

CLAIMS

1. A method of wireless communication performed by a user equipment (UE), comprising:
 - receiving, from a base station (BS), a signaling communication that indicates one or more preamble sequence configurations,
 - wherein each of the one or more preamble sequence configurations specifies a respective plurality of preamble sequence rules for a different random access channel (RACH) procedure type;
 - wherein the plurality of preamble sequence rules comprises a preamble sequence rule that specifies a plurality of candidate root sequences for generating the preamble sequence and a cyclic shift rule that specifies a plurality of candidate cyclic shifts for generating the preamble sequence; and
 - generating, based at least in part on a plurality of preamble sequence rules for a preamble sequence configuration of the one or more preamble sequence configurations, a preamble sequence for a RACH communication in a RACH procedure;
 - wherein generating the preamble sequence comprises:
 - selecting a root sequence from the plurality of candidate root sequences,
 - selecting a cyclic shift from the plurality of candidate cyclic shifts,
 - generating the preamble sequence based at least in part on the root sequence and the cyclic shift;
 - wherein selecting the root sequence and the cyclic shift comprises:
 - selecting the root sequence and the cyclic shift based at least in part on at least one of:
 - a pathloss associated with the UE, a distance of the UE from the center of a cell associated with the BS, a payload size of data to be transmitted in the RACH communication, or an amount of Doppler shift associated with the UE.
2. The method of claim 1, wherein the plurality of preamble sequence rules comprises:
 - a preamble format rule that specifies a quantity of preamble sequences and a quantity of repetitions for the preamble sequence; and
 - wherein generating the preamble sequence comprises:
 - generating the preamble sequence based at least in part on the quantity of preamble sequences and the quantity of repetitions for the preamble sequence.
3. The method of claim 2, wherein selecting the root sequence and the cyclic shift comprises:
 - selecting the root sequence and the cyclic shift based at least in part on:
 - a radio resource control (RRC) state of the UE.

4. The method of claim 2, wherein a first candidate root sequence and a first candidate cyclic shift, of the plurality of candidate root sequences and the plurality of candidate cyclic shifts, corresponds to a same time resource and a same frequency resource as a second candidate root sequence and a second candidate cyclic shift of the plurality of candidate root sequences and the plurality of candidate cyclic shifts.

5. The method of claim 2, wherein a first candidate root sequence of the plurality of candidate root sequences and a first candidate cyclic shift of the plurality of candidate cyclic shifts, and a second candidate root sequence of the plurality of candidate root sequences and a second candidate cyclic shift of the plurality of candidate cyclic shifts, correspond to different time resources and different frequency resources.

6. The method of claim 1, wherein the RACH communication comprises:

- a msgA communication in a two-step RACH procedure, or
- a msg1 communication in a four-step RACH procedure.

7. The method of claim 1, wherein generating the preamble sequence comprises:

- generating a plurality of initial preamble sequences; and
- generating a composite preamble sequence based at least in part on the plurality of initial preamble sequences.

8. The method of claim 7, wherein generating the composite preamble sequence comprises:

- concatenating the plurality of initial preamble sequences to form the composite preamble sequence.

9. The method of claim 7, wherein generating the plurality of initial preamble sequences comprises:

- generating a first initial preamble sequence based at least in part on a first root sequence and a first cyclic shift step size ; and
- generating a second initial preamble sequence based at least in part on the first root sequence and a second cyclic shift step size .

10. The method of claim 7, wherein generating the plurality of initial preamble sequences comprises:

- generating a first initial preamble sequence based at least in part on a first root sequence and a first cyclic shift step size; and
- generating a second initial preamble sequence based at least in part on a second root sequence and the first cyclic shift step size.

11. The method of claim 7, wherein generating the plurality of initial preamble sequences comprises:

generating a first initial preamble sequence based at least in part on a first root sequence and a first cyclic shift step size ; and

generating a second initial preamble sequence based at least in part on a second root sequence and a second cyclic shift step size.

12. The method of claim 7, wherein generating the plurality of initial preamble sequences comprises:

generating a first initial preamble sequence based at least in part on a first root sequence and a first cyclic shift step size; and

generating a second initial preamble sequence based at least in part on the first root sequence and the first cyclic shift step size.

13. The method of claim 7, wherein generating the composite preamble sequence comprises:

applying a code cover to the composite preamble sequence,

wherein the code cover comprises:

an orthogonal code cover, or

a quasi-orthogonal code cover.

14. The method of claim 13, wherein a length of the code cover is determined based at least in part on a quantity of initial preamble sequences included in the plurality of initial preamble sequences.

15. The method of claim 1, wherein the plurality of preamble sequence rules includes a preamble sequence rule that specifies a plurality of candidate cyclic shift step sizes for generating the preamble sequence; and

wherein generating the preamble sequence comprises:

selecting a cyclic shift step size from the plurality of candidate cyclic shift step sizes, and

generating the preamble sequence based at least in part on the cyclic shift step size.

16. The method of claim 15, wherein selecting the cyclic shift step size comprises:

selecting the cyclic shift step size based at least in part on a radio resource control (RRC) state of the UE.

17. The method of claim 15, wherein selecting the cyclic shift step size comprises:
selecting the cyclic shift step size based at least in part on a pathloss associated with the UE.
18. The method of claim 15, wherein selecting the cyclic shift step size comprises:
selecting the cyclic shift step size based at least in part on a distance, of the UE, from a center of a cell associated with the BS.
19. The method of claim 1, wherein the signaling communication comprises:
a system information block (SIB),
a radio resource control (RRC) communication, or
a downlink control information (DCI) communication.
20. The method of claim 1, wherein generating the preamble sequence comprises:
generating the preamble sequence based at least in part on a signal measurement of a reference signal transmitted by the BS.
21. The method of claim 20, wherein generating the preamble sequence based at least in part on the signal measurement of the reference signal transmitted by the BS comprises:
selecting one or more preamble sequence parameters, for generating the preamble sequence, based at least in part on:
the signal measurement of the reference signal transmitted by the BS, and
the plurality of preamble sequence rules.
22. The method of claim 20, wherein the reference signal comprises at least one of:
a synchronization signal block (SSB),
a system information block (SIB),
a positioning reference signal (PRS), or
a channel state information reference signal (CSI-RS).
23. The method of claim 20, wherein the signal measurement is a reference signal received power (RSRP) measurement; and
wherein generating the preamble sequence based at least in part on the signal measurement comprises:
generating, based at least in part on determining that the RSRP measurement satisfies a threshold, the preamble sequence for a msgA communication in a two-step RACH procedure based at least in part on a first preamble sequence configuration of the one or more preamble sequence configurations, or

generating, based at least in part on determining that the RSRP measurement does not satisfy the threshold, the preamble sequence for a msg1 communication in a four-step RACH procedure based at least in part on a second preamble sequence configuration of the one or more preamble sequence configurations.

24. A user equipment (UE) for wireless communication, comprising:

a memory; and

one or more processors operatively coupled to the memory, the memory and the one or more processors configured to:

receive, from a base station (BS), a signaling communication that indicates one or more preamble sequence configurations,

wherein each of the one or more preamble sequence configurations specifies a respective plurality of preamble sequence rules for a different random access channel (RACH) procedure type;

wherein the plurality of preamble sequence rules comprises a preamble sequence rule that specifies a plurality of candidate root sequences for generating the preamble sequence and a cyclic shift rule that specifies a plurality of candidate cyclic shifts for generating the preamble sequence and generate, based at least in part on a plurality of preamble sequence rules for a preamble sequence configuration of the one or more preamble sequence configurations, a preamble sequence for a RACH communication in a RACH procedure;

wherein generating the preamble sequence comprises:

selecting a root sequence from the plurality of candidate root sequences,

selecting a cyclic shift from the plurality of candidate cyclic shifts,

generating the preamble sequence based at least in part on the root sequence and the cyclic shift;

wherein selecting the root sequence and the cyclic shift comprises:

selecting the root sequence and the cyclic shift based at least in part on at least one of:

a pathloss associated with the UE, a distance of the UE from the center of a cell associated with the BS, a payload size of data to be transmitted in the RACH communication, or an amount of Doppler shift associated with the UE.

25. The UE of claim 24, wherein the plurality of preamble sequence rules comprises:

a preamble format rule that specifies a quantity of preamble sequences and a quantity of repetitions for the preamble sequence; and

wherein the one or more processors, when generating the preamble sequence, are to:

generate the preamble sequence based at least in part on the quantity of preamble sequences and the quantity of repetitions for the preamble sequence.

26. The UE of claim 24, wherein the one or more processors, when generating the preamble sequence, are to:

generate, based at least in part on determining that a reference signal received power (RSRP) measurement of a reference signal transmitted by the BS satisfies a threshold, the preamble sequence for a msgA communication in a two-step RACH procedure based at least in part on a first preamble sequence configuration of the one or more preamble sequence configurations, or

generate, based at least in part on determining that the RSRP measurement does not satisfy the threshold, the preamble sequence for a msg1 communication in a four-step RACH procedure based at least in part on a second preamble sequence configuration of the one or more preamble sequence configurations.

27. A non-transitory computer-readable medium storing one or more instructions for wireless communication, the one or more instructions comprising:

one or more instructions that, when executed by one or more processors of a user equipment (UE), cause the one or more processors to:

receive, from a base station (BS), a signaling communication that indicates one or more preamble sequence configurations,

wherein each of the one or more preamble sequence configurations specifies a respective plurality of preamble sequence rules for a different random access channel (RACH) procedure type;

wherein the plurality of preamble sequence rules comprises a preamble sequence rule that specifies a plurality of candidate root sequences for generating the preamble sequence and a cyclic shift rule that specifies a plurality of candidate cyclic shifts for generating the preamble sequence and generate, based at least in part on a plurality of preamble sequence rules for a preamble sequence configuration of the one or more preamble sequence configurations, a preamble sequence for a RACH communication in a RACH procedure; wherein generating the preamble sequence comprises:

selecting a root sequence from the plurality of candidate root sequences,

selecting a cyclic shift from the plurality of candidate cyclic shifts,

generating the preamble sequence based at least in part on the root sequence and the cyclic shift;

wherein selecting the root sequence and the cyclic shift comprises:

selecting the root sequence and the cyclic shift based at least in part on at least one of:

a pathloss associated with the UE, a distance of the UE from the center of a cell associated with the BS, a payload size of data to be transmitted in the RACH communication, or an amount of Doppler shift associated with the UE.

28. The non-transitory computer-readable medium of claim 27, wherein the plurality of preamble sequence rules comprises:

a preamble format rule that specifies a quantity of preamble sequences and a quantity of repetitions for the preamble sequence; and

wherein the one or more instructions, that cause the one or more processors to generate the preamble sequence, cause the one or more processors to:

generate the preamble sequence based at least in part on the quantity of preamble sequences and the quantity of repetitions for the preamble sequence.

29. An apparatus for wireless communication, comprising:

means for receiving, from a base station (BS), a signaling communication that indicates one or more preamble sequence configurations,

wherein each of the one or more preamble sequence configurations specifies a respective plurality of preamble sequence rules for a different random access channel (RACH) procedure type;

wherein the plurality of preamble sequence rules comprises a preamble sequence rule that specifies a plurality of candidate root sequences for generating the preamble sequence and a cyclic shift rule that specifies a plurality of candidate cyclic shifts for generating the preamble sequence and

means for generating, based at least in part on a plurality of preamble sequence rules for a preamble sequence configuration of the one or more preamble sequence configurations, a preamble sequence for a RACH communication in a RACH procedure;

wherein generating the preamble sequence comprises:

selecting a root sequence from the plurality of candidate root sequences,

selecting a cyclic shift from the plurality of candidate cyclic shifts,

generating the preamble sequence based at least in part on the root sequence and the cyclic shift;

wherein selecting the root sequence and the cyclic shift comprises:

selecting the root sequence and the cyclic shift based at least in part on at least one of:

a pathloss associated with the UE, a distance of the UE from the center of a cell associated with the BS, a payload size of data to be transmitted in the RACH communication, or an amount of Doppler shift associated with the UE.

30. The apparatus of claim 29, wherein the plurality of preamble sequence rules comprises:
a preamble format rule that specifies a quantity of preamble sequences and a quantity of repetitions for the preamble sequence; and
wherein the means for generating the preamble sequence comprises:
means for generating the preamble sequence based at least in part on the quantity of preamble sequences and the quantity of repetitions for the preamble sequence.