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TwinRX Daughterboard

Product Overview

The TwinRX daughterboard for the USRP™ X Series software defined radios is a dual channel superheterodyne receiver that offers wide dynamic range and accurate phase synchronization for spectrum monitoring and direction finding applications. The RF signal chain features preampilifiers, preselectors, attenuators, and two mixer stages for excellent selectivity and spurious performance. The receiver is tunable from 10 MHz – 6 GHz and has 80 MHz of instantaneous bandwidth per channel, providing the versatility necessary to analyze a variety of signals in multiple bands of interest. Users can tune the two channels independently to simultaneously monitor uplink and downlink communication with a combined bandwidth of 160 MHz. The ability to share the LO between channels across multiple daughterboards enables the phase-aligned operation required to implement scalable multichannel phased arrays. The receiver is capable of fast frequency hopping to detect frequency agile emitters. The USRP Hardware Driver™ (UHD) software API automatically configures RF attenuation and preamplication to optimize dynamic range in favor of noise figure for faint signals, or IP3 for stronger signals. With the RF Network on Chip (RFNoC™) FPGA development framework, users can seamlessly off load compute intensive components of their application from host to FPGA for hardware acceleration and real-time performance.

Applications

Spectrum Monitoring

The two-stage superheterodyne architecture provides wide dynamic range and excellent spurious performance to accurately distinguish a broad range of spectral signals.

Direction Finding

By sharing the LO between multiple channels of multiple daughterboards, and the 10 MHz and PPS reference between multiple X Series motherboards, users achieve optimal phase synchronization for direction finding applications.

Features

Frequency Range: 10 MHz to 6 GHz
Bandwidth: 80 MHz per channel
Channels
- Two-Stage Superheterodyne
- 2 RX
- Independent tuning

Preselector Filters
Dynamic Range at 2.4 GHz: 110 dB
Min Noise Figure at 2.4 GHz: 5.5 dB
IP3 at 2.4 GHz: 2 dBm at 10 dB Noise Figure
LO Sharing Capability
Coherent and phase-aligned operation
Power Dissipation: 10 W
RF Shielding
USRP Compatibility: X300/X310

Image of two TwinRX daughterboards inside a USRP X Series motherboard connected with LO sharing cables

Specifications[4]

Frequency	Noise Figure[2] (dB)
10 MHz – 3 GHz	< 5
3 GHz – 5 GHz	< 4
5 GHz – 6 GHz	< 8

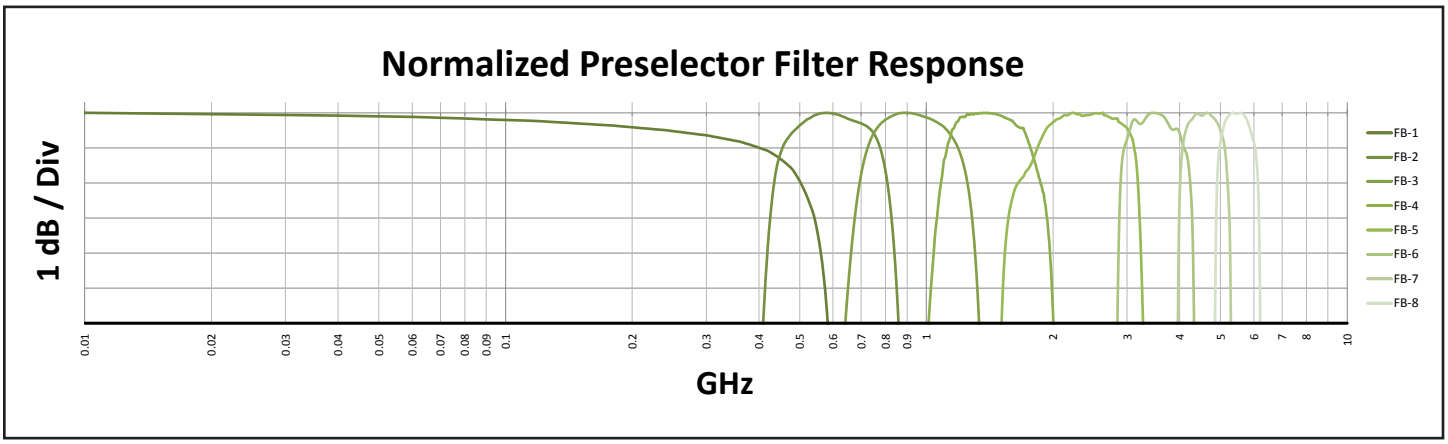
Frequency	Image Rejection[2] (dBc)
500 MHz – 6 GHz	-70

Phase Noise (dBc/Hz)			
Frequency Offset	0.9 GHz	2.4 GHz	5.8 GHz
10 kHz	-88	-86	-82
100 kHz	-105	-107	-103
1 MHz	-124	-127	-127

Third Order Intercept (dBm)			
Frequency	Full Scale = - 45 dBm	Full Scale = - 30 dBm	Full Scale = - 20 dBm
10 MHz - 1.8 GHz	-8	-2	16
1.8 GHz - 3 GHz	-10	-1	14
3 GHz - 6 GHz	-13	-1	12

Frequency	Non-Input Related (Residual) Spurs[1, 2] (dBm)
10 MHz – 3 GHz	< -95
3.2 GHz	-92
4.8 GHz	-98
5.4 GHz	-98

Preselector Filter Performance[3]



[1] Non-input-related spurs (residual spurs) are the responses observed when no input signal is present. The non-input-related spur values are based on RF input being terminated, 0 dB RF attenuation, and maximum gain settings.

[2] Values are based on 0 dB RF attentuation and maximum gain settings.

[3] Filters are dynamically selected based on user frequency selection to reduce interference from out-of-band signals. The graph displays normalized values based on component characteristics.

[4] All specifications are subject to change without notice. Values provided are nominal and describe additional information about the product that may be useful, including expected performance that is not covered under warranty.

About Ettus Research

Ettus Research™, a National Instruments company, is the world's leading supplier of software defined radio platforms, including the USRP™ (Universal Software Radio Peripheral) family of products. The USRP platform supports multiple development environments on an expansive portfolio of high performance RF hardware, and enables algorithm design, exploration, prototyping, and deployment of next generation wireless technologies across a wide variety of applications spanning DC to 6 GHz such as cognitive radio, spectrum monitoring and analysis, remote sensing, advanced wireless prototyping, mobile radio, public safety, broadcast TV, satellite communication, and navigation.

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