

Claims

1. A method, in a wireless device, for operating in a wireless communications network, the method comprising:

receiving a first downlink signal comprising information indicating a plurality of
5 uplink access configurations, each uplink access configuration including a random access configuration;

receiving a second downlink signal comprising an uplink access configuration index, using the uplink access configuration index to identify an uplink access configuration from among the indicated plurality of uplink access
10 configurations, and transmitting to the wireless communications network according to the identified uplink access configuration; and

receiving, in a first downlink subframe, a first Orthogonal Frequency-Division Multiplexing (OFDM) transmission formatted according to a first numerology and receiving, in a second downlink subframe, a second
15 OFDM transmission formatted according to a second numerology, the second numerology differing from the first numerology, wherein the first numerology has a first subcarrier spacing and the second numerology has a second subcarrier spacing, the first subcarrier spacing differing from the second subcarrier spacing.

20 2. The method of claim 1, wherein the method further comprises:

receiving broadcasted system access information and using the received system access information for accessing the wireless communications network.

25 3. The method of claim 1 or 2, further comprising operating in a connected mode for one or more first intervals and operating in a dormant mode for one or more second intervals,

wherein said first and second OFDM transmissions are performed in the connected mode,
and wherein said operating in the dormant mode comprises:

monitoring signals carrying tracking area identifiers;

comparing tracking area identifiers received during said monitoring with a tracking area

5 identifier list; and

notifying the wireless communication network in response to determining that a received
tracking area identifier is not on said list but otherwise refraining from notifying the
wireless communication network in response to receiving changing tracking area
identifiers.

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4. The method of one of the preceding claims, wherein said first and second downlink
subframes are received on the same carrier.

5. The method of one of the preceding claims, wherein said first and second numerologies
15 comprise subframes of first and second subframe lengths, respectively, the first subframe
length differing from the second subframe length.

6. The method of one of the preceding claims, wherein subframes of said first and second
numerologies comprise first and second predetermined numbers of OFDM symbols,

20 respectively.

7. The method of one of the preceding claims, wherein at least one of said first and
second numerologies comprises subframes having a length of 250 microseconds or less.

25 8. The method of one of the preceding claims, wherein the method further comprises:
requesting additional system information from the wireless communications network; and

receiving additional system information from the wireless communications network, in response to said requesting.

9. The method of one of the preceding claims, wherein the method further comprises
5 receiving additional system information from the wireless communications network, in a dedicated transmission.

10. The method of one of the preceding claims, wherein the method further comprises:
receiving, in a first-in-time OFDM symbol of said first or second downlink subframe,
10 downlink control signalling in a first set of subcarriers of said first-in-time OFDM symbol
and dedicated user data in a second set of subcarriers of said first-in-time OFDM symbol.

11. The method of one of the preceding claims, wherein the method further comprises:
transmitting acknowledgement (ACK) or negative acknowledgement (NACK) data in
15 response to said first OFDM transmission in said first downlink subframe, in a last OFDM
symbol of an uplink subframe interval at least partially overlapping said first downlink
subframe.

12. The method of one of the preceding claims, further comprising receiving a third OFDM
20 transmission formatted according to said first numerology, said third OFDM transmission
occupying a transmission time interval (TTI) having a length equal to a plurality of
subframes according to said first numerology.

13. The method of one of the preceding claims, wherein the method further comprises
25 processing data from the first OFDM transmission using a first Medium Access Control
(MAC) protocol layer and processing data from said second OFDM transmission using a
second MAC protocol layer, said first MAC protocol layer differing from said second MAC

protocol layer, and wherein the method further comprises processing messages received from each of said first and second MAC protocol layers using a single, common Radio Resource Control (RRC) protocol layer.

5 14. The method of one of the preceding claims, further comprising transmitting to the wireless communications network using Discrete Fourier Transform-Spread OFDM (DFTS-OFDM) transmission.

15. The method of one of the preceding claims, further comprising:

10 measuring a first mobility reference signal on a first received beam;
 measuring a second mobility reference signal on a second received beam, the
 second mobility reference signal differing from the first mobility reference
 signal; and
 reporting results of measuring said first and second mobility reference signals to
15 the wireless communications network.

16. The method of one of the preceding claims, wherein said receiving of at least one of said first and second OFDM transmissions comprises decoding said at least one of said first and second OFDM transmissions using a polar code.

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17. The method of one of the preceding claims, wherein said receiving of at least one of the first and second OFDM transmissions comprises decoding said at least one of the first and second OFDM transmissions using a low-density parity check (LDPC) code.

25 18. The method of one of the preceding claims, wherein the method further comprises:
 receiving signals using asynchronous hybrid automatic repeat request (HARQ) protocol.

19. The method of one of the preceding claims, wherein the method further comprises:
transmitting signals using asynchronous hybrid automatic repeat request (HARQ)
protocol.

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20. The method of one of the preceding claims, wherein the method further comprises:
transmitting on physical uplink control channel with the same numerology as on
physical data channel.

10 21. The method of one of the preceding claims, wherein the method further comprises:
constructing a random access preamble by repeating a short sequence multiple
times, wherein the short sequence has the same length as the length of OFDM symbols
used for user data signalling; and
transmitting the random access preamble to the network node equipment.

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22. The method of one of the preceding claims, wherein the method further comprises:
receiving an indication from the radio network equipment which channel state
information reference signal (CSI-RS) resources to use for measurements.

20 23. The method of one of the preceding claims, wherein the method further comprises:
operating in a connected mode for one or more first intervals and operating in a dormant
mode for one or more second intervals and
receiving, when the wireless device is operating in dormant mode, a paging
request from the network node equipment via core network.

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24. The method of one of the preceding claims, wherein the method comprises:

operating in a connected mode for one or more first intervals and operating in a dormant mode for one or more second intervals and

upon entering the dormant mode, keeping, for the wireless device, all packet data convergence protocol (PDCP) entities of signaling radio bearers (SRBs) and resource
5 blocks (RBs) and radio resource control (RRC) UE Context Identity, wherein the RRC UE Context Identity has been received in an RRC connection set up procedure.

25. The method of one of the preceding claims, wherein the method further comprises:

receiving a configuration indicating a bounded set of radio resource in which the
10 wireless device is configured to operate only.

26. A method, in radio network equipment operating in a wireless communications network, the method comprising:

transmitting a first downlink signal comprising information indicating a plurality of
15 uplink access configurations, each uplink access configuration including a random access configuration;

transmitting a second downlink signal comprising an uplink access configuration index, the uplink access configuration index identifying an uplink access configuration from among the indicated plurality of uplink access
20 configurations, and subsequently receiving a transmission from a first wireless device according to said identified uplink access configuration; and

transmitting, in a first downlink subframe, a first Orthogonal Frequency-Division Multiplexing (OFDM) transmission formatted according to a first
25 numerology and transmitting, in a second downlink subframe, a second OFDM transmission formatted according to a second numerology, the second numerology differing from the first numerology, wherein the first

numerology has a first subcarrier spacing and the second numerology has a second subcarrier spacing, the first subcarrier spacing differing from the second subcarrier spacing.

5 27. The method of claim 26, further comprising:
broadcasting system access information for letting said wireless device use received
system access information for accessing the wireless communications network.

28. The method of one of claims 26 to 27, wherein said first and second downlink
10 subframes are transmitted on the same carrier.

29. The method of one of claims 26 to 28, wherein said transmitting of the second
downlink signal comprising said uplink access configuration index is performed by a first
instance of radio network equipment, and wherein said transmitting of said first and
15 second OFDM transmissions is performed by a second instance of radio network
equipment.

30. The method of one of claims 26 to 29, wherein said first and second numerologies
comprise subframes of first and second subframe lengths, respectively, said first
20 subframe length differing from said second subframe length.

31. The method of one of claims 26 to 30, wherein subframes of said first and second
numerologies comprise first and second predetermined numbers of OFDM symbols,
respectively.

25 32. The method of one of claims 26 to 31, wherein at least one of said first and second
numerologies comprises subframes having a length of 250 microseconds or less.

33. The method of one of claims 26 to 32, wherein the method further comprises:
transmitting, in a first-in-time OFDM symbol of said first or second downlink subframe,
downlink control signalling in first subcarriers of said First-in-time OFDM symbol and
5 dedicated user data in second subcarriers of said First-in-time OFDM symbol.

34. The method of one of claims 26 to 33, wherein the method further comprises:
receiving acknowledgement (ACK) or negative acknowledgement (NACK) data in
response to said first OFDM transmission in said first downlink subframe, in a last OFDM
10 symbol of an uplink subframe interval at least partially overlapping said first downlink
subframe.

35. The method of one of claims 26 to 34, further comprising transmitting a third OFDM
transmission formatted according to said first numerology, said third OFDM transmission
15 occupying a transmission time interval (TTI) having a length equal to a plurality of
subframes according to said first numerology.

36. The method of claim 29, wherein the transmitting of the first downlink signal is
performed by a third instance of radio network equipment.

37. The method of one of claims 26-36, wherein said transmitting of said first and second
OFDM transmissions is performed by a single instance of radio network equipment,
wherein the method further comprises processing data for said first OFDM transmission
using a first Medium Access Control (MAC) protocol layer and processing data for said
25 second OFDM transmission using a second MAC protocol layer, said first MAC protocol
layer differing from said second MAC protocol layer, and wherein the method further

comprises processing messages to be transported by each of said first and second MAC protocol layers, using a single, common Radio Resource Control (RRC) protocol layer.

38. The method of one of claims 26-37, further comprising:

- 5 serving a fifth wireless device, wherein serving the fifth wireless device comprises
 sending data from said fifth wireless device to a first network node or first
 set of network nodes, according to a first network slice identifier associated
 with said fifth wireless device; and
- serving a sixth wireless device, wherein serving the sixth wireless device
- 10 comprises sending data from said sixth wireless device to a second
 network node or second set of network nodes, according to a second
 network slice identifier associated with the sixth wireless device, the
 second network slice identifier differing from the first network slice
 identifier, and the second network node or second set of network nodes
- 15 differing from the first network node or first set of network nodes.

39. The method of one of claims 26-38, wherein the method further comprises:

- transmitting signals using asynchronous hybrid automatic repeat request (HARQ)
 protocol.
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40. The method of one of claims 26-39, wherein the method further comprises:

- receiving signals using asynchronous hybrid automatic repeat request (HARQ)
 protocol.
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41. The method of one of claims 26-40, wherein the method further comprises:
- receiving on physical uplink control channel with the same numerology as on
 physical data channel.

42. The method of one of claims 26-41, wherein the method further comprises:

receiving a random access preamble from a wireless device, wherein the random access preamble is comprised of a concatenation of repeated short sequence multiple times, wherein the short sequence has the same length as the length of OFDM symbols used for user data signalling.

43. The method of one of claims 26-42, wherein the method further comprises:

transmitting an indication to the wireless device which channel state information reference signal (CSI-RS) resources to use for measurements.

44. The method of one of claim 26-43, wherein the method comprises:

transmitting, when a wireless device is operating in a dormant mode, a paging request to the wireless device via core network.

45. The method of one of claims 26-44, wherein the method further comprises:

transmitting a configuration to the wireless device indicating a bounded set of radio resource in which the wireless device is configured to operate only.

46. A wireless device, comprising radio-frequency circuitry and processing circuitry operatively connected to the radio-frequency circuitry, wherein the processing circuitry is configured to:

receive a first downlink signal comprising information indicating a plurality of uplink access configurations, each uplink access configuration including a random access configuration;

receive a second downlink signal comprising an uplink access configuration index, use the uplink access configuration index to identify an uplink access

configuration from among the indicated plurality of uplink access configurations, and transmit to the wireless communications network according to the identified uplink access configuration; and receive, in a first downlink subframe, a first Orthogonal Frequency-Division Multiplexing (OFDM) transmission formatted according to a first numerology and receive, in a second downlink subframe, a second OFDM transmission formatted according to a second numerology, the second numerology differing from the first numerology, wherein the first numerology has a first subcarrier spacing and the second numerology has a second subcarrier spacing, the first subcarrier spacing differing from the second subcarrier spacing.

47. The wireless device of claim 46, wherein said processing circuitry is further configured to: receive broadcasted system access information and use the received system access information for accessing the wireless communications network.

48. The wireless device of one of claims 46 to 47, wherein said processing circuitry is configured to operate in a connected mode for one or more first intervals and operate in a dormant mode for one or more second intervals, such that said first and second OFDM transmissions are performed in said connected mode, and wherein said processing circuitry is configured to, when operating in said dormant mode: monitor signals carrying tracking area identifiers; compare tracking area identifiers received during said monitoring with a tracking area identifier list; and notify the wireless communication network in response to determining that a received tracking area identifier is not on said list but otherwise refrain from notifying the wireless communication network in response to receiving changing tracking area identifiers.

49. The wireless device of one of claims 46 - 48, wherein said first and second downlink subframes are received on the same carrier.

5 50. The wireless device of one of claims 46 - 49, wherein the first and second numerologies comprise subframes of first and second subframe lengths, respectively, the first subframe length differing from the second subframe length.

51. The wireless device of one of claims 46 - 50, wherein subframes of said first and
10 second numerologies comprise first and second predetermined numbers of OFDM symbols, respectively.

52. The wireless device of one of claims 46-51, wherein at least one of said first and second numerologies comprises subframes having a length of 250 microseconds or less.

15 53. The wireless device of one of claims 46-52, wherein the processing circuitry is further configured to:

request additional system information from the wireless communications network; and
receive additional system information from the wireless communications network, in
20 response to said requesting.

54. The wireless device of one of claims 46-53, wherein the processing circuitry is further configured to receive additional system information from the wireless communications network, in a dedicated transmission.

25 55. The wireless device of one of claims 46-54, wherein said processing circuitry is further configured to:

receive, in a first-in-time OFDM symbol of said first or second downlink subframe,
downlink control signalling in a first set of subcarriers of said First-in-time OFDM symbol
and dedicated user data in a second set of subcarriers of said First-in-time OFDM symbol.

5 56. The wireless device of one of claims 46-55, wherein said processing circuitry is further
configured to:

transmit acknowledgement (ACK) or negative acknowledgement (NACK) data in response
to said first OFDM transmission in said first downlink subframe, in a last OFDM symbol of
an uplink subframe interval at least partially overlapping said first downlink subframe.

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57. The wireless device of one of claims 46-56, wherein said first downlink subframe
comprises one or more reference symbols in the first-in-time OFDM symbol of said first
downlink subframe, and wherein said processing circuitry is further configured to begin
decoding of said first OFDM transmission in said first downlink subframe before a duration
15 of said first downlink subframe has ended, using a channel estimate based on said one or
more reference symbols.

58. The wireless device of one of claims 46-57, wherein said processing circuitry is further
configured to receive a third OFDM transmission formatted according to said first
20 numerology, said third OFDM transmission occupying a transmission time interval (TTI)
having a length equal to a plurality of subframes according to said first numerology.

59. The wireless device of one of claims 46-58, wherein said processing circuitry is further
configured to process data from said first OFDM transmission using a first Medium Access
25 Control (MAC) protocol layer and process data from said second OFDM transmission
using a second MAC protocol layer, said first MAC protocol layer differing from said
second MAC protocol layer, and wherein said processing circuitry is configured to process

messages received from each of said first and second MAC protocol layers using a single, common Radio Resource Control (RRC) protocol layer.

60. The wireless device of one of claims 46-59, wherein the wireless device is further
5 configured to transmit to the wireless communications network using Discrete Fourier Transform-Spread OFDM (DFTS-OFDM) transmission.

61. The wireless device of one of claims 46-60, wherein the processing circuitry is further configured to:

10 measure a first mobility reference signal on a first received beam;
 measure a second mobility reference signal on a second received beam, the
 second mobility reference signal differing from the first mobility reference
 signal; and
 report results of measuring the first and second mobility reference signals to the
15 wireless communications network.

62. The wireless device of one of claims 46-61, wherein said processing circuitry is configured to decode at least one of said first and second OFDM transmissions using a polar code.

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63. The wireless device of one of claims 46-62, wherein said processing circuitry is configured to decode at least one of said first and second OFDM transmissions using a low-density parity check (LDPC) code.

25 64. The wireless device of one of claims 46-63, wherein said processing circuitry is configured to receive signals using asynchronous hybrid automatic repeat request (HARQ) protocol.

65. The wireless device of one of claims 46-64, wherein said processing circuitry is configured to transmit signals using asynchronous hybrid automatic repeat request (HARQ) protocol.

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66. The wireless device of one of claims 46-65, wherein said processing circuitry is configured to transmit on physical uplink control channel with the same numerology as on physical data channel.

10 67. The wireless device of one of claims 46-66 wherein said processing circuitry is configured to construct a random access preamble by repeating a short sequence multiple times, wherein the short sequence has the same length as the length of OFDM symbols used for user data signalling; and transmit the random access preamble to the network node equipment.

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68. The wireless device of one of claims 46-67, wherein said processing circuitry is configured to receive an indication from the radio network equipment which channel state information reference signal (CSI-RS) resources to use for measurements.

20 69. The wireless device of one of claims 46-68, wherein said processing circuitry is configured to operate in a connected mode for one or more first intervals and operate in a dormant mode for one or more second intervals and receive, when the wireless device is operating in dormant mode, a paging request from the network node equipment via core network.

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70. The wireless device of one of claims 46-69, wherein said processing circuitry is configured to operate in a connected mode for one or more first intervals and operate in a

dormant mode for one or more second intervals and upon entering the dormant mode, keep, for the wireless device, all packet data convergence protocol (PDCP) entities of signaling radio bearers (SRBs) and resource blocks (RBs) and radio resource control (RRC) UE Context Identity, wherein the RRC UE Context Identity has been received in an RRC connection set up procedure.

71. The wireless device of one of claims 46-70, wherein said processing circuitry is configured to receive a configuration indicating a bounded set of radio resource in which the wireless device is configured to operate only.

72. A system comprising one or more instances of radio network equipment, each instance of the radio network equipment comprising radio circuitry and a processing circuitry operatively connected to the radio circuitry, wherein the processing circuitry in the radio network equipment is configured to:

transmit a first downlink signal comprising information indicating a plurality of uplink access configurations, each uplink access configuration including a random access configuration;

transmit a second downlink signal comprising an uplink access configuration index, the uplink access configuration index identifying an uplink access configuration from among the indicated plurality of uplink access configurations, and subsequently receive a transmission from a first wireless device according to the identified uplink access configuration; and

transmit, in a first downlink subframe, a first Orthogonal Frequency-Division Multiplexing (OFDM) transmission formatted according to a first numerology and transmitting, in a second downlink subframe, a second OFDM transmission formatted according to a second numerology, the second numerology differing from the first numerology, wherein the first

numerology has a first subcarrier spacing and the second numerology has a second subcarrier spacing, the first subcarrier spacing differing from the second subcarrier spacing.

5 73. The system of claim 72, wherein said processing circuitry in said radio network equipment is configured to broadcast system access information for accessing the wireless communications network.

74. The system of claim 72 or 73, wherein said processing circuitry in said radio network
10 equipment is configured to transmit said first and second downlink subframes on the same carrier.

75. The system of one of claims 72 -74, wherein the processing circuitry of a first instance of said radio network equipment is configured to transmit said second downlink signal
15 comprising said uplink access configuration index, and wherein the processing circuitry of a second instance of said radio network equipment is configured to transmit said first and second OFDM transmissions.

76. The system of one of claims 72-75, wherein said first and second numerologies
20 comprise subframes of first and second subframe lengths, respectively, the first subframe length differing from the second subframe length.

77. The system of one of claims 72-76, wherein subframes of said first and second numerologies comprise first and second predetermined numbers of OFDM symbols,
25 respectively.

78. The system of one of claims 72-77, wherein at least one of said first and second numerologies comprises subframes having a length of 250 microseconds or less.

79. The system of one of claims 72-78, wherein said processing circuitry in said radio

5 network equipment is configured to:

transmit, in a first-in-time OFDM symbol of said first or second downlink subframe,

downlink control signalling in a first set of subcarriers of said First-in-time OFDM symbol

and dedicated user data in a second set of subcarriers of said First-in-time OFDM symbol.

10 80. The system of one of claims 72-79, wherein said processing circuitry in said radio network equipment is configured to:

receive acknowledgement (ACK) or negative acknowledgement (NACK) data in response

to said first OFDM transmission in said first downlink subframe, in a last OFDM symbol of

an uplink subframe interval at least partially overlapping said first downlink subframe.

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81. The system of one of claims 72-80, wherein said processing circuitry in said radio

network equipment is configured to transmit a third OFDM transmission formatted

according to said first numerology, the third OFDM transmission occupying a transmission

time interval (TTI) having a length equal to a plurality of subframes according to said first

20 numerology.

82. The system of claim 75, wherein the processing circuitry of a third instance of the radio network equipment is configured to transmit said first downlink signal.

25 83. The system of one of claims 72-82, wherein the processing circuitry of one instance of said radio network equipment is configured to perform said first and second OFDM transmissions, and to process data for said first OFDM transmission using a first Medium

Access Control (MAC) protocol layer and process data for said second OFDM transmission using a second MAC protocol layer, the first MAC protocol layer differing from the second MAC protocol layer, and to process messages to be transported by each of said first and second MAC protocol layers, using a single, common Radio Resource Control (RRC) protocol layer.

84. The system of one of claims 72-83, wherein the processing circuitry of at least one instance of said radio network equipment is configured to:

serve a fifth wireless device, such that serving the fifth wireless device comprises sending data from said fifth wireless device to a first network node or first set of network nodes, according to a first network slice identifier associated with said fifth wireless device; and

serve a sixth wireless device, such that serving the sixth wireless device comprises sending data from said sixth wireless device to a second network node or second set of network nodes, according to a second network slice identifier associated with said sixth wireless device, the second network slice identifier differing from the first network slice identifier, and the second network node or second set of network nodes differing from the first network node or first set of network nodes.

85. The system of one of claims 72-84, wherein the processing circuitry of at least one instance of said radio network equipment is configured to:

transmit signals using asynchronous hybrid automatic repeat request (HARQ) protocol.

86. The system of one of claims 72-85, wherein the processing circuitry of at least one instance of said radio network equipment is configured to:

receive signals using asynchronous hybrid automatic repeat request (HARQ) protocol.

87. The system of one of claims 72-86, wherein the processing circuitry of at least one instance of said radio network equipment is configured to:

5 receive on physical uplink control channel with the same numerology as on physical data channel.

88. The system of one of claims 72-87 wherein the processing circuitry of at least one instance of said radio network equipment is configured to:

10 receive a random access preamble from a wireless device, wherein the random access preamble is comprised of a concatenation of repeated short sequence multiple times, wherein the short sequence has the same length as the length of OFDM symbols used for user data signalling.

15 89. The system of one of claims 72-88, wherein the processing circuitry of at least one instance of said radio network equipment is configured to:

 transmit an indication to the wireless device which channel state information reference signal (CSI-RS) resources to use for measurements.

20 90. The system of one of claims 72-89, wherein the processing circuitry of at least one instance of said radio network equipment is configured to:

 transmit, when a wireless device is operating in a dormant mode, a paging request to the wireless device via core network.

25 91. The system of one of claims 72-90, wherein the processing circuitry of at least one instance of said radio network equipment is configured to:

transmit a configuration to the wireless device indicating a bounded set of radio resource in which the wireless device is configured to operate only.

92. A user equipment (UE) for operating in a wireless communications network, said UE
5 comprising:

an antenna configured to send and receive wireless signals;
processing circuitry;

radio front-end circuitry connected to the antenna and to the processing circuitry,
and configured to condition signals communicated between said antenna
10 and said processing circuitry;

an input interface connected to said processing circuitry and configured to allow
input of information into the UE to be processed by said processing
circuitry;

an output interface connected to said processing circuitry and configured to output
15 information from the UE that has been processed by said processing
circuitry; and

a battery connected to said processing circuitry and configured to supply power to
the UE;

said processing circuitry being configured to:

20 receive a first downlink signal comprising information indicating a plurality of uplink
access configurations, each uplink access configuration including a random
access configuration;

receive a second downlink signal comprising an uplink access configuration index,
using the uplink access configuration index to identify an uplink access
25 configuration from among the indicated plurality of uplink access
configurations, and transmit to the wireless communications network
according to the identified uplink access configuration; and

receive, in a first downlink subframe, a first Orthogonal Frequency-Division Multiplexing (OFDM) transmission formatted according to a first numerology and receive, in a second downlink subframe, a second OFDM transmission formatted according to a second numerology, the second numerology differing from the first numerology, wherein the first numerology has a first subcarrier spacing and the second numerology has a second subcarrier spacing, the first subcarrier spacing differing from the second subcarrier spacing.

93. The UE of claim 92, wherein the UE is further operative to perform the steps of any one of claims 1-25.

94. A base station (BS) for operating in a wireless communications network, said BS comprising:

one or more antennas configured to send and receive wireless signals;
processing circuitry;
radio front-end circuitry connected to said antenna and to said processing circuitry,
and configured to condition signals communicated between said antenna
and said processing circuitry;

and
power supply circuitry connected to said processing circuitry and configured to
supply power to the BS;

said processing circuitry being configured to:

transmit a first downlink signal comprising information indicating a plurality of
uplink access configurations, each uplink access configuration including a
random access configuration;

transmit a second downlink signal comprising an uplink access configuration index, the uplink access configuration index identifying an uplink access configuration from among the indicated plurality of uplink access configurations, and subsequently receive a transmission from a first user equipment (UE) according to the identified uplink access configuration; and

5 transmit, in a first downlink subframe, a first Orthogonal Frequency-Division Multiplexing (OFDM) transmission formatted according to a first numerology and transmit, in a second downlink subframe, a second OFDM transmission formatted according to a second numerology, the second

10 numerology differing from the first numerology, wherein the first numerology has a first subcarrier spacing and the second numerology has a second subcarrier spacing, the first subcarrier spacing differing from the second subcarrier spacing.

15 95. The BS of claim 94, wherein the BS is further operative to perform the steps of any one of claims 26-45.