, wherein subcarrier spacings (SCSs) for a preamble portion of the first message and the payload portion of the first message are configured separately.

12. The method of claim 1, wherein: the UE uses a same subcarrier spacing (SCS) for the preamble portion and the payload portion of the first message of the two-step RACH procedure; and the SCS for the preamble portion and the payload portion of the first message of the two-step RACH procedure is indicated separately from an SCS used by the UE for message transmission for the four-step RACH procedure.

13. The method of claim 1, further comprising receiving signaling indicating that the UE is to include both the payload and the RACH preamble in the first message only when sending the first message of the two-step RACH procedure for contention free random access (CFRA).

14. A method for wireless communications by a network entity, comprising: transmitting remaining minimum system information (RMSI) configuring a user equipment (UE) with one or more parameters to support transitioning from a two-step random access channel (RACH) procedure to a four-step RACH procedure, wherein the one or more parameters include at least a first reference signal receive power (RSRP) threshold for the two-step RACH procedure and a second RSRP threshold for the four-step RACH procedure different from the first RSRP threshold; receiving, based on the first RSRP threshold, a first message from a user equipment (UE) as part of a two-step RACH procedure, the first message comprising at least a random access channel (RACH) preamble; and sending a random access response (RAR) message to the UE, wherein a first format of the RAR message indicates successful reception of both the RACH preamble and a payload included in a payload portion of the first message and a second format of the RAR message signals the UE to transition to a four-step RACH procedure before successful completion of the two-step RACH procedure, wherein a power offset is applied to the payload portion of the first message.

15. The method of claim 14, wherein: the RAR message of the second format that triggers the transition has a random access preamble identifier (RAPID) field that indicates the network entity at least successfully detected the RACH preamble of the first message.

16. The method of claim 15, wherein: the network entity begins the four-step RACH procedure by detecting a message that has an indication of an identifier (ID) of the UE.

17. The method of claim 14, wherein the RAR message of the second format that triggers the transition is broadcast to a plurality of UEs with a same random access radio network temporary identity (RA-RNTI).

18. The method of claim 14, wherein the RAR message of the second format that triggers the transition is sent as a unicast message to the UE.

19. The method of claim 14, wherein the network entity is configured to perform soft-combining of the payload portion of the first message of the two-step RACH procedure to help decode at least a portion of a message the four-step RACH procedure.

20. An apparatus for wireless communications by a user equipment (UE), comprising: means for receiving remaining minimum system information (RMSI) configuring the UE with one or more parameters to support transitioning from a two-step random access channel (RACH) procedure to a four-step RACH procedure, wherein the one or more parameters include at least a first reference signal receive power (RSRP) threshold for the two-step RACH procedure and a second RSRP threshold for the four-step RACH procedure different from the first RSRP threshold; means for initiating, based on the first RSRP threshold, a two-step random access channel (RACH) procedure including sending a first message to a base station, the first message comprising at least a preamble portion, including a RACH preamble, and a payload portion, including a payload, wherein the means for initiating comprise means for applying a power offset to the payload portion of the first message of the two-step RACH procedure; means for receiving a random access response (RAR) message from the base station, wherein the RAR message indicates successful reception, by the base station, of both the RACH preamble and the payload when the response message is of a first format; and means for transitioning to a four-step RACH procedure before successful completion of the two-step RACH procedure when the RAR message is of a second format.

21. An apparatus for wireless communications by a network entity, comprising: means for transmitting remaining minimum system information (RMSI) configuring a user equipment (UE) with one or more parameters to support selecting between a two-step random access channel (RACH) procedure and a four-step RACH procedure, wherein the one or more parameters include at least a first reference signal receive power (RSRP) threshold for the two-step RACH procedure and a second RSRP threshold for the four-step RACH procedure different from the first RSRP threshold; means for receiving, based on the first RSRP threshold, a first message from a user equipment (UE) as part of a two-step RACH procedure, the first message comprising at least a random access channel (RACH) preamble; and means for sending a random access response (RAR) message to the UE, wherein a first format of the RAR message indicates successful reception of both the RACH preamble and a payload included in a payload portion of the first message and a second format of the RAR message signals the UE to transition to a four-step RACH procedure before successful completion of the two-step RACH procedure, wherein a power offset is applied to the payload portion of the first message.

22. A non-transitory computer readable medium for wireless communication, comprising: instructions that, when executed by at least one processor, cause the at least one processor to: receive remaining minimum system information (RMSI) configuring a UE with one or more parameters to support selecting between a two-step random access channel (RACH) procedure and a four-step RACH procedure, wherein the one or more parameters include at least a first reference signal receive power (RSRP) threshold for the two-step RACH procedure and a second RSRP threshold for the four-step RACH procedure different from the first RSRP threshold; initiate, based on the first RSRP threshold, a two-step random access channel (RACH) procedure including sending a first message to a base station, the first message comprising at least a preamble portion, including a RACH preamble, and a payload portion, including a payload, wherein sending the first message includes applying a power offset to the payload portion of the first message; receive a random access response (RAR) message from the base station, wherein the RAR message indicates successful reception, by the base station, of both the RACH preamble and the payload when the response message is of a first format; and transition to a four-step RACH procedure before successful completion of the two-step RACH procedure when the RAR message is of a second format.

23. A non-transitory computer readable medium for wireless communication, comprising: instructions that, when executed by at least one processor, cause the at least one processor to: transmit remaining minimum system information (RMSI) configuring a user equipment (UE) with one or more parameters to support selecting between a two-step random access channel (RACH) procedure and a four-step RACH procedure, wherein the one or more parameters include at least a first reference signal receive power (RSRP) threshold for the two-step RACH procedure and a second RSRP threshold for the four-step RACH procedure different from the first RSRP threshold; receive, based on the first RSRP threshold, a first message from a user equipment (UE) as part of a two-step RACH procedure, the first message comprising at least a random access channel (RACH) preamble; and send a random access response (RAR) message to the UE, wherein a first format of the RAR message indicates successful reception of both the RACH preamble and a payload included in a payload portion of the first message and a second format of the RAR message signals the UE to transition to a four-step RACH procedure before successful completion of the two-step RACH procedure, wherein a power offset is applied to the payload portion of the first message.