

CLAIMS

WHAT IS CLAIMED IS:

1. A method of wireless communications, comprising:
 - determining, at a base station, a distance between a first user equipment (UE) and a second UE of a plurality of UEs, wherein the distance is determined based on one or more of a sequence length, a number of hypothesis, or a number of UEs sharing an orthogonal frequency division multiplexing (OFDM) symbol;
 - determining, at the base station, a plurality of cyclic shifts for each of the first UE and the second UE, wherein the plurality of cyclic shifts are determined relative to a base sequence and based on the distance and the number of UEs sharing the OFDM symbol;
 - assigning one or more sequences to each of the first UE and the second UE, wherein the one or more sequences assigned to the first UE and the second UE are based on a corresponding plurality of cyclic shifts associated with the first UE and the second UE;
 - receiving, at the base station, a multiplexed signal, wherein the multiplexed signal includes at least one bit of uplink control information (UCI) from the first UE and the second UE multiplexed on an uplink short burst transmitted via the OFDM symbol.
2. The method of claim 1, wherein the distance is a hypothesis distance, a user distance, or a random distance, and wherein the at least one bit of UCI includes one or more bits of an acknowledgement (ACKs), negative ACK (NACK) or a scheduling request (SR).
3. The method of claim 2, wherein the distance is the hypothesis distance, and wherein the hypothesis distance is a distance between a first hypothesis and a second hypothesis associated with a UE, and wherein the UE is the first UE or the second UE.
4. The method of claim 3, wherein the hypothesis distance is a maximum hypothesis distance.
5. The method of claim 3, wherein the first hypothesis is an ACK and the second hypothesis is a NACK.

6. The method of claim 2, wherein the distance is the user distance, and wherein the user distance is a distance between the first UE and a second UE.
7. The method of claim 6, wherein the user distance is a maximum user distance.
8. The method of claim 2, wherein the distance is based on random assigning of sequences to the first UE and the second UE.
9. The method of claim 1, wherein the at least one bit of UCI comprises at least one scheduling request (SR) bit, at least one acknowledgement (ACK) bit, or at least one SR bit and at least one ACK bit.
10. The method of claim 9, wherein the hypothesis distance between two of the plurality of cyclic shifts is 6 for 2 UCI hypothesis from one UE.
11. The method of claim 9, wherein the minimum hypothesis distance between any two adjacent cyclic shifts of the plurality of cyclic shifts is 3 for 4 UCI hypothesis from one UE.
12. The method of claim 9, wherein receiving the multiplexed signal includes receiving the at least one SR bit and the at least one ACK bit in a short physical uplink control channel (PUCCH) for the at least one bit of UCI of up to 2 bits.
13. The method of claim 9, wherein the at least one bit of UCI comprises at most one scheduling request (SR) bit, at most two acknowledgement (ACK) bits, or at most one SR bit and at most two ACK bits.
14. The method of claim 1, wherein the sequence has a length of 12 indices.
15. The method of claim 1, wherein one cyclic shift includes only a single scheduling request (SR).

16. The method of claim 1, wherein the multiplexed signal includes UCI from both the first UE and the second UE.
17. A base station, comprising:
 - a memory; and
 - a processor in communication with the memory and configured to:
 - determine one or more frequency resources for a first UE and a second UE of a plurality of UEs;
 - assign the determined one or more frequency resources to each of the first UE and the second UE;
 - assign one or more cyclic shifts to each of the first UE and the second UE;
 - receive a multiplexed signal, wherein the multiplexed signal includes at least one bit of uplink control information (UCI) from the first UE and the second UE based on a frequency division multiplexing (FDM) on an uplink short burst transmitted via an orthogonal frequency division multiplexing (OFDM) symbol.
18. The base station of claim 17, wherein the one or more frequency resources are located in different bands and wherein the at least one bit of UCI includes one or more bits of an acknowledgement (ACKs), negative ACK (NACK) or a scheduling request (SR).
19. The base station of claim 17, wherein the one or more frequency resources are based on different combs for the first UE and the second UE.
20. The base station of claim 17, wherein the one or more cyclic shifts have maximum hypothesis distance.
21. The base station of claim 20, wherein the hypothesis distance between two of the plurality of cyclic shifts is 6 for 2 UCI hypothesis from one UE.
22. The base station of claim 20, wherein the minimum hypothesis distance between any two adjacent cyclic shifts of the plurality of cyclic shifts is 3 for 4 UCI hypothesis from one UE.

23. The base station of claim 17, wherein the at least one bit of UCI comprise at least one scheduling request (SR) bit, at least one acknowledgment (ACK) bit, or at least one SR bit and at least one ACK bit.

24. The base station of claim 23, wherein the at least one bit of UCI comprises at most one scheduling request (SR) bit, at most two acknowledgment (ACK) bits, or at most one SR bit and at most two ACK bits.

25. The base station of claim 17, wherein one cyclic shift includes only a single scheduling request (SR).

26. The base station of claim 17, wherein the multiplexed signal includes UCI from both the first UE and the second UE.

27. A method of wireless communications, comprising:
receiving, at a UE, one or more sequences assigned to the UE by a base station, wherein the one or more sequences are assigned by the base station based on a plurality of cyclic shifts associated with the UE and determined by the base station relative to a base sequence and based on a distance between the UE and a second UE and a number of UEs sharing an orthogonal frequency division multiplexing (OFDM) symbol; and
transmitting, by the UE, uplink control information (UCI) as part of a multiplexed signal, wherein the multiplexed signal includes at least one bit of UCI from the UE and a second UE multiplexed on an uplink short burst transmitted via the OFDM symbol.

28. The method of claim 27, wherein the distance is determined by the base station based on one or more of a sequence length, a number of hypothesis, or the number of UEs sharing the OFDM symbol.

29. A method of wireless communication comprising:
receiving, at the UE, one or more frequency resources and one or more shifts determined by a base station;

transmitting, by the UE, uplink control information (UCI) as part of a multiplexed signal, wherein the multiplexed signal includes at least one bit of UCI from the UE and a second UE based on a frequency division multiplexing (FDM) on an uplink short burst transmitted via an orthogonal frequency division multiplexing (OFDM) symbol.

30. The method of claim 29, wherein the one or more frequency resources are located in different bands and wherein the at least one bit of UCI includes one or more bits of an acknowledgement (ACKs), negative ACK (NACK) or a scheduling request (SR).