CLAIMS

What is claimed is:

1. A method for fixing the initial phase of a free-running oscillator comprising:

injecting an initial current pulse into the resonant LC tank of the free-running oscillator before oscillation build up in the free-running oscillator, wherein the initial current pulse has a predetermined magnitude, wherein the initial phase of the free-running oscillator is determined by the predetermined magnitude of the initial current pulse; and

locking the free-running oscillator in response to a relationship between the predetermined magnitude of the initial current pulse and a phase of the free-running oscillator.

2. The method in accordance with Claim 1 wherein the step of locking the free-running oscillator comprises:

determining the relationship between the predetermined magnitude of the initial current pulse and the phase of the free-running oscillator; and

locking the free-running oscillator in response to the determination.

3. The method in accordance with any of Claims 1 and 2 wherein the initial current pulse has both a predetermined magnitude and a predetermined pulse width.

4. The method in accordance with any of Claims 1 to 3 wherein the free-running oscillator is a differential oscillator and wherein the resonant LC tank has a first side and a second side, and wherein the step of injecting the initial current pulse into the resonant LC tank comprises the step of injecting the initial current pulse into either the first side or the second side of the resonant LC tank.

5. A method for signal generation as target harmonics of a free running oscillator for injection locking, the method comprising:

injecting a gated reference current signal into a resonance LC tank of the free running oscillator for the free running oscillator to lock to;

varying a duty cycle of the gated reference current signal to reduce power of the gated reference signal and to maintain substantially equivalent strength of injected harmonics.

6. The method in accordance with Claim 5 wherein the step of varying the duty cycle of the gated reference current signal comprises varying the duty cycle of the gated reference current signal to produce equal-power harmonics for the free running LC oscillator to lock to.

7. The method in accordance with any of Claims 5 or 6 wherein the step of varying the duty cycle of the gated reference current signal comprises varying the duty cycle of the gated reference current signal to change coefficients of low level harmonics thereof.

8. The method in accordance with any of Claims 5 to 7 further comprising:

injecting an initial current pulse into the resonance LC tank of the free running oscillator before oscillation build up in the free-running LC oscillator, wherein the initial current pulse has a predetermined magnitude, wherein the initial phase of the free-running oscillator is determined by the predetermined magnitude of the initial current pulse; and

locking the free running oscillator in response to a relationship between the predetermined magnitude of the initial current pulse and a phase of the free running oscillator.

9. The method in accordance with Claim 8 wherein the initial current pulse has both a predetermined magnitude and a predetermined pulse width.

10. The method in accordance with any of Claims 5 to 9 wherein the free-running oscillator is a differential oscillator and wherein the resonance LC tank has a first side and a second side, and wherein the step of injecting the initial current pulse into the resonance LC tank comprises the step of injecting the initial current pulse into either the first side or the second side of the resonance LC tank.

11. A duty-cycled injection locked oscillator for frequency shift keyed (FSK) signal transmission comprising:

a resonance LC tank for generating an oscillation transmission signal; and

a first switching device coupled to the resonance LC tank for injecting an initial current pulse into the resonance LC tank before oscillation build up, wherein the initial current pulse has a predetermined magnitude, and wherein the initial current pulse fixes an initial phase of the free-running oscillator in response to the predetermined magnitude of the initial current pulse to enable fast settling of injection locking and high data rate operation of the duty-cycled injection locked oscillator.

12. The oscillator in accordance with Claim 11 wherein the initial current pulse has both a predetermined magnitude and a predetermined pulse width.

13. The oscillator in accordance with any of Claims 11 or 12 further comprising a second switching device coupled to the LC resonance tank for injecting a gated periodic reference signal, wherein a duty cycle of the gated periodic reference signal is modified to reduce power of the gated periodic reference signal by approximately seventy-five per cent.

14. The oscillator in accordance with Claim 13 wherein the second switching device is a differential pair of switching devices.

15. The oscillator in accordance with any of Claims 11 to 14 wherein the first switching device and/or the second switching device each comprise a PMOS devices.

16. The oscillator in accordance with any of Claims 11 to 14 wherein the first switching device and the second switching device each comprise a NMOS devices.

17. The oscillator in accordance with Claim 14 wherein each of the differential pair of switching devices are either PMOS devices or NMOS devices.

18. The oscillator in accordance with Claim 13 wherein the duty cycle of the gated periodic reference signal is also modified to provide equal power harmonics for the oscillator to lock to.

19. The oscillator in accordance with any of Claims 14 to 17 wherein the duty-cycled injection locked oscillator is a differential oscillator and wherein the resonance LC tank has a first side and a second side, and wherein the first switching device is coupled to the first side of the resonance LC tank for injecting the initial current pulse into the first side of the resonance LC tank.

20. The oscillator in accordance with any of Claims 14 to 17 wherein the duty-cycled injection locked oscillator is a differential oscillator and wherein the resonance LC tank has a first side and a second side, and wherein the first switching device is coupled to the second side of the resonance LC tank for injecting the initial current pulse into the second side of the resonance LC tank.

CLAIMS

What is claimed is:

1. A method for fixing the initial phase of a free-running oscillator comprising:

injecting an initial current pulse into the resonant LC tank of the free-running oscillator before oscillation build up in the free-running oscillator, wherein the initial current pulse has a predetermined magnitude, wherein the initial phase of the free-running oscillator is determined by the predetermined magnitude of the initial current pulse; and

locking the free-running oscillator in response to a relationship between the predetermined magnitude of the initial current pulse and a phase of the free-running oscillator.

2. The method in accordance with Claim 1 wherein the step of locking the free-running oscillator comprises:

determining the relationship between the predetermined magnitude of the initial current pulse and the phase of the free-running oscillator; and

locking the free-running oscillator in response to the determination.

3. The method in accordance with any of Claims 1 and 2 wherein the initial current pulse has both a predetermined magnitude and a predetermined pulse width.

4. The method in accordance with any of Claims 1 to 3 wherein the free-running oscillator is a differential oscillator and wherein the resonant LC tank has a first side and a second side, and wherein the step of injecting the initial current pulse into the resonant LC tank comprises the step of injecting the initial current pulse into either the first side or the second side of the resonant LC tank.

5. A duty-cycled injection locked oscillator for frequency shift keyed (FSK) signal transmission comprising:

a resonance LC tank for generating an oscillation transmission signal; and

a first switching device coupled to the resonance LC tank for injecting an initial current pulse into the resonance LC tank before oscillation build up, wherein the initial current pulse has a predetermined magnitude, and wherein the initial current pulse fixes an initial phase of the free-running oscillator in response to the predetermined magnitude of the initial current pulse to enable fast settling of injection locking and high data rate operation of the duty-cycled injection locked oscillator.

6. The oscillator in accordance with Claim 5 wherein the initial current pulse has both a predetermined magnitude and a predetermined pulse width.

7. The oscillator in accordance with any of Claims 5 or 6 further comprising a second switching device coupled to the LC resonance tank for injecting a gated periodic reference signal, wherein a duty cycle of the gated periodic reference signal is modified to

reduce power of the gated periodic reference signal by approximately seventy-five per cent.

8. The oscillator in accordance with Claim 7 wherein the second switching device is a differential pair of switching devices.

9. The oscillator in accordance with any of Claims 5 to 8 wherein the first switching device and/or the second switching device each comprise a PMOS devices.

10. The oscillator in accordance with any of Claims 5 to 8 wherein the first switching device and the second switching device each comprise a NMOS devices.

11. The oscillator in accordance with Claim 8 wherein each of the differential pair of switching devices are either PMOS devices or NMOS devices.

12. The oscillator in accordance with Claim 7 wherein the duty cycle of the gated periodic reference signal is also modified to provide equal power harmonics for the oscillator to lock to.

13. The oscillator in accordance with any of Claims 8 to 11 wherein the duty-cycled injection locked oscillator is a differential oscillator and wherein the resonance LC tank has a first side and a second side, and wherein the first switching device is coupled to

the first side of the resonance LC tank for injecting the initial current pulse into the first side of the resonance LC tank.

14. The oscillator in accordance with any of Claims 8 to 11 wherein the duty-cycled injection locked oscillator is a differential oscillator and wherein the resonance LC tank has a first side and a second side, and wherein the first switching device is coupled to the second side of the resonance LC tank for injecting the initial current pulse into the second side of the resonance LC tank.