

# SBX

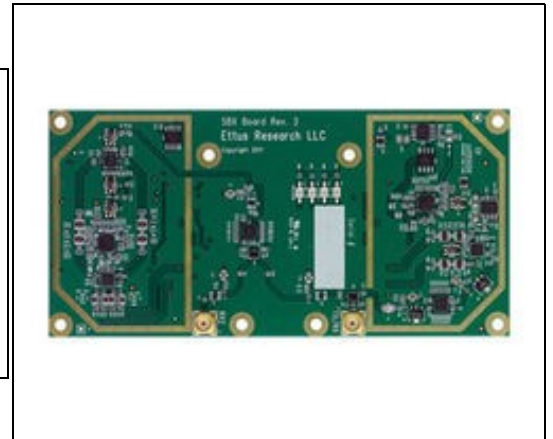
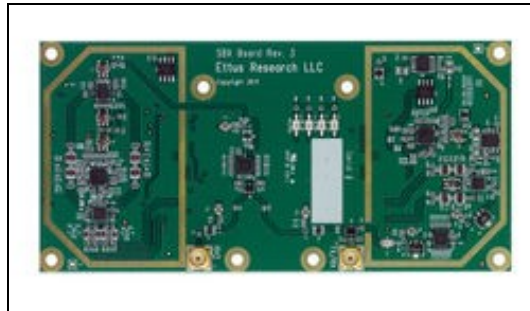
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The SBX is a wide bandwidth transceiver that provides up to 100 mW of output power, and a typical noise figure of 5 dB. The local oscillators for the receive and transmit chains operate independently, which allows dual-band operation. The SBX is MIMO capable, and provides 40 MHz or 120 MHz of bandwidth. The SBX is ideal for applications requiring access to a variety of bands in the 400 MHz-4400 MHz range. Example application areas include WiFi, WiMax, S-band transceivers and 2.4 GHz ISM band transceivers. The SBX daughterboard is supported by the USRP Hardware Driver? (UHD) software API for seamless integration into existing applications.

The SBX is capable of phase coherent operation, and therefore is suitable for MIMO and Phased Array applications.

- Frequency Range: 400MHz - 4.4GHz
- Versions: 40MHz / 120MHz
- Power Output: 100mW



- 2 quadrature frontends (1 transmit, 1 receive)
  - ◆ Defaults to direct conversion
  - ◆ Can be used in low IF mode through `lo_offset` with `uhd::tune_request_t`
- Independent receive and transmit LO's and synthesizers
  - ◆ Allows for full-duplex operation on different transmit and receive frequencies
  - ◆ Can be set to use Integer-N tuning for better spur performance with `uhd::tune_request_t`

Transmit: **TX/RX**

Receive: **TX/RX** or **RX2**

- **Frontend 0:** Complex baseband signal for selected antenna
  - **Note:** The user may set the receive antenna to be TX/RX or RX2. However, when using an SBX board in full-duplex mode, the receive antenna will always be set to RX2, regardless of the settings.
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- Transmit Gains: **PGA0**, Range: 0-31.5dB
  - Receive Gains: **PGA0**, Range: 0-31.5dB
- 
- SBX: 40 MHz, RX & TX
  - SBX-120: 120 MHz, RX & TX
- 
- **io\_locked:** boolean for LO lock state
- 
- All LEDs flash when daughterboard control is initialized
  - **TX LD:** Transmit Synthesizer Lock Detect
  - **TX/RX:** Receiver on TX/RX antenna port (No TX)
  - **RX LD:** Receive Synthesizer Lock Detect
  - **RX1/RX2:** Receiver on RX2 antenna port
- 
- 400MHz - 4.4GHz
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- 4 - 5 dB @ (400MHz ~ 1.5GHz)
  - 5 - 7 dB @ (1.5GHz ~ 3GHz)
  - 7 - 12dB @ (3GHz ~ 4.4GHz)
- 
- 16 ~ 22 dBm
- 
- -20 dBc @ (400MHz ~ 600MHz)
  - -30dBc @ (600MHz ~ 4.4GHz)
- 
- 20 dBm @ (400MHz ~ 3.5GHz)
  - 18 - 20dBm @ (3.5GHz ~ 4.4GHz)
- 
- 26 - 30dBm @ (400MHz ~ 1.5GHz)
  - 30 dBm @ (1.5GHz ~ 4.4GHz)
- 
- -20 dBc @ (400MHz ~ 600MHz)
  - -30dBc @ (600MHz ~ 4.4GHz)
- 
- All RF Ports are matched to 50 Ohm with -10dB or better return loss generally. Detailed test is pending.
  - The maximum input power for the SBX is -15 dBm.
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- **SBX without UHD Corrections**
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- Ettus Research recommends to always use the latest stable version of UHD
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- Current Hardware Revision: 5.1
  - Minimum version of UHD required: 3.8.0
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- 0-40 °C
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- 10% to 90% non-condensing
- 
- N or X Series
- 
- X Series only

The SBX daughterboard is capable of phase-synchronous operation, and is recommended for phase-coherent applications. The UBX and TwinRX daughterboards are also recommended for phase-coherent applications.

#### SBX Schematics

Part Number	Description	Schematic ID (Page)
MGA82563	Amplifier	U1, U5, U4 (1)

AS225-313LF	SPDT Switch	U3, U6 (1)
HMC624LP4E	ATTENUATOR	U2, U7 (1)
LFCN-5850+	Low Pass Filter	FL1 (1)
PHA-1+	Amplifier	U8 (1)
GVA-84+	Amplifier	U9 (1)
ADL5380ACPZ	Quadrature Demodulator	U11 (2)
ADA4927-2YCPZ	Differential ADC Driver	U10 (2)
AD8591ARTZ-REEL	Amplifiers	U31 (2)
ADF4350BCPZ	Synthesizer with Integrated VCO	U23 (3); U24 (6)
SKY13267	Diversity Switch	U12 (3); U25 (6)
LFCN-1200+	Low Pass Filter	FL13 (3); FL12 (6)
TC1-1-43A+	RF Transformer	T3 (2); T2, T5 (3); T4, T6 (6)
LP3878MR-ADJ	Voltage Regulator	U13, U14 (4); U19, U20 (5)
NC7WZ04P6X	Dual Inverter	U15, U16 (4); U21 (5); U27 (6); U26 (3)
24LC024	EEPROM	U17 (4); U22 (5)
ADL5375	Quadrature Modulator	U18 (5)

- [File:cu ettus-cca-sbx.pdf](#)

- The SBX daughterboard features female SMA connectors for both the TX/RX and RX2 connectors.

As of December 1st, 2010 all Ettus Research products are RoHS compliant unless otherwise noted. More information can be found at <http://ettus.com/legal/rohs-information>

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- [Media:volatility UBX CBX WBX SBX r1 1.pdf](#)

FPGA Resources

UHD Stable Binaries

UHD Source Code on Github