

# Bald Eagle RF

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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 Half Length or 3U cPCI/PXI Form Factor



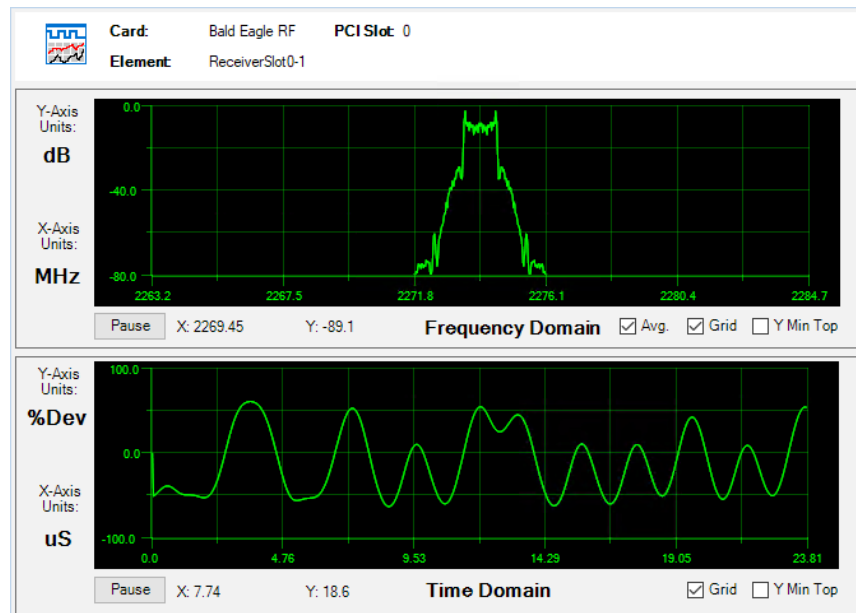
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# Bald Eagle RF

The Bald Eagle RF is a daughter card that mounts to the Tarsus3-PCIe or -cPCI/PXI motherboard. 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 motherboard 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 with future free firmware upgrades for PM/  
BPSK/QPSK/AUQPSK demodulation modes

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  
and optional DEWESoft full acquisition and analysis  
software

## 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

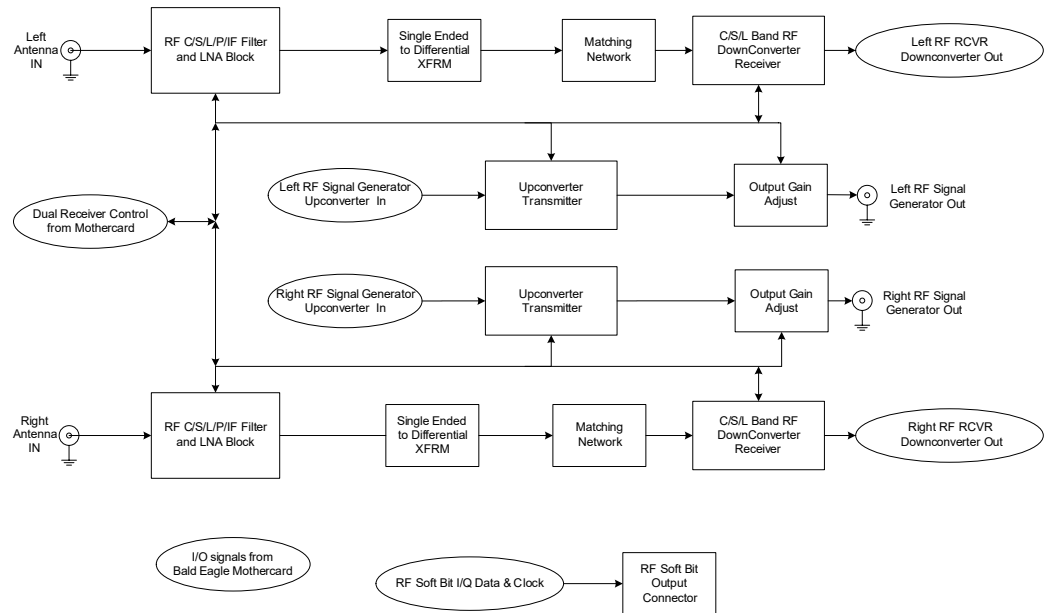
50 kHz input frequency tuning resolution

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

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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 Downconverter 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 Combiner modes or bypass for independent dual receiver capability

Demodulator modes include FM/SOQPSK with Multi-Symbol Detection with future free firmware upgrades for PM/BPSK/QPSK/AUQPSK when available

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 S-Band 2185 – 2485 MHz U/L L-Band 1420 – 1850 MHz P-Band Extended 500 – 1250 MHz P-Band 200-500 MHz 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	1 kHz to 40 MHz
Demodulation Modes	FM/SQPSK with future free firmware upgrades for BPSK/QPSK/AUQPSK
Diversity Combiner	Polarization, Frequency, and Spatial
Combiner Mode:	Pre-D
AFC Tracking	Optional future: +/- 500 kHz of programmed center frequency with 10 kHz frequency resolution
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

### RF Generator Specifications (Optional)

Output RF Frequency Range	C-Band 4400 – 5250 MHz S-Band 2185 – 2485 MHz Upper L-Band 1700 – 1850 MHz Lower L-Band 1420 – 1590 MHz P-Band Extended 500 – 1250 MHz P-Band 200– 500 MHz IF 70 MHz
Transmit Outputs:	1
IF Bandwidth	1 kHz to 40 MHz
Modulation Modes	FM/SQPSK with future free firmware upgrades for BPSK/QPSK/AUQPSK
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	30 dB
Output Impedance	50 ohms using SMA connector

### Physical Specifications

cPCI/PXI Form Factor PCIe Form Factor	100mm x 160 mm 100mm x 160 mm
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 Storage: -20°C to 60°C
Power Consumption:	Approximately 30 Watts total, for all supplies

### Ordering Options

Bald Eagle RF-PCIe 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/NO error analysis capability

**\*Specifications are subject to change without notice.**  
**Revised: June 22, 2021**

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