Claims

1. A Near Field Communication (NFC) receiver comprising:

an analog-to-digital converter (ADC) for digitising a received NFC signal at a sampling rate higher than a carrier frequency of the received NFC signal;

a carrier frequency offset (CFO) module which is configured to estimate a CFO between the NFC receiver and a NFC transmitter propagating the received NFC signal if the NFC receiver is operative as tag reader;

a digital downconverter which is configured to downconvert, with CFO correction based on the estimated CFO, the digitised signal to a baseband complex signal centered at zero frequency, if the NFC receiver is operative as NFC tag;

one of an envelope detector and a phase detector for respectively ascertaining one of an amplitude and a phase of the downconverted signal and generating a pre-demodulation signal; and

a demodulator for generating a decoded bit stream from the pre-demodulation signal.

2. The NFC receiver of claim 1, wherein the demodulator includes a first module which is operative if the NFC receiver is operative as NFC tag, wherein the first module includes:

a hard decision module configured to convert the pre-demodulation signal into binary bit stream based on a predetermined threshold;

an XOR sum module configured to perform an XOR operation on each locally-stored sample of the binary bit stream with a locally-stored reference followed by a summation operation on a plurality of results generated from the XOR operation; and

a synchronisation and bit decision module configured to perform frame synchronization and bit decision based the XOR sum module output.

3. The NFC receiver of claim 1, wherein the digital downconverter is further configured to downconvert, with zero frequency offset, the digitised signal to a baseband complex signal centered at zero frequency, if the NFC receiver is operative as NFC reader.

4. The NFC receiver of claim 3, wherein the demodulator includes a second module which is operative if the NFC receiver is operative as NFC receiver,

a correlator configured to perform multiplication operation on the pre-demodulation signal with a plurality of correlator coefficients; and

a synchronisation and bit decision module configured to perform frame synchronization and bit decision based the correlator output.

5. The NFC receiver of claim 4, wherein the plurality of correlator coefficients are predetermined based on data rate and the sampling rate.

6. The NFC receiver of claim 1, wherein the digital downconverter is further configured to ascertain whether the NFC receiver is operative as NFC tag or NFC reader.

7. The NFC receiver of claim 1, wherein the sampling rate is four times the carrier frequency of the received NFC signal.

8. The NFC receiver of claim 1, further comprising a DC cancellation module for removing DC offset component from the pre-demodulation signal prior to use in the demodulator.

9. A method of sampling at a Near Field Communication (NFC) receiver, the method comprising:

detecting a radio frequency (RF) field at a NFC-supported device, including receiving a NFC signal;

digitising the received NFC signal;

if the NFC receiver is operating as NFC tag, estimating a carrier frequency offset (CFO) between the digitised signal and a clock frequency of the NFC-supported device, and performing downconversion of the digitised signal with CFO correction based on the estimated CFO; and

if the NFC receiver is operative as NFC reader, performing downconversion based on zero frequency offset.

10. The method of claim 9, wherein if the NFC receiver is ascertained operating as NFC tag, the method further comprising:

low-pass filtering the downconverted signal;

downsampling the low-pass filtered signal;

estimating one of magnitude and phase of the downsampled signal to generate a pre-demodulation signal; and

demodulating the pre-demodulation signal, including converting the pre-demodulation signal to a binary data stream, performing XOR-summation operation on the binary data stream to generate an XOR-sum output, and generating a decoded bit stream from the XOR-sum output.

11. The method of claim 10, wherein if the NFC receiver is ascertained operating as NFC reader, the method further comprising:

low-pass filtering the downconverted signal;

downsampling the low-pass filtered signal;

estimating one of magnitude and phase of the downsampled signal to generate a pre-demodulation signal; and

demodulating the pre-demodulation signal, including correlating the pre-demodulation signal, and generating a decoded bit stream from the correlated output.

12. The method of claim 10, wherein estimating one of magnitude and phase of the downsampled signal to generate a pre-demodulation signal further includes cancelling DC offset component to generate the pre-demodulation signal.

13. A non-transitory computer readable medium comprising computer program code for direct radio frequency (RF) sampling at a Near Field Communication (NFC) receiver, wherein the computer program code, when executed, is configured to cause a processor in a Near Field Communication (NFC)-supported device perform a method, comprising:

detecting a radio frequency (RF) field at a NFC-supported device, including receiving a NFC signal;

digitising the received NFC signal; if the NFC receiver is operating as NFC tag, estimating a carrier frequency offset (CFO) between the digitised signal and a clock

frequency of the NFC-supported device, and performing downconversion of the digitised signal with CFO correction based on the estimated CFO; and

if the NFC receiver is operative as NFC reader, performing downconversion based on zero frequency offset.

14. The non-transitory computer readable medium of claim 13, wherein if the NFC receiver is ascertained operating as NFC tag, the method further comprising:

low-pass filtering the downconverted signal;

downsampling the low-pass filtered signal; estimating one of magnitude and phase of the downsampled signal to generate a pre-demodulation signal; and

demodulating the pre-demodulation signal, including converting the pre-demodulation signal to a binary data stream, performing XOR-summation operation on the binary data stream to generate an XOR-sum output, and generating a decoded bit stream from the XOR-sum output.

15. The non-transitory computer readable medium of claim 14, wherein if the NFC receiver is ascertained operating as NFC reader, the method further comprising:

low-pass filtering the downconverted signal;

downsampling the low-pass filtered signal;

estimating one of magnitude and phase of the downsampled signal to generate a pre-demodulation signal; and

demodulating the pre-demodulation signal, including correlating the pre-demodulation signal, and generating a decoded bit stream from the correlated output.

16. The non-transitory computer readable medium of claim 14, wherein estimating one of magnitude and phase of the downsampled signal to generate a pre-demodulation signal further includes cancelling DC offset component to generate the pre-demodulation signal.