

CLAIMS

1. A method of wireless communication, comprising:
receiving, by a user equipment (UE) capable of using a sub-physical resource block (PRB) resource allocation and a resource allocation of one or more PRBs, a grant identifying an uplink resource allocation of less than one PRB,
wherein the grant identifies a particular PRB in which the uplink resource allocation is included and at least a group of subcarriers allocated for the UE,
wherein the uplink resource allocation is associated with a transport block,
wherein the uplink resource allocation maps the transport block to at least one resource unit that includes a first number of subcarriers and a second number of subframes, and
wherein the grant indicates a number of resource units to which the transport block is to be mapped; and
transmitting uplink data, by the UE, using the uplink resource allocation.
2. The method of claim 1, wherein the UE includes a Category M UE, a Category M1 UE, or a Category M2 UE.
3. The method of claim 1, wherein the uplink resource allocation further identifies a narrowband in which the particular PRB is included.
4. The method of claim 1, wherein the particular PRB is selected from a predefined group of PRBs that includes fewer than all PRBs of a narrowband on which the UE is configured to communicate.
5. The method of claim 4, wherein a configuration of the predefined group of PRBs is indicated using radio resource control signaling.
6. The method of claim 1, wherein the particular PRB is selected based at least in part on the particular PRB being not included in a narrowband.

7. The method of claim 1, wherein the particular PRB is selected based at least in part on the particular PRB being included in a guard band.

8. The method of claim 1, wherein the uplink resource allocation is identified based at least in part on a joint coding with a repetition level associated with the grant.

9. The method of claim 1, wherein a transport block size of the transport block is determined based at least in part on the number of resource units.

10. The method of claim 9, wherein a modulation order of the transport block is overwritten with quadrature phase shift keying or binary phase shift keying when a determined modulation order of the transport block is greater than 2.

11. The method of claim 1, wherein the group of subcarriers is selected from multiple non-overlapping groups of subcarriers of the particular PRB.

12. The method of claim 1, wherein the UE is further configured to receive a second grant of at least one PRB, and wherein a number of PRBs of the second grant is based at least in part on a maximum transmission bandwidth of the UE.

13. The method of claim 12, wherein the maximum transmission bandwidth is 1.4 megahertz and the second grant is associated with from one to six PRBs.

14. The method of claim 12, wherein the maximum transmission bandwidth is 5 megahertz and the second grant is associated with from one to 24 PRBs.

15. A method of wireless communication, comprising:
receiving, by a user equipment (UE), a grant identifying an uplink resource allocation of less than one physical resource block (PRB),
wherein the grant identifies a number of subframes or resource units to which a

transport block, associated with the uplink resource allocation, is to be mapped; and
determining, by the UE, a frequency hopping technique based at least in part on the
number of subframes or resource units,

wherein the frequency hopping technique is within a narrowband that contains the
uplink resource allocation, and

wherein at least one of:

the UE is configured to deactivate the frequency hopping technique when
the grant identifies the uplink resource allocation of less than one PRB,

the UE is configured to configure the frequency hopping technique based
at least in part on a coverage extension mode, a frequency hopping interval, and
the number of subframes or resource units when the grant identifies the uplink
resource allocation of less than one PRB,

the UE is configured to perform the frequency hopping technique within
one or more predefined PRBs when the grant identifies the uplink resource
allocation of less than one PRB, or

the UE is configured to perform the frequency hopping technique within a
particular PRB, the frequency hopping technique is based at least in part on a
cyclic approach within the particular PRB.

16. The method of claim 15, wherein the UE is configured to deactivate the frequency
hopping technique when the grant identifies the uplink resource allocation of less than one PRB.

17. The method of claim 15, wherein the UE is configured to configure the frequency
hopping technique based at least in part on the coverage extension mode, the frequency hopping
interval, and the number of subframes or resource units when the grant identifies the uplink
resource allocation of less than one PRB.

18. The method of claim 17, wherein the UE is configured to perform the frequency
hopping technique when the frequency hopping interval matches the number of subframes or
resource units associated with the uplink resource allocation.

19. The method of claim 15, wherein the UE is configured to perform the frequency hopping technique within the one or more predefined PRBs when the grant identifies the uplink resource allocation of less than one PRB.

20. The method of claim 15, wherein the UE is configured to perform the frequency hopping technique within the particular PRB, and wherein the frequency hopping technique is based at least in part on the cyclic approach within the particular PRB.

21. A method of wireless communication, comprising:
 receiving, by a user equipment (UE), a grant identifying an uplink resource allocation of less than one physical resource block (PRB); and
 performing, by the UE, a retuning operation based at least in part on the grant identifying an uplink resource allocation of less than one PRB,
 wherein the retuning operation is performed according to a retuning configuration corresponding to a system bandwidth capability of the UE, and
 wherein at least one of:
 the UE is configured to perform the retuning operation when a narrowband on which the UE communicates changes,
 the UE is configured to perform the retuning operation when a PRB on which the UE communicates changes,
 the UE is configured to puncture a last one or more symbols of a subframe based at least in part on performing the retuning operation, or
 the UE is configured to rate match a first one or more symbols of the subframe based at least in part on performing the retuning operation.

22. The method of claim 21, wherein the UE is configured to perform the retuning operation when the narrowband on which the UE communicates changes.

23. The method of claim 21, wherein the UE is configured to perform the retuning operation when the PRB on which the UE communicates changes.

24. The method of claim 21, wherein the UE is configured to puncture the last one or more symbols of the subframe based at least in part on performing the retuning operation.

25. The method of claim 21, wherein the UE is configured to rate match the first one or more symbols of the subframe based at least in part on performing the retuning operation.

26. 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 a grant identifying an uplink resource allocation of less than one physical resource block (PRB),
wherein the grant identifies a particular PRB in which the uplink resource allocation is included and at least a group of subcarriers is allocated for the UE,
wherein the uplink resource allocation is associated with a transport block,
wherein the uplink resource allocation maps the transport block to at least one resource unit that includes a first number of subcarriers and a second number of subframes, and
wherein the grant indicates a number of resource units to which the transport block is to be mapped; and
transmit uplink data using the uplink resource allocation.

27. The UE of claim 26, wherein the uplink resource allocation further identifies a narrowband in which the particular PRB is included.

28. The UE of claim 26, wherein the particular PRB is selected from a predefined group of PRBs that includes fewer than all PRBs of a narrowband on which the UE is configured to communicate.

29. The UE of claim 28, wherein a configuration of the predefined group of PRBs is indicated using radio resource control signaling.

30. The UE of claim 26, wherein a transport block size of the transport block is determined based at least in part on the number of resource units.