

CLAIMS

1. A user equipment (12) for communicating with a base station (10) in a narrowband communication system, wherein the user equipment (12) comprises:

5 radio circuitry and processing circuitry whereby the user equipment (12) is configured to:

10 obtain a set of multiple indices, each index in the set of multiple indices corresponding to a different uplink resource allocation from a set of uplink resource allocations (11) formed from twelve contiguous subcarriers, the set of uplink resource allocations (11) comprising an allocation of the twelve contiguous subcarriers, two allocations of six contiguous ones of the twelve contiguous subcarriers, four allocations of three contiguous ones of the twelve contiguous subcarriers, and twelve allocations of a single one of the twelve contiguous subcarriers, such that:

15 the two allocations of six contiguous subcarriers do not overlap with each other and fall within a bandwidth (105) of the twelve contiguous subcarriers,

20 the four allocations of three contiguous subcarriers do not overlap with each other and fall within the bandwidth (105) of the twelve contiguous subcarriers, and

the twelve allocations of single subcarriers do not overlap with each other and fall within the bandwidth (105) of the twelve contiguous subcarriers;

25 receive an index indication corresponding to an index from the set of multiple indices from the base station (10); and

transmit data to the base station (10) using the resource allocation corresponding to the received index indication.

30 2. The user equipment (12) of claim 1, wherein the index indication is the index.

3. The user equipment (12) of any of the previous claims, wherein the narrowband communication system is a narrowband Internet of Things (NB-IoT) system.

35 4. The user equipment (12) of any of the previous claims, wherein the narrowband communication system is deployed in-band or in a guard band of a Long Term Evolution (LTE) system.

5. The user equipment (12) of any of the previous claims, wherein each of the twelve contiguous subcarriers has a 15 kHz bandwidth (105).
6. The user equipment (12) of any of the previous claims, wherein the user equipment (12) is preconfigured with the set of multiple indices, and wherein the user equipment (12) is configured to obtain the set by reading the preconfigured set of multiple indices.
7. The user equipment (12) of any of the previous claims, wherein a narrowband physical uplink shared channel in the narrowband communication system comprises the set of uplink resource allocations (11).
8. The user equipment (12) of any of the previous claims, wherein the user equipment (12) is configured to transmit the data over the narrowband physical uplink shared channel.
9. The user equipment (12) of any of the previous claims, wherein the set of multiple indices comprises 19 indices.
10. The user equipment (12) of any of the previous claims, wherein the received index indication comprises 5 bits.
11. The user equipment (12) of any of the previous claims, wherein the received index indication comprises 6 bits.
12. The user equipment (12) of any of the previous claims, wherein the user equipment (12) is configured to receive, where the index indication comprises less than 5 bits, at least one further index indication identifying one or more secondary resource allocations for the user equipment (12) .
13. The user equipment (12) of any of the previous claims, wherein the index is received in at least one system information block (SIB) transmitted by the base station (10).
14. The user equipment (12) of any of claims 1-12, wherein the user equipment (12) is configured to receive the index via radio resource control (RRC) signaling.
15. The user equipment (12) of any of claims 1-12, wherein the user equipment (12) is configured to receive the index in at least one downlink control information (DCI) message transmitted by the base station (10).

16. The user equipment (12) of claim 15, wherein the at least one DCI has an associated DCI format of N0.

17. A method implemented by a user equipment (12) for performing wireless communication with a base station (10) in a narrowband communication system, the method comprising:

obtaining a set of multiple indices, each index in the set of multiple indices corresponding to a different uplink resource allocation from a set of uplink resource allocations (11) formed from twelve contiguous subcarriers, the set of uplink resource allocations (11) comprising an allocation of the twelve contiguous subcarriers, two allocations of six contiguous ones of the twelve contiguous subcarriers, four allocations of three contiguous ones of the twelve contiguous subcarriers, and twelve allocations of a single one of the twelve contiguous subcarriers, such that:

the two allocations of six contiguous subcarriers do not overlap with each other and fall within a bandwidth (105) of the twelve contiguous subcarriers,

the four allocations of three contiguous subcarriers do not overlap with each other and fall within the bandwidth (105) of the twelve contiguous subcarriers, and

the twelve allocations of single subcarriers do not overlap with each other and fall within the bandwidth (105) of the twelve contiguous subcarriers;

receiving an index indication corresponding to an index from the set of multiple indices from the base station (10); and

transmitting data to the base station (10) using the resource allocation corresponding to the received index indication.

18. The method of claim 17, wherein the index indication is the index.

19. The method of either of claims 17 or 18, wherein the narrowband communication system is a narrowband Internet of Things (NB-IoT) system.

20. The method of any of claims 17-19, wherein the narrowband communication system is deployed in-band or in a guard band of a Long Term Evolution (LTE) system.

21. The method of any of claims 17-20, wherein each of the twelve contiguous subcarriers has a 15 kHz bandwidth (105).

22. The method of any of claims 17-21, wherein the user equipment (12) is preconfigured with the set of multiple indices, and wherein the user equipment (12) is configured to obtain the set by reading the preconfigured set of multiple indices.

23. The method of any of claims 17-22, wherein a narrowband physical uplink shared channel in the narrowband communication system comprises the set of uplink resource allocations (11).

24. A base station (10) configured for communication with a user equipment (12) in a narrowband communication system, wherein the base station (10) comprises:

radio circuitry (910) and processing circuitry (920) whereby the base station (10) is configured to:

obtain a set of multiple indices, each index in the set of multiple indices corresponding to a different uplink resource allocation from a set of uplink resource allocations (11) formed from twelve contiguous subcarriers, the set of uplink resource allocations (11) comprising an allocation of the twelve contiguous subcarriers, two allocations of six contiguous ones of the twelve contiguous subcarriers, four allocations of three contiguous ones of the twelve contiguous subcarriers, and twelve allocations of a single one of the twelve contiguous subcarriers, such that:

the two allocations of six contiguous subcarriers do not overlap with each other and fall within a bandwidth (105) of the twelve contiguous subcarriers,

the four allocations of three contiguous subcarriers do not overlap with each other and fall within the bandwidth (105) of the twelve contiguous subcarriers, and

the twelve allocations of single subcarriers do not overlap with each other and fall within the bandwidth (105) of the twelve contiguous subcarriers;

transmit an index indication corresponding to an index from the set of multiple indices to the user equipment (12); and

receive data from the user equipment (12) using the resource allocation corresponding to the transmitted index indication.

25. The base station (10) of claim 24, wherein the index indication is the index.

26. The base station (10) of either of claims 24 or 25, wherein the narrowband communication system is a narrowband Internet of Things (NB-IoT) system.

27. The base station (10) of any of claims 24-26, wherein the narrowband communication system is deployed in-band or in a guard band of a Long Term Evolution (LTE) system.

28. The base station (10) of any of claims 24-27, wherein each of the twelve contiguous subcarriers has a 15 kHz bandwidth (105).

29. The base station (10) of any of claims 24-28, wherein a narrowband physical uplink shared channel in the narrowband communication system comprises the set of uplink resource allocations (11).

30. A method performed by a base station (10) for communication with a user equipment (12) in a narrowband communication system, the method comprising:

obtaining a set of multiple indices, each index in the set of multiple indices corresponding to a different uplink resource allocation from a set of uplink resource allocations (11) formed from twelve contiguous subcarriers, the set of uplink resource allocations (11) comprising an allocation of the twelve contiguous subcarriers, two allocations of six contiguous ones of the twelve contiguous subcarriers, four allocations of three contiguous ones of the twelve contiguous subcarriers, and twelve allocations of a single one of the twelve contiguous subcarriers, such that:

the two allocations of six contiguous subcarriers do not overlap with each other and fall within a bandwidth (105) of the twelve contiguous subcarriers,

the four allocations of three contiguous subcarriers do not overlap with each other and fall within the bandwidth (105) of the twelve contiguous subcarriers, and

the twelve allocations of single subcarriers do not overlap with each other and fall within the bandwidth (105) of the twelve contiguous subcarriers;

transmitting an index indication corresponding to an index from the set of multiple indices to the user equipment (12); and

receiving data from the user equipment (12) using the resource allocation corresponding to the transmitted index indication.

31. The method of claim 30, wherein the index indication is the index.

32. The method of either of claims 30 or 31, wherein the narrowband communication system is a narrowband Internet of Things (NB-IoT) system.