CLAIMS

What is claimed is:

1. An apparatus for generating a plurality of signals, comprising

a first signal generation unit, comprising

an input receiving a reference signal, and

a plurality of outputs providing a first plurality of output signals being generated based on the reference signal, wherein any two of the output signals have a different phase;

a second signal generation unit, comprising

at least two inputs receiving at least two signals selected from the first plurality of output signals generated by the first signal generation unit, and

a plurality of outputs providing a second plurality of output signals being generated by interpolating the respective phases of the received at least two signals selected from the first plurality of output signals; and

a selection unit, comprising

a first plurality of inputs receiving the first plurality of output signals generated by the first signal generation unit,

a second plurality of inputs receiving the second plurality of output signals generated by the second signal generation unit, and

a plurality of outputs providing the plurality of signals wherein each of the signals is selected from the first plurality of output signals generated by the first signal generation unit and the second plurality of output signals generated by the second signal generation unit,

wherein any two signals of the plurality of signals have a different phase.

2. The apparatus of claim 1, wherein the first plurality of output signals is generated such that there is a phase difference between any two signals of the first plurality of output signals, and that the minimum phase difference

between any two signals of the first plurality of output signals is based on a first parameter value.

3. The apparatus of claim 2, wherein the second plurality of output signals is generated such that there is a phase difference between any two signals of the second plurality of output signals, and that the minimum phase difference between any two signals of the second plurality of output signals is based on a second parameter value.

4. The apparatus of claim 3, wherein the first parameter value is greater than the second parameter value.

5. The apparatus of claim 4, wherein the first parameter value and the second parameter value are programmable.

6. The apparatus of any one of claims 1-5, further comprising a calibration unit, wherein the calibration unit is programmed to compensate the minimum phase difference between any two signals of the plurality of signals, such that the minimum phase difference is at least substantially the same as the parameter value corresponding to the signals selected by the selection unit.

7. The apparatus of any one of claims 1-6, further comprising a buffering unit, wherein the buffering unit is adapted to control the slew rate of the plurality of signals, such that the rise/fall times of the plurality of signals are at least substantially the same as a predefined value.

8. The apparatus of any one of claims 1-7, wherein the second signal generation unit comprises at least one phase interpolating circuit.

9. The apparatus of any one of claims 1-8, wherein the second signal generation unit comprises a plurality of phase interpolating circuits, which are connected in series.

10. The apparatus of any one of claims 1-9, wherein the plurality of signals of the selection unit is provided to an antenna beamforming unit.

11. The apparatus of any one of claims 1-10, wherein the number of output signals in the first plurality of output signals is the same as the number of output signals in the second plurality of output signals.

12. The apparatus of any one of claims 1-11, wherein the first signal generation unit comprises a delay lock loop circuit.

13. The apparatus of any one of claims 1-11, wherein the first signal generation unit comprises a phase lock loop circuit.

14. The apparatus of any one of claims 1-13, wherein the selection unit comprises a multiplexer circuit.

15. A communication device, comprising

the apparatus for generating the plurality of signals of any one of claims 1-14.

16. A method of generating a plurality of signals, comprising

generating a first plurality of output signals based on a reference signal, wherein any two signals of the plurality of output signals have a different phase;

selecting at least two signals from the first plurality of output signals;

generating a second plurality of output signals by interpolating the respective phases of the selected at least two signals from the first plurality of output signals; and

selecting the plurality of signals from the first plurality of output signals and the second plurality of output signals, wherein any two signals of the plurality of signals have a different phase.

17. The method of claim 16, wherein the first plurality of output signals is generated such that there is a phase difference between any two signals of the first plurality of output signals, and that the minimum phase difference between any two signals of the first plurality of output signals is based on a first parameter value.

18. The method of claim 17, wherein the second plurality of output signals is generated such that there is a phase difference between any two signals of the second plurality of output signals, and that the minimum phase difference between any two signals of the second plurality of output signals is based on a second parameter value.

19. The method of claim 18, wherein the first parameter value is greater than the second parameter value.

20. The method of claim 19, wherein the first parameter value and the second parameter value are programmable.

21. The method of any one of claims 16-20, further comprising

compensating the minimum phase difference between any two signals of the plurality of signals, such that the minimum phase difference is substantially the same as the parameter value corresponding to the selected plurality of signals.

22. The method of any one of claims 16-21, further comprising

controlling the slew rate of the plurality of signals, such that the rise/fall times of the plurality of signals are at least substantially the same as a predefined value.

23. The method of any one of claims 16-22, further comprising

providing the plurality of signals to an antenna beamforming unit.

CLAIMS

1. An apparatus for generating a plurality of signals, comprising:

a first signal generation unit, comprising

an input receiving a reference signal, and

a plurality of outputs providing a first plurality of output signals being generated based on the reference signal, wherein any two of the output signals have a different phase;

a second signal generation unit, comprising

at least two inputs receiving at least two signals selected from the first plurality of output signals generated by the first signal generation unit, and

a plurality of outputs providing a second plurality of output signals being generated by interpolating the respective phases of the received at least two signals selected from the first plurality of output signals;

a selection unit, comprising

a first plurality of inputs receiving the first plurality of output signals generated by the first signal generation unit,

a second plurality of inputs receiving the second plurality of output signals generated by the second signal generation unit, and

a plurality of outputs providing the plurality of signals wherein each of the signals is selected from the first plurality of output signals generated by the first signal generation unit and the second plurality of output signals generated by the second signal generation unit,

wherein any two signals of the plurality of signals have a different phase; and

a calibration unit, wherein the calibration unit is programmed to compensate the minimum phase difference between any two signals of the plurality of signals, such that the minimum phase difference is at least substantially the same as a parameter value corresponding to the signals selected by the selection unit.

2. The apparatus of claim 1, wherein the first plurality of output signals is generated such that there is a phase difference between any two signals of the first plurality of output signals, and that the minimum phase difference between any two signals of the first plurality of output signals is based on a first parameter value.

3. The apparatus of claim 2, wherein the second plurality of output signals is generated such that there is a phase difference between any two signals of the second plurality of output signals, and that the minimum phase difference between any two signals of the second plurality of output signals is based on a second parameter value.

4. The apparatus of claim 3, wherein the first parameter value is greater than the second parameter value.

5. The apparatus of claim 4, wherein the first parameter value and the second parameter value are programmable.

6. The apparatus of claim 1, further comprising a buffering unit, wherein the buffering unit is adapted to control the slew rate of the plurality of signals, such that the rise/fall times of the plurality of signals are at least substantially the same as a predefined value.

7. The apparatus of claim 1, wherein the second signal generation unit comprises at least one phase interpolating circuit.

8. The apparatus of claim 1, wherein the second signal generation unit comprises a plurality of phase interpolating circuits, which are connected in series.

9. The apparatus of claim 1, wherein the number of output signals in the first plurality of output signals is the same as the number of output signals in the second plurality of output signals.

10. The apparatus of claim 1, wherein the first signal generation unit comprises a delay lock loop circuit.

11. The apparatus of claim 1, wherein the first signal generation unit comprises a phase lock loop circuit.

12. The apparatus of claim 1, wherein the selection unit comprises a multiplexer circuit.

13. A method of generating a plurality of signals, comprising:

generating a first plurality of output signals based on a reference signal, wherein any two signals of the plurality of output signals have a different phase;

selecting at least two signals from the first plurality of output signals;

generating a second plurality of output signals by interpolating the respective phases of the selected at least two signals from the first plurality of output signals;

selecting the plurality of signals from the first plurality of output signals and the second plurality of output signals, wherein any two signals of the plurality of signals have a different phase; and

compensating the minimum phase difference between any two signals of the plurality of signals, such that the minimum phase difference is substantially the same as a parameter value corresponding to the selected plurality of signals.

14. The method of claim 13, wherein the first plurality of output signals is generated such that there is a phase difference between any two signals of the first plurality of output signals, and that the minimum phase difference between any two signals of the first plurality of output signals is based on a first parameter value.

15. The method of claim 14, wherein the second plurality of output signals is generated such that there is a phase difference between any two signals of the second plurality of output signals, and that the minimum phase difference between any two signals of the second plurality of output signals is based on a second parameter value.

16. The method of claim 15, wherein the first parameter value is greater than the second parameter value.

17. The method of claim 16, wherein the first parameter value and the second parameter value are programmable.

18. The method of claim 13, further comprising controlling the slew rate of the plurality of signals, such that the rise/fall times of the plurality of signals are at least substantially the same as a predefined value.

19. The method of claim 13, further comprising providing the plurality of signals to an antenna beamforming unit.