

## **Exhibit I: Operational Description**

**FCC ID: HN2MPCI3A-20**

## **DESCRIPTION OF THE Orinoco 2.4 GHz BLOCKDIAGRAM**

The various parts of the Blockdiagram are numbered and an explanation is given of these blocks.

First the transmitter will be described:

A) Digital Signal Processor. (22)

Function : Generate spreaded signal with an Barker sequence of 11, the original raw data rate of two Megabits is transformed to a symbol rate of one MegaBaud and multiplied with eleven and modulated with a DQPSK ( Differential Quadrature Phase Shift Keying ) Modulation. The unfiltered data comes out of I and Q and goes to the up/down mixer (6)

B) The above signals are mixed in (6) in a so called quadrature modulator with the Intermediate Frequency ( IF) of 352 MHz.

C) The upmixer is fed by the VCO of 704 MHz, which is divided by 2 to 352 MHz.

D) The SAW ( 8 ) filters all unwanted mixing products, such that only the 352 MHz band remains.

E) This signal goes into the RF upmixer ( 9) SA2420 where it is mixed with the RF VCO with a range of 2050 to 2150 MHz.

F) The Rx/Tx switch (17) brings the signal to the variable attenuator (10), where the output level is controlled.

G) The signal is fed through a 2.4- 2.5 GHz bandpass filter (11) to remove all unwanted mixer products, and thus to get a clean signal for further processing.

H) The signal is amplified in (12), with approx 23 dB to an output level of approx. 15 dBm

I) This signal goes to the special connector.

J) The output power is controlled with a so called power feed back loop (15) in which the output power is compared with a DAC value from (10)

Receiver functions.

K) The receive signal enters the antenna passes the RX/TX switch (14) and (13) this is set to RX mode.

L) The signal goes through the 2.4 GHz filter (16) to remove all unwanted spectral components in order to deliver a clean signal for the receiver.

M) A Low Noise Amplifiers (LNA) (in 9) is used to amplify the weak signal to a level fitted for down mixing.

N) The AGC (27) can amplify or attenuate the signal according to the Digital signal processor required input with a step size of 26 dB.

O) Again the Rx/Tx switch in the Rx mode is passed and also the same filter as in transmit mode ( 18).

P) The down mixer (9) mixes the 2.4 GHz with the 2.1 GHz to the 352 MHz IF.

Q) The signal of 352 MHz is amplified again (9) and filtered by a SAW filter (19) to give a clean signal for the second mixer.

R) The Downmixer (6) mixes the 352 MHz signal down to the I and Q signals, also the auto gain control can increase the level to the required level via line 20.

S) The very low amplitude baseband I and Q signal is amplified in the AMPs (6) to a level fitted for the Analog to Digital converters (22), which make it a proper signal for the digital signal processor.

- T) The digital signal processor (22) removes the spreading as present on the signal with a so called autocorrelation function. The resulting output of the processor is a received data rate of 2 Megabits.

VCO , PLL and OSC.

- U) These three form one entity to generate a single tone signal for down mixing.  
There are two of these blocks available, one for the IF LO (7 and 6 ) (352MHz ) and one for the RF LO (25 and 26) of 2050 to 2150 MHz.
- V) All the PLL's and the processor (2) have one reference Crystal of 22 MHz (4) with an accuracy of 25 ppm.

General circuits:

- W) Antenna Diversity.  
Depending on the signal strength and signal quality the Digital processor (22) can select between two antenna's which gives the best signal. This is done initial during the training sequence in the received signal.
- X) Automatic Gain control.  
Depending on the signal strength and signal quality the Digital processor (22) can choose to increase or decrease the signal level at the digital input, this is done by reducing or increasing the gain in the receiver via the LNA-AGC (in 9).
- Y) The Signal processor (22) can read via the MAC (2) the registers for programming all
- Z) The MAC is used to do the handshaking with the miniPCI bridge chip bus (1 ) and handling the IEEE protocol. Also used to load the PLL frequencies and dividers, also used to interface to the Eeprom which contains all parameters for the PLL's and the Callcode

## **Blockdiagram description of the Lucent 2.4 GHz Orinoco, miniPCI card**

Guus Jansen

**Aug 16, 2000**