# Bald Eagle RF

Dual C/S/L/P/EP/IF Band Multi-Mode Receivers with Diversity Combiner and Optional PCM Modulating Multi-Mode RF Signal Generator/Transmitter

Two Independent C-Band, S-Band, Upper-L Band, Lower-L Band, P-Band Extended, P-Band, 70 MHz Multi-Mode Receivers with Diversity Combining and Optional RF Modulated Signal Generator with the same RF Band Capabilities in both PCIe or cPCI/PXI Half Length, 3U Form Factor

ULYSSIX TECHNOLOGIES, INC.

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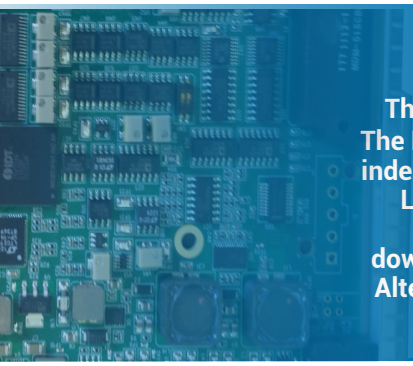
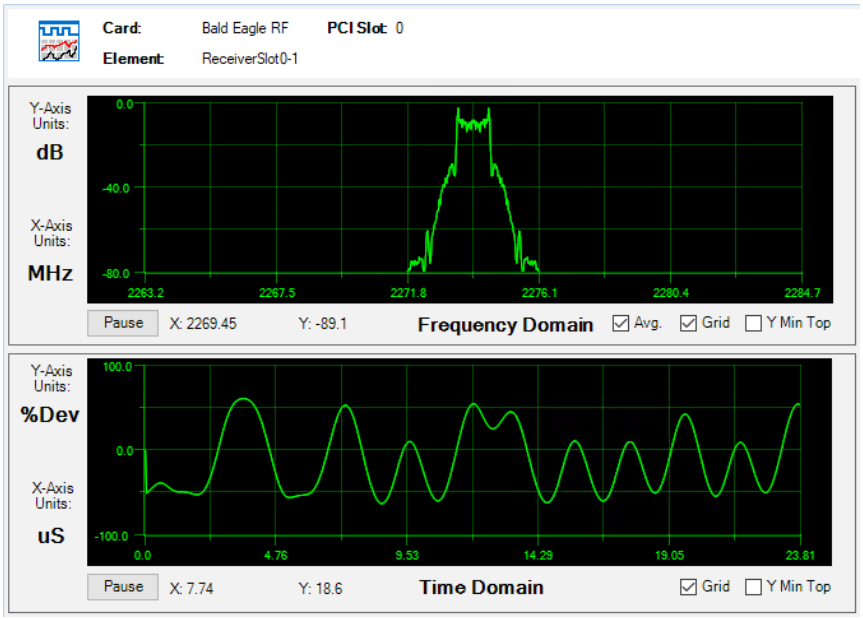


# Bald Eagle RF

**The Bald Eagle RF is a daughter card that mounts to the Tarsus3-PCIe or -cPCI/PXI mothercard. The Bald Eagle RF is comprised of two independent multi-mode complex downconverters and one independent multi-mode upconverters that cover the RF bands of C-Band, S-Band, Upper-L Band, Lower-L Band, P-Band, P-Band extended, and 70 MHz IF. Each receiver input and RF generator output have a very broad dynamic range. The Bald Eagle RF high speed digitizes the complex downconverted output and sends the digital data to the Bald Eagle PCM-cPCI mothercard INTEL/ Altera Arria V GZ FPGA. Demodulation, diversity combining, and PCM processing (bit sync/frame sync/decommutation) are performed and available for real-time and post mission analysis.**

## Display Features

Real-time Input RF FFT Spectrum and Output Video FFT Spectrum and Digital Scope Display




## Main System Features

Dual Channel C/S/L/PE/P/IF bands (fully independent) FM/SOQPSK/BPSK/QPSK/GMSK

Complete RF to bits solution with Tarsus3 Mothercard connection to the Bald Eagle RF daughter card in standard configuration

No filter tuning or preventive maintenance required

Optional Dual Channel Modulated RF Signal Generator C/S/L/P/PE/IF bands (fully independent). Modulation Inputs are internal PCM simulator output, Chapter 10 or .tad file inputs, and external TTL Input external PCM stream

User-friendly and intuitive Ulyssix developed and in-house supported ALTAIR software program included

## RF Capabilities

Dual channel frequency range of C-Band (4400-5250MHz), S-Band (2185-2485 MHz), Upper-L Band (1700-1850 MHz), Lower-L Band (1420-1590 MHz), P-Band Extended (1150-1250 MHz), P-Band (200-500 MHz), 70 MHz IF

Single Channel PCM modulated RF Signal Generators for simulation or BER testing at same frequencies, as stated above

RF detection performed with direct complex downconversion to DC and digitizing using single integrated IC

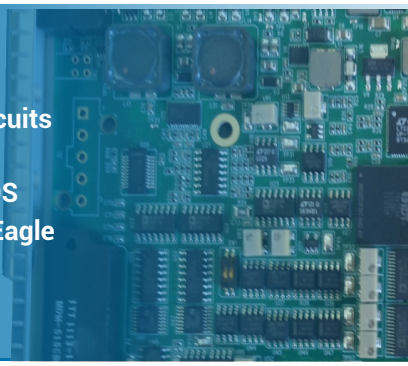
DSP implemented IF data bandwidth filtering from 1 kHz to 40 MHz continuous

50 kHz input frequency tuning resolution

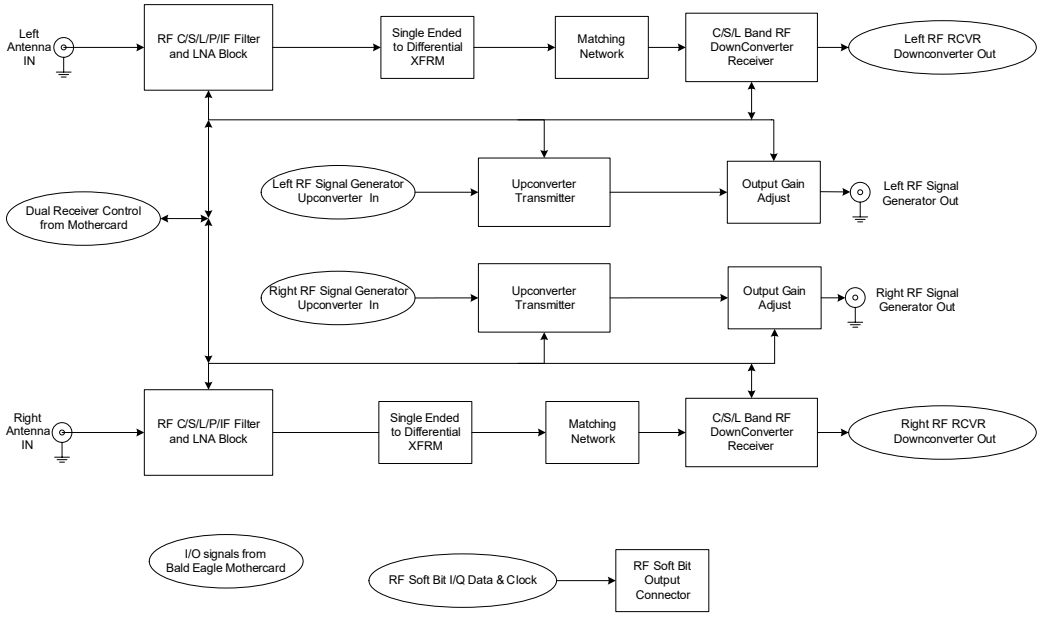
AM and DC level AGC test points available for antenna and/ or receiver tracking

# Bald Eagle RF

**The Bald Eagle RF daughter board uses state-of-the-art RF to DSP implemented integrated circuits for RF signal processing and digitizing. The complex digital high speed output from the RF to DC downcoverter is transferred to the Tarsus3 motherboard through a high speed shielded LVDS differential connector. The optional RF modulated PCM data is also transferred up to the Bald Eagle RF daughter card through the same connector for assurance of data fidelity.**



## Bald Eagle RF Block Diagram




## Diversity Combining and Demodulation

Pre-D Best Source or Optimal Ratio Diversity Combiner modes or bypass for independent dual receiver capability

Demodulator modes include FM/SOQPSK/BPSK/QPSK/GMSK with Multi-Symbol Detection

Fully programmable digital FIR output filter for deviation ratio capability or can be bypassed for higher data rates

User selectable output filter characteristics for analog or digital output data

FPGA-based architecture allows for rapid enhancements and customization

Direct connection to Tarsus3 PCIe or cPCI/PXI for full PCM processing and output of data for storage or digital display

Soft bit decision I/Q outputs for external processing of RF input data streams

Digitally time synchronized and sampled output data available for FFT analysis and direct capture

# Bald Eagle RF
# Specifications*

## Receiver Specifications

| | |
|---|---|
| Input RF Frequency Range | C-Band 4400 – 5250 MHz<br>S-Band 2185 – 2485 MHz<br>U/L L-Band 1420 - 1850 MHz<br>P-Band Extended 500 - 1250 MHz<br>P-Band 200-500 MHz<br>IF 70 MHz |
| RF Inputs | 2 |
| Frequency Tuning Resolution | 50 kHz |
| Dynamic Range | -10 dBm to -104 dBm |
| VSWR Ratio | 2:1 typical, 2.5:1 maximum |
| Noise Figure | 5 dB typical, 8 dB max |
| Maximum Safe RF Input Level | +20 dBm without damage |
| Input Impedance | 50 ohms into SMA connectors |
| Spurious signal rejection | > 60 dBc |

## Signal Processing Specifications

| | |
|---|---|
| IF Bandwidth | 20 kHz to 56 MHz |
| Demodulation Modes | FM/SOQPSK/BPSK/QPSK/GMSK |
| Diversity Combiner | Optimal Ratio and Best Source |
| Combiner Mode | Pre-D |
| AFC Tracking | Maximum AFC acquisition range is +/- 50 MHz for C and S Band; +/- 25 MHz for L-Band; +/- 12.5 MHz for EP Band; +/- 6.25 MHz for P-Band/ IF 70 MHz |
| AFC Frequency Resolution | 1 kHz for all bands |
| AFC Acquisition | ≤ 100 msec for all bands |
| AGC Time Constants | 1.0 msec, 0.1msec, 0.01msec, selectable |
| AGC Modes | Automatic, Manual, Freeze |
| AM AGC Out | AC coupled AM AGC detector output, 50 kHz frequency response, 5 Vpp bipolar or unipolar out |
| AGC DC Level Detector | DC coupled from 0 to + 3.5 VDC for min to max RF AGC attenuation |

## Physical Specifications

| | |
|---|---|
| cPCI/PXI Form Factor<br>PCIe Form Factor | 100 mm x 160 mm (3U)<br>100 mm x 160 mm (3U) |
| Interface Connectors | RF inputs, RF Signal Generator Outputs: SMA, Video Outputs and AGC Testpoints are BNC outputs from the Tarsus3 MDM-51 DAC outputs connectors |
| Manufacturing | The design utilizes Surface Mount Technology (SMT), manufactured with robotic assembly techniques to IPC-610B Class 2 manufacturing standards |
| Temperature Range | Operating: 0°C to 50°C<br>Storage: -20°C to 60°C |
| Power Consumption: | Approximately 30 Watts total, for all supplies |
| Chassis Slots per Card | Three (3) slots |
| Mechanical Dimensions | 100 mm height, 160 mm length, 28 mm width (not including mounting or edge connectors) (3U) |

## Ordering Options

| | |
|---|---|
| Bald Eagle RF-PCIe<br>Bald Eagle RF-cPCI | C-Band, S-Band, Upper L-Band, Lower L-Band, P-Band extended, P-Band supporting data rates to 40 Mbps full RF to bits including dual receivers, dual bit sync with Multi-Symbol Detector/frame sync/decom, PCM simulator, IRIG Time Code Reader in half length PCIe form factor or 3U cPCI/ PXI |
| ULX-OPT-Bald Eagle-TX | Optional Single RF Signal generators with RF C/S/L/P/EP/IF Frequency Bands and BERT Eb/N0 error analysis capability |

## RF Generator Specifications (Optional)

| | |
|---|---|
| Output RF Frequency Range | C-Band 4400 – 5250 MHz<br>S-Band 2185 – 2485 MHz<br>Upper L-Band 1700 – 1850 MHz<br>Lower L-Band 1420 – 1590 MHz<br>P-Band Extended 500 –1250 MHz<br>P-Band 200– 500 MHz<br>IF 70 MHz |
| Transmit Outputs: | 1 |
| IF Bandwidth | 1 kHz to 40 MHz |
| Modulation Modes | FM/SOQPSK/BPSK/QPSK/GMSK |
| Modulation Source | Tarsus3 PCM simulator running stored PN-11/15 patterns, user defined PCM frame, archived user data, or external TTL Input PCM stream |
| Output Dynamic Range | -20 dB to -90 dB |
| Output Impedance | 50 ohms using SMA connector |

***Specifications are subject to change without notice.***
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