~~CLAIMS~~

~~What is claimed is:~~

CLAIMS

1. A method for suppressing interference implemented by a user equipment (UE) with a radar in a communication system, comprising:

selecting waveform parameters for transmission of a radar waveform, the waveform parameters being a slope, a frequency offset, a chirp duration, or a combination thereof of a chirp of the radar waveform, wherein the radar waveform comprises a plurality of chirps and the selecting comprises varying the waveform parameters for at least one chirp of the plurality of chirps;

transmitting an indication of one or more of the selected waveform parameters over the communication system; and

transmitting the radar waveform according to the selected waveform parameters.

2. The method of claim 1, wherein the selecting the waveform parameters comprises:

selecting a codeword from a codebook comprising a plurality of codewords, wherein the codeword indicates the selected waveform parameters.

3. The method of claim 2, wherein the selecting the waveform parameters comprises:

identifying a set of codewords for additional UEs within a threshold distance; and

varying the waveform parameters for the at least one chirp with uniform distribution within a range such that a distance is maximized between the selected codeword and the identified set of codewords.

4. The method of claim 1, wherein the transmitting the indication of the one or more of the selected waveform parameters comprises:

broadcasting the indication of the one or more of the selected waveform parameters on one or more side-communication channels between the UE and one or more additional UEs.

5. The method of claim 1, wherein the transmitting the indication of the one or more of the selected waveform parameters comprises:

transmitting the indication of the one or more of the selected waveform parameters on an uplink channel between the UE and a network entity.

6. The method of claim 1, further comprising:

receiving, from a network entity, information of a set of codewords being used in proximity to the UE.

7. The method of claim 1, further comprising:

broadcasting a beacon, a coded discovery message, or a combination thereof on one or more side-communication channels between the UE and one or more additional UEs to indicate a location of the UE.

8. The method of claim 1, further comprising:

receiving information of a set of codewords used by additional UEs on one or more side-communication channels between the UE and one or more of the additional UEs, wherein the waveform parameters are varied based at least in part on the information of the set of codewords used by the additional UEs.

9. The method of claim 8, further comprising:

receiving a set of beacons, a set of coded discovery messages, or a combination thereof for the additional UEs on the one or more side-communication channels between the UE and the one or more of the additional UEs to indicate locations of the additional UEs; and

determining a set of proximity values for the additional UEs with respect to the UE, wherein the waveform parameters are varied based at least in part on the set of proximity values for the additional UEs.

~~10. The method of claim 1, wherein the selected waveform parameters comprise a frequency range, a chirp duration, a frequency offset, or a combination thereof.~~

~~11.~~ 10. The method of claim 1, further comprising:

identifying, for the radar waveform, a range of interest for interference sources; and

setting a first frequency offset for the radar waveform such that an interference peak of at least one interference source appears beyond the range of interest.

~~12.~~ 11. The method of claim 1, further comprising:

phase-coding one or more chirps of the radar waveform to avoid coherent addition of chirps with other radar waveforms in the communication system.

12. The method of claim 1, wherein each of the plurality of chirps sweeps across a frequency range at least once during a respective chirp duration.

13. The method of claim 1, wherein selecting the waveform parameters comprises selecting values for at least two of the waveform parameters for each of the plurality of chirps.

14. The method of claim 13, wherein the at least two of the waveform parameters comprise the slope and the frequency offset.

15. The method of claim 1, wherein selecting the waveform parameters comprises selecting a first slope and a first frequency offset for one or more first chirps of the plurality of chirps and selecting a second slope and a second frequency offset for one or more second chirps of the plurality of chirps.

~~13~~16. An apparatus for suppressing interference implemented by a user equipment (UE) with a radar in a communication system, comprising:

means for selecting waveform parameters for transmission of a radar waveform, the waveform parameters being a slope, a frequency offset, a chirp duration, or a combination thereof of a chirp of the radar waveform, wherein the radar waveform comprises a plurality of chirps and the selecting comprises varying the waveform parameters for at least one chirp of the plurality of chirps;

means for transmitting an indication of one or more of the selected waveform parameters over the communication system; and

means for transmitting the radar waveform according to the selected waveform parameters.

~~14.~~ 17. The apparatus of claim ~~13~~16, wherein the means for selecting the waveform parameters comprises:

means for selecting a codeword from a codebook comprising a plurality of codewords, wherein the codeword indicates the selected waveform parameters.

~~15.~~ 18. The apparatus of claim ~~14~~17, wherein the means for selecting the waveform parameters comprises:

means for identifying a set of codewords for additional UEs within a threshold distance; and

means for varying the waveform parameters for the at least one chirp with uniform distribution within a range such that a distance is maximized between the selected codeword and the identified set of codewords.

~~16.~~ 19. The apparatus of claim ~~13~~16, wherein the means for transmitting the indication of the one or more of the selected waveform parameters comprises:

means for broadcasting the indication of the one or more of the selected waveform parameters on one or more side-communication channels between the UE and one or more additional UEs.

~~17.~~ 20. The apparatus of claim ~~13~~16, wherein the means for transmitting the indication of the one or more of the selected waveform parameters comprises:

means for transmitting the indication of the one or more of the selected waveform parameters on an uplink channel between the UE and a network entity.

~~18.~~ 21. The apparatus of claim ~~13~~16, further comprising:

means for receiving, from a network entity, information of a set of codewords being used in proximity to the UE.

~~19.~~ 22. The apparatus of claim ~~13~~16, further comprising:

means for broadcasting a beacon, a coded discovery message, or a combination thereof on one or more side-communication channels between the UE and one or more additional UEs to indicate a location of the UE.

~~20~~23. The apparatus of claim ~~13~~16, further comprising:

means for receiving information of a set of codewords used by additional UEs on one or more side-communication channels between the UE and one or more of the additional UEs, wherein the waveform parameters are varied based at least in part on the information of the set of codewords used by the additional UEs.

~~21~~24. The apparatus of claim ~~20~~23, further comprising:

means for receiving a set of beacons, a set of coded discovery messages, or a combination thereof for the additional UEs on the one or more side-communication channels between the UE and the one or more of the additional UEs to indicate locations of the additional UEs; and

means for determining a set of proximity values for the additional UEs with respect to the UE, wherein the waveform parameters are varied based at least in part on the set of proximity values for the additional UEs.

~~22~~25. The apparatus of claim ~~13, wherein the selected waveform parameters comprise a frequency range, a chirp duration, a frequency offset, or a combination thereof.~~

~~23. The apparatus of claim 13~~16, further comprising:

means for identifying, for the radar waveform, a range of interest for interference sources; and

means for setting a first frequency offset for the radar waveform such that an interference peak of at least one interference source appears beyond the range of interest.

~~24.~~ 26. The apparatus of claim ~~13~~16, further comprising:

means for phase-coding one or more chirps of the radar waveform to avoid coherent addition of chirps with other radar waveforms in the communication system.

~~25~~27. An apparatus for suppressing interference implemented by a user equipment (UE) with a radar in a communication system, comprising:

a processor;

memory coupled to the processor; and

instructions stored in the memory and executable by the processor to cause the apparatus to:

select waveform parameters for transmission of a radar waveform, the waveform parameters being a slope, a frequency offset, a chirp duration, or a combination thereof of a chirp of the radar waveform, wherein the radar waveform comprises a plurality of chirps and the selecting comprises varying the waveform parameters for at least one chirp of the plurality of chirps;

transmit an indication of one or more of the selected waveform parameters over the communication system; and

transmit the radar waveform according to the selected waveform parameters.

~~26.~~ 28. The apparatus of claim ~~25~~27, wherein the instructions executable by the processor to cause the apparatus to select the waveform parameters are further executable to cause the apparatus to select a codeword from a codebook comprising a plurality of codewords, wherein the codeword indicates the selected waveform parameters.

~~27.~~ 29. The apparatus of claim ~~26~~28, wherein the instructions executable by the processor to cause the apparatus to select the waveform parameters are further executable to cause the apparatus to:

identify a set of codewords for additional UEs within a threshold distance; and

vary the waveform parameters for the at least one chirp with uniform distribution within a range such that a distance is maximized between the selected codeword and the identified set of codewords.

~~28.~~ 30. The apparatus of claim ~~25~~27, wherein the instructions executable by the processor to cause the apparatus to transmit the indication of the one or more of the selected waveform parameters are further executable to cause the apparatus to broadcast the indication of the one or more of the selected waveform parameters on one or more side-communication channels between the UE and one or more additional UEs.

~~29~~31. The apparatus of claim ~~25~~27, wherein the instructions executable by the processor to cause the apparatus to transmit the indication of the one or more of the selected waveform parameters are further executable to cause the apparatus to transmit the indication of the one or more of the selected waveform parameters on an uplink channel between the UE and a network entity.

~~30.~~ 32. The apparatus of claim ~~25~~27, wherein the instructions are further executable by the processor to cause the apparatus to receive, from a network entity, information of a set of codewords being used in proximity to the UE.

~~31.~~ 33. The apparatus of claim ~~25~~27, wherein the instructions are further executable by the processor to cause the apparatus to broadcast a beacon, a coded discovery message, or a combination thereof on one or more side-communication channels between the UE and one or more additional UEs to indicate a location of the UE.

~~32~~34. The apparatus of claim ~~25~~27, wherein the instructions are further executable by the processor to cause the apparatus to receive information of a set of codewords used by additional UEs on one or more side-communication channels between the UE and one or more of the additional UEs, wherein the waveform parameters are varied based at least in part on the information of the set of codewords used by the additional UEs.

~~33~~35. The apparatus of claim ~~32~~34, wherein the instructions are further executable by the processor to cause the apparatus to:

receive a set of beacons, a set of coded discovery messages, or a combination thereof for the additional UEs on the one or more side-communication channels between the UE and the one or more of the additional UEs to indicate locations of the additional UEs; and

determine a set of proximity values for the additional UEs with respect to the UE, wherein the waveform parameters are varied based at least in part on the set of proximity values for the additional UEs.

~~34~~36. The apparatus of claim ~~25, wherein the selected waveform parameters comprise a frequency range, a chirp duration, a frequency offset, or a combination thereof.~~

~~35. The apparatus of claim 25~~27, wherein the instructions are further executable by the processor to cause the apparatus to:

identify, for the radar waveform, a range of interest for interference sources; and

set a first frequency offset for the radar waveform such that an interference peak of at least one interference source appears beyond the range of interest.

~~36.~~ 37. The apparatus of claim ~~25~~27, wherein the instructions are further executable by the processor to cause the apparatus to phase-code one or more chirps of the radar waveform to avoid coherent addition of chirps with other radar waveforms in the communication system.

~~37~~38. A non-transitory processor-readable storage medium having stored thereon processor-executable instructions configured to cause a processor of an apparatus to

suppress interference implemented by a user equipment (UE) with a radar in a communication system, the processor-executable instructions configured to cause the processor to:

select waveform parameters for transmission of a radar waveform, the waveform parameters being a slope, a frequency offset, a chirp duration, or a combination thereof of a chirp of the radar waveform, wherein the radar waveform comprises a plurality of chirps and the selecting comprises varying the waveform parameters for at least one chirp of the plurality of chirps;

transmit an indication of one or more of the selected waveform parameters over the communication system; and

transmit the radar waveform according to the selected waveform parameters.

~~38. The non-transitory processor-readable storage medium of claim 37, wherein the processor-executable instructions configured to cause the processor to select the waveform parameters are further configured to cause the processor to select a codeword from a codebook comprising a plurality of codewords, wherein the codeword indicates the selected waveform parameters.~~

39. The non-transitory processor-readable storage medium of claim 38, wherein the processor-executable instructions configured to cause the processor to select the waveform parameters are further configured to cause the processor to select a codeword from a codebook comprising a plurality of codewords, wherein the codeword indicates the selected waveform parameters.

40. The non-transitory processor-readable storage medium of claim 39, wherein the processor-executable instructions configured to cause the processor to select the waveform parameters are further configured to cause the processor to:

identify a set of codewords for additional UEs within a threshold distance; and

vary the waveform parameters for the at least one chirp with uniform distribution within a range such that a distance is maximized between the selected codeword and the identified set of codewords.

~~40.~~ 41. The non-transitory processor-readable storage medium of claim ~~37~~38, wherein the processor-executable instructions configured to cause the processor to transmit the indication of the one or more of the selected waveform parameters are further configured to cause the processor to broadcast the indication of the one or more of the selected waveform parameters on one or more side-communication channels between the UE and one or more additional UEs.

~~41.~~ 42. The non-transitory processor-readable storage medium of claim ~~37~~38, wherein the processor-executable instructions configured to cause the processor to transmit the indication of the one or more of the selected waveform parameters are further configured to cause the processor to transmit the indication of the one or more of the selected waveform parameters on an uplink channel between the UE and a network entity.

~~42.~~ 43. The non-transitory processor-readable storage medium of claim ~~37~~38, wherein the processor-executable instructions are further configured to cause the processor to receive, from a network entity, information of a set of codewords being used in proximity to the UE.

~~43.~~ 44. The non-transitory processor-readable storage medium of claim ~~37~~38, wherein the processor-executable instructions are further configured to cause the processor to broadcast a beacon, a coded discovery message, or a combination thereof on one or more side-communication channels between the UE and one or more additional UEs to indicate a location of the UE.

~~44~~45. The non-transitory processor-readable storage medium of claim ~~37~~38, wherein the processor-executable instructions are further configured to cause the processor to receive information of a set of codewords used by additional UEs on one or more side-communication channels between the UE and one or more of the additional UEs, wherein the waveform parameters are varied based at least in part on the information of the set of codewords used by the additional UEs.

~~45~~46. The non-transitory processor-readable storage medium of claim ~~44~~45, wherein the processor-executable instructions are further configured to cause the processor to:

receive a set of beacons, a set of coded discovery messages, or a combination thereof for the additional UEs on the one or more side-communication channels between the UE and the one or more of the additional UEs to indicate locations of the additional UEs; and

determine a set of proximity values for the additional UEs with respect to the UE, wherein the waveform parameters are varied based at least in part on the set of proximity values for the additional UEs.

~~46~~47. The non-transitory processor-readable storage medium of claim ~~37,~~ ~~wherein the selected waveform parameters comprise a frequency range, a chirp duration, a frequency offset, or a combination thereof.~~

~~47. The non-transitory processor-readable storage medium of claim 37~~38, wherein the processor-executable instructions are further configured to cause the processor to:

identify, for the radar waveform, a range of interest for interference sources; and

set a first frequency offset for the radar waveform such that an interference peak of at least one interference source appears beyond the range of interest.

48. The non-transitory processor-readable storage medium of claim ~~37~~38, wherein the processor-executable instructions are further configured to cause the processor to phase-code one or more chirps of the radar waveform to avoid coherent addition of chirps with other radar waveforms in the communication system.