

CLAIMS

What is claimed is:

- 1 1. A method of wireless communication comprising:
2 receiving a synchronization signal using a narrowband portion of a bandwidth
3 of a cell, wherein the synchronization signal comprises a base sequence repeated over a
4 plurality of symbol periods using a cover code;
5 detecting at least one of a frequency offset or a timing offset for the cell based
6 at least in part on the synchronization signal and the cover code; and
7 determining an identity of the cell based at least in part on applying the at least
8 one of the frequency offset or the timing offset.
- 1 2. The method of claim 1, wherein the detecting comprises:
2 determining a first timing offset estimate or a first frequency offset estimate
3 using a sliding autocorrelation on the synchronization signal at a first sampling rate;
4 determining a second timing offset estimate or a second frequency offset
5 estimate using a first cross-correlation on the synchronization signal at the first sampling rate
6 based at least in part on applying the first timing offset estimate or the first frequency offset
7 estimate; and
8 detecting the at least one of the frequency offset or the timing offset using a
9 second cross-correlation on the synchronization signal at a second sampling rate based at
10 least in part on applying the second timing offset estimate or the second frequency offset
11 estimate.
- 1 3. The method of claim 2, wherein the sliding autocorrelation comprises a
2 combination of sliding autocorrelations for multiple lags.
- 1 4. The method of claim 3, further comprising:
2 selecting, based at least in part on a metric, a function for the combination of
3 sliding autocorrelations for multiple lags from a plurality of combination functions.
- 1 5. The method of claim 2, wherein at least one of the sliding
2 autocorrelation, the first cross-correlation, or the second cross-correlation is based at least in
3 part on an update of a correlation parameter of the synchronization signal.

1 6. The method of claim 2, further comprising:
2 determining a first value of a plurality of sequence terms based at least in part
3 on the cover code, wherein each sequence term of the plurality of sequence terms
4 corresponds to a portion of the synchronization signal received during a symbol period of the
5 plurality of symbol periods; and
6 determining a second value based at least in part on the first value and a
7 reference sequence term, wherein the first cross-correlation or the second cross-correlation is
8 based at least in part on the second value.

1 7. The method of claim 2, wherein an accumulation of the sliding
2 autocorrelation is based at least in part on a correlation parameter of the synchronization
3 signal and a correlation parameter of at least one previously received version of the
4 synchronization signal.

1 8. The method of claim 1, further comprising:
2 determining the identity of the cell based at least in part on a secondary
3 synchronization signal (SSS), wherein the SSS is identified in a received signal based at least
4 in part on the applying of the at least one of the timing offset or the frequency offset.

1 9. The method of claim 1, wherein the determining the identity of the cell
2 further comprises determining a duplexing mode or a cyclic prefix (CP) length.

1 10. The method of claim 1, wherein the base sequence comprises a
2 constant amplitude zero autocorrelation (CAZAC) sequence.

1 11. The method of claim 1, wherein the cover code comprises a binary
2 cover code.

1 12. The method of claim 11, wherein the binary cover code comprises an
2 antipodal binary cover code.

1 13. The method of claim 1, wherein the cover code comprises a polyphase
2 sequence.

1 14. A method of wireless communication comprising:

2 generating a synchronization signal that includes a cover code applied to a
3 plurality of versions of a base sequence; and
4 transmitting the synchronization signal using a narrowband portion of a
5 bandwidth of a cell over a plurality of symbol periods, wherein each version of the plurality
6 of versions of the base sequence is transmitted using a symbol period of the plurality of
7 symbol periods.

1 15. The method of claim 14, further comprising:
2 transmitting a second synchronization signal using a central portion of the
3 bandwidth of the cell, wherein the central portion of the bandwidth is greater than the
4 narrowband portion of the bandwidth.

1 16. The method of claim 14, further comprising:
2 transmitting a secondary synchronization signal (SSS) comprising at least one
3 of an indication of an identity of the cell, a duplexing mode, or a cyclic prefix (CP) length.

1 17. The method of claim 14, wherein the cover code comprises a binary
2 cover code.

1 18. The method of claim 17, wherein the binary cover code comprises an
2 antipodal binary cover code.

1 19. The method of claim 14, wherein the cover code comprises a
2 polyphase sequence.

1 20. The method of claim 14, wherein the base sequence comprises a
2 constant amplitude zero autocorrelation (CAZAC) sequence.

1 21. The method of claim 14, further comprising:
2 transmitting the synchronization signal over a plurality of physical resource
3 blocks (PRBs).

1 22. The method of claim 14, further comprising:
2 generating a plurality of synchronization signals, wherein each
3 synchronization signal includes one of a plurality of cover codes applied to a plurality of
4 versions of the base sequence; and

5 transmitting the plurality of synchronization signals over a plurality of
6 physical resource blocks (PRBs).

1 23. An apparatus for wireless communication, comprising:
2 means for receiving a synchronization signal using a narrowband portion of a
3 bandwidth of a cell, wherein the synchronization signal comprises a base sequence repeated
4 over a plurality of symbol periods using a cover code;
5 means for detecting at least one of a frequency offset or a timing offset for the
6 cell based at least in part on the synchronization signal and the cover code; and
7 means for determining an identity of the cell based at least in part on applying
8 the at least one of the frequency offset or the timing offset.

1 24. The apparatus of claim 23, further comprising:
2 means for determining a first timing offset estimate or a first frequency offset
3 estimate using a sliding autocorrelation on the synchronization signal at a first sampling rate;
4 and
5 means for determining a second timing offset estimate or a second frequency
6 offset estimate using a first cross-correlation on the synchronization signal at the first
7 sampling rate based at least in part on applying the first timing offset estimate or the first
8 frequency offset estimate,
9 wherein the means for detecting the at least one of the frequency offset or the
10 timing offset detects the at least one of the frequency offset or the timing offset using a
11 second cross-correlation performed on the synchronization signal at a second sampling rate
12 based at least in part on applying the second timing offset estimate or the second frequency
13 offset estimate.

1 25. The apparatus of claim 24, further comprising means for recursively
2 updating a correlation parameter of the synchronization signal, wherein at least one of the
3 sliding autocorrelation, the first cross-correlation, or the second cross-correlation is based at
4 least in part on the recursively updated correlation parameter.

1 26. The apparatus of claim 24, further comprising:
2 means for determining a first value of a plurality of sequence terms based at
3 least in part on the cover code, wherein each sequence term of the plurality of sequence terms

4 corresponds to a portion of the synchronization signal received during a symbol period of the
5 plurality of symbol periods; and

6 means for determining a second value based at least in part on the first value
7 and a reference sequence term, wherein the first cross-correlation or the second cross-
8 correlation is based at least in part on the second value.

1 27. The apparatus of claim 23, further comprising:

2 means for determining the identity of the cell based at least in part on a
3 secondary synchronization signal (SSS), wherein the SSS is identified in a received signal
4 based at least in part on the applying of the at least one of the timing offset or the frequency
5 offset.

1 28. An apparatus for wireless communication, comprising:

2 means for generating a synchronization signal that includes a cover code
3 applied to a plurality of versions of a base sequence; and

4 means for transmitting the synchronization signal using a narrowband portion
5 of a bandwidth of a cell over a plurality of symbol periods, wherein each version of the
6 plurality of versions of the base sequence is transmitted using a symbol period of the plurality
7 of symbol periods.

1 29. The apparatus of claim 28, wherein the means for transmitting

2 transmits an additional synchronization signal using a central portion of the bandwidth of the
3 cell, wherein the central portion of the bandwidth is greater than the narrowband portion of
4 the bandwidth.

1 30. The apparatus of claim 28, wherein the means for transmitting

2 transmits a secondary synchronization signal (SSS) comprising an indication of a cell
3 identity.