

CLAIMS

1. A method for wireless communication, comprising:
 applying, by a base station associated with a cell identifier for a cell, a first processing stage to a plurality of blocks of a channel,
 wherein each block, of the plurality of blocks, includes repetitions of sets of symbols, and
 wherein, when applying the first processing stage, each block, of the plurality of blocks, is scrambled using a scrambling sequence, of a plurality of scrambling sequences, initialized based on a block index of the block and the cell identifier;
 applying, by the base station, a second processing stage to the repetitions of sets of symbols,
 wherein, when applying the second processing stage, each repetition, of the repetitions of sets of symbols, for each block, is rotated using a different rotation sequence, of a plurality of rotation sequences, initialized based on a non-linear combination of the cell identifier and a repetition index of the repetition;
 transmitting, by the base station, a primary synchronization signal (PSS) or a secondary synchronization signal (SSS) that indicates the cell identifier; and
 transmitting, by the base station, the channel after applying the first processing stage and the second processing stage to one or more bits of the channel.

2. The method of claim 1, wherein a plurality of phase rotations are applied to the repetitions of sets of symbols based on the equation:

$$\theta_f(i) = \begin{cases} 1, & \text{if } c_f(2i) = 0 \text{ and } c_f(2i+1) = 0 \\ -1, & \text{if } c_f(2i) = 0 \text{ and } c_f(2i+1) = 1 \\ j, & \text{if } c_f(2i) = 1 \text{ and } c_f(2i+1) = 0 \\ -j, & \text{if } c_f(2i) = 1 \text{ and } c_f(2i+1) = 1 \end{cases}.$$

3. The method of claim 1, wherein the plurality of scrambling sequences are initialized based on the equation:

$$c_{\text{init}} = (N_{\text{ID}}^{\text{Ncell}} + 1)(n_f \bmod 8 + 1)^3 \cdot 2^9 + N_{\text{ID}}^{\text{Ncell}}.$$

4. The method of claim 1, wherein the channel is a physical broadcast channel.

5. The method of claim 1, wherein the repetition index is based on a radio frame number.

6. The method of claim 1, wherein a binary sequence, of a plurality of binary sequences, is generated for each repetition index associated with the repetitions of sets of symbols; and

wherein the plurality of rotation sequences are generated based on the plurality of binary sequences.

7. The method of claim 6, wherein the plurality of binary sequences are obtained based on a binary generator; and

wherein the binary generator is initialized, for each binary sequence, of the plurality of binary sequences, based on a corresponding cell identifier and a corresponding repetition index.

8. The method of claim 6, wherein the plurality of binary sequences are obtained based on a binary generator; and

wherein the binary generator is initialized, for each binary sequence, of the plurality of binary sequences, based on a binary vector associated with the non-linear combination of the cell identifier and the repetition index.

9. A method for wireless communication, comprising:

receiving, by a user equipment and from a base station associated with a cell identifier for a cell, a primary synchronization signal (PSS) or a secondary synchronization signal (SSS) that indicates the cell identifier;

receiving, by the UE and from the base station, a channel after receiving the PSS or the SSS from the base station,

wherein each block, of a plurality of blocks of the channel, includes repetitions of sets of symbols,

wherein each block, of the plurality of blocks, is scrambled using a scrambling sequence, of a plurality of scrambling sequences, initialized based on a block index of the block and the cell identifier for the cell, and

wherein each repetition, of the repetitions of sets of symbols, for each block is rotated using a different rotation sequence, of a plurality of rotation sequences, initialized

based on a non-linear combination of the cell identifier for the cell and a repetition index of the repetition;
reversing, by the UE, a first processing stage applied to the plurality of blocks; and
reversing, by the UE, a second processing stage applied to the repetitions of sets of symbols.

10. The method of claim 9, wherein a plurality of phase rotations are applied to the repetitions of sets of symbols based on the equation:

$$\theta_f(i) = \begin{cases} 1, & \text{if } c_f(2i) = 0 \text{ and } c_f(2i+1) = 0 \\ -1, & \text{if } c_f(2i) = 0 \text{ and } c_f(2i+1) = 1 \\ j, & \text{if } c_f(2i) = 1 \text{ and } c_f(2i+1) = 0 \\ -j, & \text{if } c_f(2i) = 1 \text{ and } c_f(2i+1) = 1 \end{cases}.$$

11. The method of claim 9, wherein the plurality of scrambling sequences are initialized based on the equation:

$$c_{\text{init}} = (N_{\text{ID}}^{\text{Ncell}} + 1)(n_f \bmod 8 + 1)^3 \cdot 2^9 + N_{\text{ID}}^{\text{Ncell}}.$$

12. The method of claim 9, wherein the channel is a physical broadcast channel.

13. The method of claim 9, wherein the repetition index is based on a radio frame number.

14. The method of claim 9, wherein a binary sequence, of a plurality of binary sequences, is generated for each repetition index associated with the repetitions of sets of symbols; and

wherein the plurality of rotation sequences are generated based on the plurality of binary sequences.

15. The method of claim 14, wherein the plurality of binary sequences are obtained based on a binary generator; and

wherein the binary generator is initialized, for each binary sequence, of the plurality of binary sequences.

16. A method for wireless communication, comprising:

applying, by a base station associated with a cell identifier for a cell, one or more

processing stages to one or more bits of a channel,

wherein the channel includes a plurality of repetitions of a set of bits in a plurality of subframes, and

wherein, when applying the one or more processing stages, each repetition, of the plurality of repetitions, is scrambled using a different scrambling sequence, of a plurality of different scrambling sequences, initialized based on a non-linear combination of the cell identifier and a repetition index;

transmitting, by the base station, a primary synchronization signal (PSS) or a secondary synchronization signal (SSS) that indicates the cell identifier; and

transmitting, by the base station, the channel after applying the one or more processing stages to the one or more bits of the channel.

17. The method of claim 16, wherein each scrambling sequence, of the plurality of different scrambling sequences, includes a plurality of tuples of bits; and

wherein each repetition is scrambled based on a tuple of bits, of the plurality of tuples of bits, associated with a corresponding scrambling sequence, of the plurality of different scrambling sequences.

18. The method of claim 16, wherein the channel conveys a system information block type-1 (SIB1).

19. The method of claim 16, wherein each binary sequence, of a plurality of binary sequences, is obtained based on a binary generator;

wherein the binary generator is initialized based on the cell identifier and the repetition index; and

wherein the plurality of scrambling sequences are obtained based on a corresponding binary sequence of the plurality of binary sequences.

20. The method of claim 19, wherein the binary generator is initialized based on a binary vector associated with the non-linear combination of the cell identifier and the repetition index.

21. The method of claim 16, wherein the repetition index is based on a radio frame

number.

22. The method of claim 16, wherein the plurality of scrambling sequences are determined based on a Gold code.

23. The method of claim 16, wherein the plurality of different scrambling sequences are based on an equation:

$$c_{\text{init}} = n_{\text{RNTI}} \cdot 2^{15} + (N_{\text{ID}}^{\text{Ncell}} + 1)((n_f \bmod 61) + 1), \text{ or}$$
$$c_{\text{init}} = n_{\text{RNTI}} \cdot 2^{14} + n_f \bmod 2 \cdot 2^{13} + \lfloor n_s/2 \rfloor \cdot 2^9 + N_{\text{ID}}^{\text{Ncell}}.$$

24. The method of claim 16, wherein the channel is a physical shared channel.

25. A method for wireless communication, comprising:

receiving, by a user equipment and from a base station associated with a cell identifier for a cell, a primary synchronization signal (PSS) or a secondary synchronization signal (SSS) that indicates the cell identifier;

receiving, by the UE and from the base station, a channel after receiving the PSS or the SSS from the base station,

wherein the channel includes a plurality of repetitions of a set of bits in a plurality of subframes, and

wherein each repetition, of the plurality of repetitions, is scrambled using a different scrambling sequence, of a plurality of different scrambling sequences, initialized based on a non-linear combination of the cell identifier and a repetition index, and

wherein the repetition index is based on a radio frame number; and

reversing, by the user equipment, one or more processing stages applied to one or more bits of the channel.

26. The method of claim 25, wherein each scrambling sequence, of the plurality of different scrambling sequences, includes a plurality of tuples of bits; and

wherein each repetition is scrambled based on a tuple of bits, of the plurality of tuples of bits, associated with a corresponding scrambling sequence, of the plurality of different scrambling sequences.

27. The method of claim 25, wherein the channel conveys a system information block type-1 (SIB1).

28. The method of claim 25, wherein each binary sequence, of a plurality of binary sequences, is obtained based on a binary generator;

wherein the binary generator is initialized based on the cell identifier and the repetition index; and

wherein the plurality of scrambling sequences are obtained based on a corresponding binary sequence of the plurality of binary sequences.

29. The method of claim 28, wherein the binary generator is initialized based on a binary vector associated with the non-linear combination of the cell identifier and the repetition index.

30. The method of claim 25, wherein the non-linear combination comprises at least one term that is a product based on the cell identifier and the repetition index.