Ettus Research™
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USRP™ N321

Simplyfing SDR Deployment

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Product Overview

The USRP N321 is a networked software defined radio that provides reliability and fault-tolerance for deployment in large scale and distributed wireless systems. This is a high per formance SDR that uses a unique RF design by Ettus Research to provide 2 RX and 2 TX channels in a half-wide RU form factor. Each channel provides up to 200 MHz of instantaneous bandwidth, and covers an extended frequency range from 3 MHz to 6 GHz. The baseband processor uses the Xilinx Zynq-7100 SoC to deliver a large user programmable FPGA for real-time, low latency processing and a dual-core ARM CPU for stand-alone operation. Support for 1 GbE, 10 GbE, and Aurora interfaces over two SPF+ ports and a QSFP+ port enables high throughput IQ streaming to a host PC or FPGA coprocessor. A flexible synchronization architecture with support for 10 MHz clock reference, PPS time reference, external TX and RX LO input, and GPSDO enables implementation of phase coherent MIMO testbeds. The USRP N320 leverages recent software developments in UHD to simplify control and management of multiple devices over the network with the unique capability to remotely administrate tasks such as debugging, updating software, rebooting, resetting to factory state, and monitoring system health.

In addition to the above functionality, the N321 also features the abilty to export it's TX and RX LOs in a Star configuration to multiple other N320 or N321 radios.

Applications

Phase Coherent Wireless Testbeds

The ability to import and export both TX and RX LOs for any supported frequency provides a path to building large, phase coherent MIMO testbeds for a variety of advanced wireless research topics.

Features

RF Capabilities
- 2 TX, 2 RX
- Sub-octave filter banks
- 3 MHz to 6 GHz
- Up to 200 MHz Bandwitdh per channel

Baseband Processing
- Xilinx Zynq 7100
  - Dual-core ARM A9 866 MHz w/ 1 GB DDR3 RAM

Software
- UHD version 3.14.0.0 or later
- RFNoC
- GNU Radio
- C/C++
- Python

Synchronization
- 10 MHz clk ref & PPS time ref
- Trig/PPS out
- GPSDO included
- White Rabbit Support
- Ext. TX, RX LO input

Peripherals
- 2 SFP+ (1/10 GbE, Aurora)
- 1 QSFP+ (10 GbE, Aurora)
- RJ45 (1 GbE)
- **No GPIO**
- 1 Type A USB Host
- 1 microUSB (serial console, JTAG)

Power
- 12 V, 7 A DC

Form Factor
- half-wide RU (357.1 x 211.1 x 43.7 mm)
- 3.13 kg

Specifications[1]

Specification	Typical	Unit
Receiver		
Number of Channels	2	–
Gain Range[2]	-16 – 34	dB
Gain Step	1	dB
Max Input Power	-15	dBm
Filter Banks	450 - 760 760 - 110 1100 – 1410 1410 – 2050 2050– 3000 3000 – 4500 4500 – 6000	MHz MHz MHz MHz MHz MHz MHz
External LO Frequency Range	450 - 6000	MHz
Tuning Time	245	us
TX/RX Switching Time	750	ns
Transmitter		
Number of Channels	2	–
Gain Range[2]	-30 – 25	dB
Gain Step	1	dB
Filter Banks	450 – 650 650 – 1000 1000 – 1350 1350 – 1900 1900 – 3000 3000 – 4100 4100 – 6000	MHz MHz MHz MHz MHz MHz MHz
External LO Frequency Range	450 - 6000	MHz
Tuning Time	245	us
TX/RX Switching Time	750	ns

Specification	Typical	Unit
Conversion and Clock Performance		
Master Clock Rates	200, 245.76, 250	MS/s
ADC Resolution	14	bits
DAC Resolution	16	bits
GPSDO Frequency Stability Unlocked[3]	0.1	ppm
GPSDO PPS Accuracy to UTC[3]	< 8	ns
GPSDO Holdover Stability[3]	< +/- 50 3 25	us hours °C
Power		
DC Input	12, 7	V, A
Power Consumption	60 - 75	W
Physical		
Dimensions	357 x 211 x 43.7	mm
Weight	3.13	kg
Environmental		
Operating Temperature Range	0 – 50	°C
Storage Temperature Range	-40 – 70	°C
Operating Shock (Tested in accordance with IEC 60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)	30 half-sine 11	g peak ms pulse
Operating Random Vibration (Tested in accordance with IEC 60068-2-64.)	5 – 500 0.3	Hz g rms
Non-Operating Random Vibration (Tested in accordance with IEC 60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)	5 – 500 2.4	Hz g rms

[1] All specifications are subject to change without notice. This equipment information is only for product description and is not covered by warranty. Characteristic specifications are unwarranted values that are representative of an average unit operating at room temperature.

[2] RX and TX path gain does not correlate to UHD gain settings. The recevied signal ampltidue and output power resulting from the gain setting varies over the frequency band and among devices.

[3] Clock specifications are based on information from the oscillator vendor and are not measured. Visit the USRP N321 hardware resources page

Specifications[1]

RX Noise Figure[4]		
Frequency (MHz)	**TX/RX port (dB)**	**RX2 port (dB)**
< 800	11.0	10.0
800 – 1800	6.5	5.5
1800 – 2800	7.0	6.0
2800 – 3800	7.5	6.5
3800 – 5000	8.5	7.5
5000 – 6000	11.0	10.0

Frequency (MHz)	Input Third-Order Intercept (IIP3) (dBm)
450 – 1000	> 13
1000 – 4500	> 17
4.5 – 6	> 16

Frequency (MHz)	Maximum Output Power[5] (dBm)
3 – 450	10
450 – 1000	20
1000 – 4250	18
4250 – 6000	15
Frequency (MHz)	**Output Third-Order Intercept (OIP3) (dBm)**
3 – 450	> 15
450 – 1600	> 28
1600 – 5800	> 25
5800 – 6000	> 23

TX RX Phase Noise (dBc/Hz)				
Frequency Offset	**1.0 GHz**	**2.0 GHz**	**3.0 GHz**	**5.5 GHz**
10 kHz	-117	-110	-108	-103
100 kHz	-117	-110	-108	-104
1 MHz	-145	-137	-135	-130

[4] Noise figure is measured at maximum gate state on the receive signal path.
[5] Maximum output power is achieved when all transmit amplifiers are enabled.

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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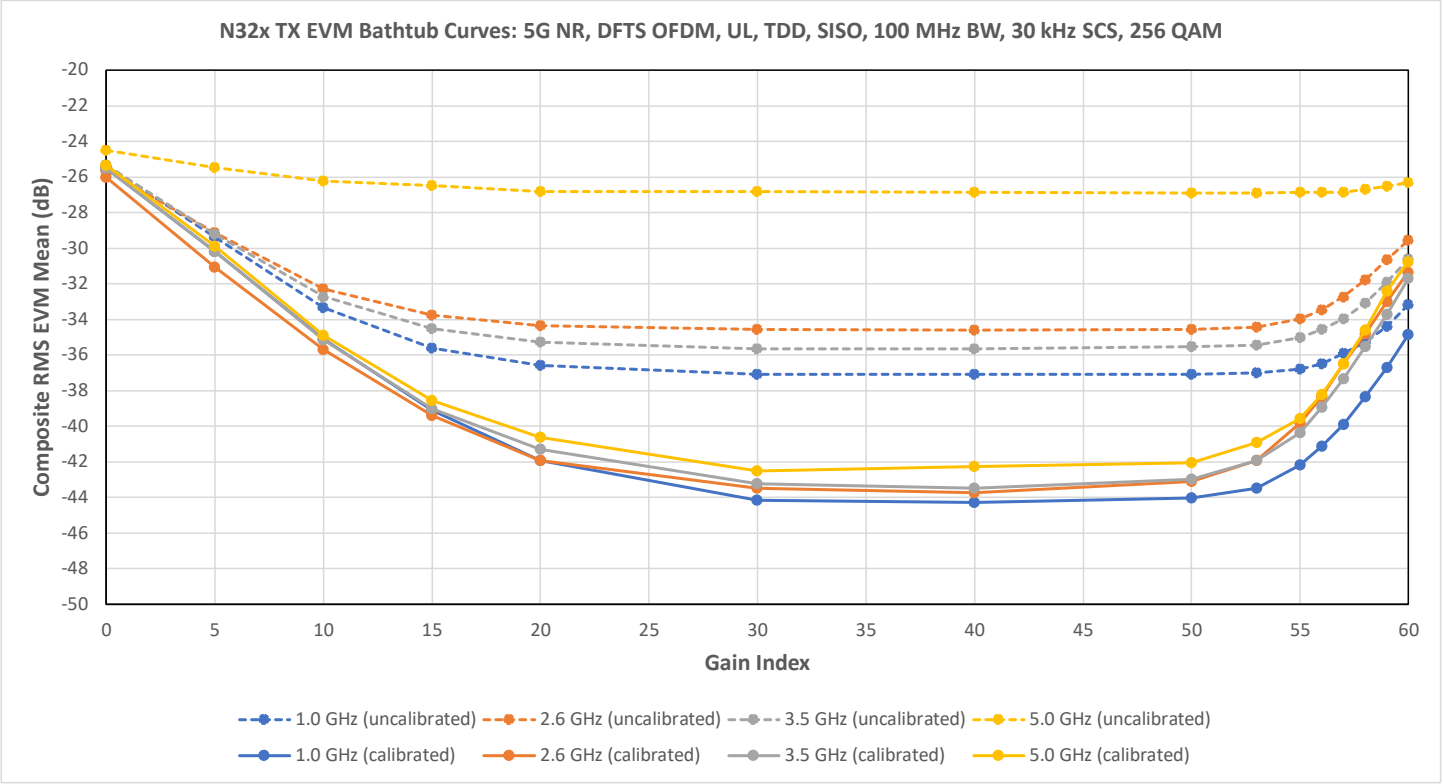
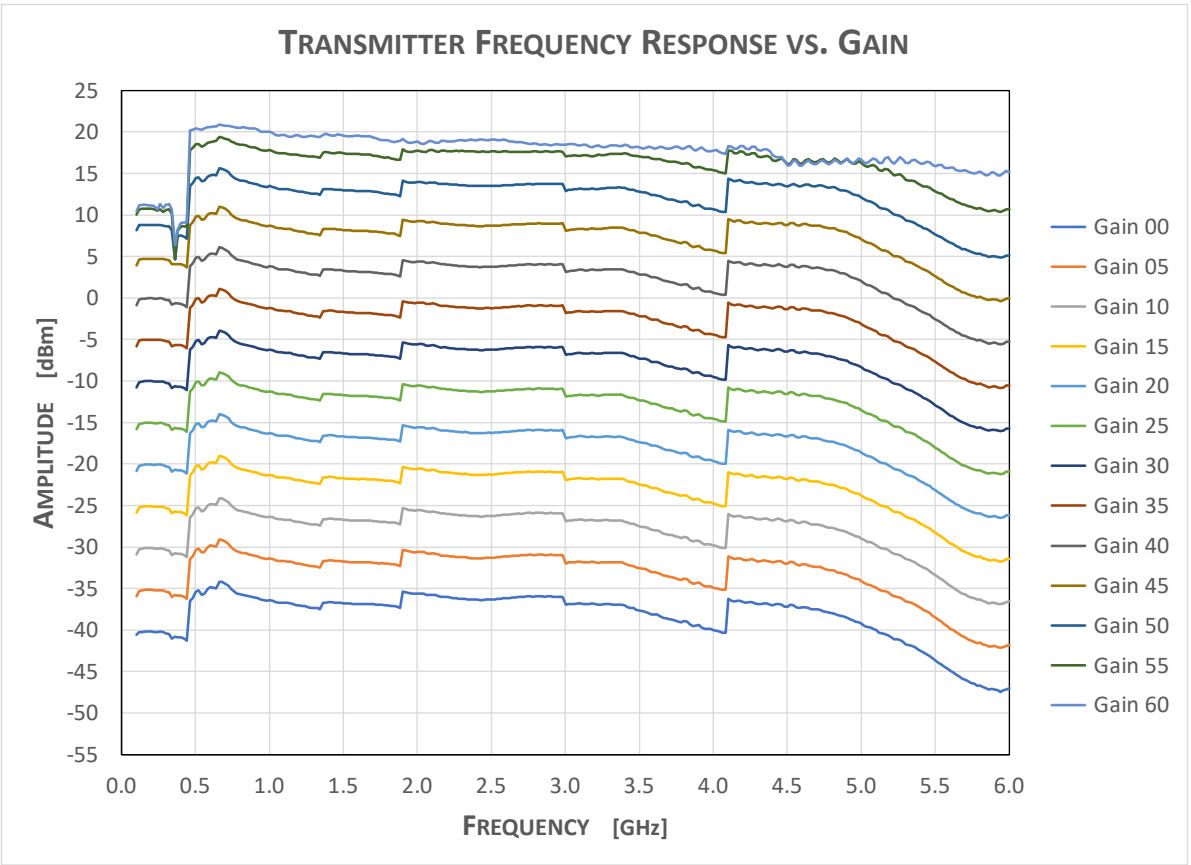
TX Measurements[1]





RX Measurements[1]