CLAIMS

1. A wireless communication apparatus comprising:

a processor configured to embed a set of identical information within each of a plurality of very-high throughput long-training-fields (VHT-LTFs) included in a preamble of a data frame;

a modulator configured to distribute the plurality of VHT-LTFs and payload data of the data frame into a plurality of spatial streams; and

a plurality of transceivers configured to output the plurality of spatial streams for transmission via a plurality of antennas.

2. The apparatus of claim 1, wherein the set of identical information comprises a single stream of identical pilot tones.

3. The apparatus of claim 1, wherein the modulator is configured to distribute the plurality of VHT-LTFs and payload data using orthogonal frequency division multiplexing (OFDM).

4. The apparatus of claim 1, wherein the preamble of the data frame contains one VHT-LTF for each receive antenna of a device configured to receive the plurality of spatial streams.

5. The apparatus of claim 1, further comprising a spatial processor to apply a per-stream cyclic shift delay to each of the plurality of spatial streams.

6. A method for wireless communication, comprising:

embedding a set of identical information within each of a plurality of very-high throughput long-training-fields (VHT-LTFs) included in a preamble of a data frame;

distributing the plurality of VHT-LTFs and payload data of the data frame into a plurality of spatial streams; and

outputting the plurality of spatial streams for transmission via a plurality of antennas.

7. The method of claim 6, wherein the set of identical information comprises a single stream of identical pilot tones.

8. The method of claim 6, wherein the plurality of VHT-LTFs and payload data are distributed using orthogonal frequency division multiplexing (OFDM).

9. The method of claim 6, wherein the preamble of the data frame contains one VHT-LTF for each receive antenna of a device configured to receive the plurality of spatial streams.

10. The method of claim 6, further comprising:

applying a per-stream cyclic shift delay to each of the spatial streams prior to transmission.

11. A non-transitory computer readable medium comprising instructions that, when executed by an apparatus, cause the apparatus to:

embed a set of identical information within each of a plurality of very-high throughput long-training-fields (VHT-LTFs) included in a preamble of a data frame;

distribute the plurality of VHT-LTFs and payload data of the data frame into a plurality of spatial streams; and

output the plurality of spatial streams for transmission via a plurality of antennas.

12. The non-transitory computer readable medium of claim 11, wherein the set of identical information comprises a single stream of pilot tones.

13. The non-transitory computer readable medium of claim 11, wherein the plurality of VHT-LTFs and payload data are distributed using orthogonal frequency division multiplexing (OFDM).

14. The non-transitory computer readable medium of claim 11, wherein the preamble of the data frame contains one VHT-LTF for each receive antenna of a device configured to receive the plurality of spatial streams.

15. The non-transitory computer readable medium of claim 11, wherein execution of the instructions further causes the apparatus to apply a per-stream cyclic shift delay to each of the plurality of spatial streams.

16. An apparatus comprising:

a plurality of antennas configured to receive a plurality of spatial streams;

a processor configured to recover a very high-throughput long training field (VHT-LTF) from each of the received spatial streams, wherein each of the VHT-LTFs includes a set of identical pilot tones and a corresponding set of data tones; and

a phase tracker configured to determine, for each set of data tones, phase rotation information based at least in part on the corresponding set of identical pilot tones.

17. The apparatus of claim 16, wherein the phase tracker is configured to determine the phase rotation information by:

determining a one dimensional channel estimation for each pilot tone in a first of the VHT-LTFs to generate a set of one dimensional channel estimations; and

for each set of data tones, determining phase rotation information based on the set of one dimensional channel estimations and the corresponding set of identical pilot tones.

18. The apparatus of claim 17, wherein the phase tracker is further configured to:

apply, to each set of data tones, the determined phase rotation information to generate a set of phase corrected data tones; and

perform channel estimation on each set of phase corrected data tones.

19. The apparatus of claim 17, wherein the one dimensional channel estimation is determined without a multiple-input multiple-output (MIMO) training cover sequence.

20. The apparatus of claim 16, wherein the set of identical pilot tones is a single stream set of pilot tones.

21. A method of wireless communication comprising:

receiving a plurality of spatial streams via a plurality of antennas;

recovering a very high-throughput long training field (VHT-LTF) from each of the received spatial streams, wherein each of the VHT-LTFs includes a set of identical pilot tones and a corresponding set of data tones; and

determining, for each set of data tones, phase rotation information based at least in part on the corresponding set of identical pilot tones.

22. The method of claim 21, wherein determining the phase rotation information comprises:

determining a one dimensional channel estimation for each pilot tone in a first of the VHT-LTFs to generate a set of one dimensional channel estimations; and

for each set of data tones, determining phase rotation information based on the set of one dimensional channel estimations and the corresponding set of identical pilot tones.

23. The method of claim 22, further comprising:

applying, to each set of data tones, the determined phase rotation information to generate a set of phase corrected data tones; and

performing channel estimation on each set of phase corrected data tones.

24. The method of claim 22, wherein the one dimensional channel estimation is determined without a multiple-input multiple-output (MIMO) training cover sequence.

25. The method of claim 21, wherein the set of identical pilot tones is a single stream set of pilot tones.

26. A non-transitory computer readable medium comprising instructions that, when executed by one or more processors of an apparatus, cause the apparatus to:

receive a plurality of spatial streams via a plurality of antennas;

recover a very high-throughput long training field (VHT-LTF) from each of the received spatial streams, wherein each of the VHT-LTFs includes a set of identical pilot tones and a corresponding set of data tones; and

determine, for each set of data tones, phase rotation information based at least in part on the corresponding set of identical pilot tones.

27. The non-transitory computer readable storage medium of claim 26, wherein execution of the instructions to determine the phase rotation information causes the apparatus to further:

determine a one dimensional channel estimation for each pilot tone in a first of the VHT-LTFs to generate a set of one dimensional channel estimations; and

for each set of data tones, determine phase rotation information based on the set of one dimensional channel estimations and the corresponding set of identical pilot tones.

28. The non-transitory computer readable storage medium of claim 27, wherein execution of the instructions causes the apparatus to further:

apply, to each set of data tones, the determined phase rotation information to generate a set of phase corrected data tones; and

perform channel estimation on each set of phase corrected data tones.

29. The non-transitory computer readable storage medium of claim 27, wherein the one dimensional channel estimation is determined without a multiple-input multiple-output (MIMO) training cover sequence.

30. The non-transitory computer readable storage medium of claim 26, wherein the set of identical pilot tones is a single stream set of pilot tones.

31. A mobile station comprising:

a plurality of antennas configured to receive a plurality of spatial streams;

a processor configured to recover a very high-throughput long training field (VHT-LTF)

from each of the received spatial streams, wherein each of the VHT-LTFs includes a set of identical pilot tones and a corresponding set of data tones; and

a phase tracker configured to determine, for each set of data tones, phase rotation information based at least in part on the corresponding set of identical pilot tones.