

WHAT IS CLAIMED IS:

1. A method (200, 600) implemented in a terminal device (120) in a wireless communication system, comprising:

generating (210, 610) a random access request including a training sequence, wherein
5 the training sequence is configured at least partially based on a requirement of a coverage gain for a predetermined coverage class five, CC5, of the terminal device (120); and

transmitting (220, 620), to a network device (110), the random access request on a random access channel.

10 2. The method (200, 600) of claim 1, wherein a length of the training sequence is in a range from 100 bits to 180 bits.

3. The method (200, 600) of claim 2, wherein the length of the training sequence includes a length of 140 bits.

15 4. The method (200, 600) of claim 3, wherein the training sequence is configured as 1 1 1 0 1 1 1 0 1 1 0 0 0 1 1 1 0 0 0 0 0 1 0 0 1 1 1 1 0 1 0 0 1 0 0 1 1 1 0 0 1 0 0 0 1 1 0 1
1 0 1 0 0 1 1 1 0 0 0 1 1 1 1 0 1 0 1 0 1 0 1 1 0 1 1 0 0 1 0 1 1 1 0 0 0 1 1 1 0 1 1 1 1 1 1 1
0 1 0 1 1 0 1 0 1 1 1 0 1 0 0 0 0 0 1 1 0 1 1 0 1 1 1 1 1 0 1 1 1 1 0 0 1 1 1 0 0 1 0.

20 5. The method (200, 600) of any of claims 1 to 4, wherein the training sequence is configured further based on one or more of the following:

an auto-correlation of the training sequence,

25 a cross-correlation between the training sequence and one or more further training sequences for one or more further coverage classes, and

an interference between the random access channel and one or more further random access channels.

30 6. The method (200, 600) of any of claims 1 to 5, wherein the random access channel includes an extended coverage random access channel, EC-RACH.

7. The method (200, 600) of any of claims 1 to 6, wherein the wireless communication system is an Extended Coverage Global System for Mobile Internet of

Things, EC-GSM-IoT, system.

8. The method (200, 600) of any of claims 1 to 7, wherein generating (210, 610) the random access request including the training sequence comprises:

5 in response to receiving an indication that the network device (110) supports the training sequence, generating the random access request including the training sequence.

9. A method (200, 700) implemented in a network device (110) in a wireless communication system, comprising:

10 receiving (230, 710) a random access request from a terminal device (120) on a random access channel; and

detecting (230, 720) a training sequence in the random access request, wherein the training sequence is configured at least partially based on a requirement of a coverage gain for a predetermined coverage class five, CC5, of the terminal device (120).

15 10. The method (200, 700) of claim 9, further comprising:
performing channel estimation based on the detected training sequence.

11. The method (200, 700) of claim 9, further comprising:
20 determining timing advance for an uplink from the terminal device (120) to the network device (110) based on the detected training sequence.

12. The method (200, 700) of claim 11, wherein the training sequence is configured
25 as 1 1 1 0 1 1 1 0 1 1 0 0 0 1 1 1 0 0 0 0 0 1 0 0 1 1 1 1 0 1 0 0 1 0 0 1 1 1 0 0 1 0 0 0 1 1 0 1
1 0 1 0 0 1 1 1 0 0 0 1 1 1 1 0 1 0 1 0 1 0 1 1 0 1 1 0 0 1 0 1 1 1 0 0 0 1 1 1 0 1 1 1 1 1 1 1
0 1 0 1 1 0 1 0 1 1 1 0 1 0 0 0 0 0 1 1 0 1 1 0 1 1 1 1 1 0 1 1 1 1 0 0 1 1 1 0 0 1 0.

13. The method (200, 700) of any of claims 9 to 12, wherein the training sequence
30 is configured further based on one or more of the following:

an auto-correlation of the training sequence,

a cross-correlation between the training sequence and one or more further training sequences for one or more further coverage classes, and

an interference between the random access channel and one or more further random

access channels.

14. The method (200, 700) of any of claims 9 to 13, wherein the random access channel includes an extended coverage random access channel, EC-RACH.

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15. The method (200, 700) of any of claims 9 to 14, wherein the wireless communication system is an Extended Coverage Global System for Mobile Internet of Things, EC-GSM-IoT, system.

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16. The method (200, 700) of any of claims 9 to 15, further comprising:
transmitting, to the terminal device (120), an indication that the network device (110) supports the training sequence.

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17. An apparatus (1000) at a terminal device (120) in a wireless communication system, comprising:

a processor (1010); and

a memory (1020) coupled to the processor (1010) and storing instructions thereon, the instructions, when executed by the processor (1010), causing the apparatus (1000) to:

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generate a random access request including a training sequence, wherein the training sequence is configured at least partially based on a requirement of a coverage gain for a predetermined coverage class five, CC5, of the terminal device (120); and

transmit, to a network device (110), the random access request on a random access channel.

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18. The apparatus (1000) of claim 17, wherein the training sequence is configured as 1 1 1 0 1 1 1 0 1 1 0 0 0 1 1 1 0 0 0 0 0 1 0 0 1 1 1 1 0 1 0 0 1 0 0 1 1 1 0 0 1 0 0 0 1 1 0 1 1 0 1 0 0 1 1 1 0 0 0 1 1 1 0 1 1 1 1 1 1 1 1 0 1 0 1 0 0 1 1 1 0 0 0 1 1 1 1 0 1 0 1 0 1 0 1 1 0 1 1 0 0 1 0 1 1 1 0 0 0 1 1 1 0 1 1 1 1 1 1 1 1 0 1 0 1 1 0 1 0 1 1 1 0 1 0 0 0 0 0 1 1 0 1 1 0 1 1 1 1 1 0 1 1 1 1 0 0 1 1 1 0 0 1 0.

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19. An apparatus (1000) at a network device (110) in a wireless communication system, comprising:

a processor (1010); and

a memory (1020) coupled to the processor (1010) and storing instructions thereon,
the instructions, when executed by the processor (1010), causing the apparatus (1000) to:

receive a random access request from a terminal device (120) on a random access
5 channel; and

detect a training sequence in the random access request, wherein the training
sequence is configured at least partially based on a requirement of a coverage gain for a
predetermined coverage class five, CC5, of the terminal device (120).

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20. The apparatus (1000) of claim 19, wherein the training sequence is configured
as 1 1 1 0 1 1 1 0 1 1 0 0 0 1 1 1 0 0 0 0 0 1 0 0 1 1 1 1 0 1 0 0 1 0 0 1 1 1 0 0 1 0 0 0 1 1 0 1
1 0 1 0 0 1 1 1 0 0 0 1 1 1 1 0 1 0 1 0 1 0 1 1 0 1 1 0 0 1 0 1 1 1 0 0 0 1 1 1 0 1 1 1 1 1 1 1 1
0 1 0 1 1 0 1 0 1 1 1 0 1 0 0 0 0 0 1 1 0 1 1 0 1 1 1 1 1 0 1 1 1 1 0 0 1 1 1 0 0 1 0.

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