SC2410

Product Specification

Common Applications

- Multiple-In, Multiple-Out (MIMO) development
- Frequency extension of legacy 6 GHz systems
- Phase coherent systems software defined radio (SDR) development

Description

The SC2410 is a 4 channel 18 GHz Up/Down Converter comprised of eight mixers all sharing a common coherent LO signal. Passive, triple balanced mixers offer excellent spurious suppression with overlapping IF and RF bands. The frequency range for the LO and RF ports is 5-18 GHz while the IF port extends from 2 to 18 GHz.

Firmware control allows for the enabling and disabling of the common LO signal as well as providing access to a digital step attenuator that can be used to set the LO signal drive level at all eight mixers.

Figure 1 - SC2250 – Unparalleled Value in an 18 GHz Microwave Extension

LO Distribution Block Diagram

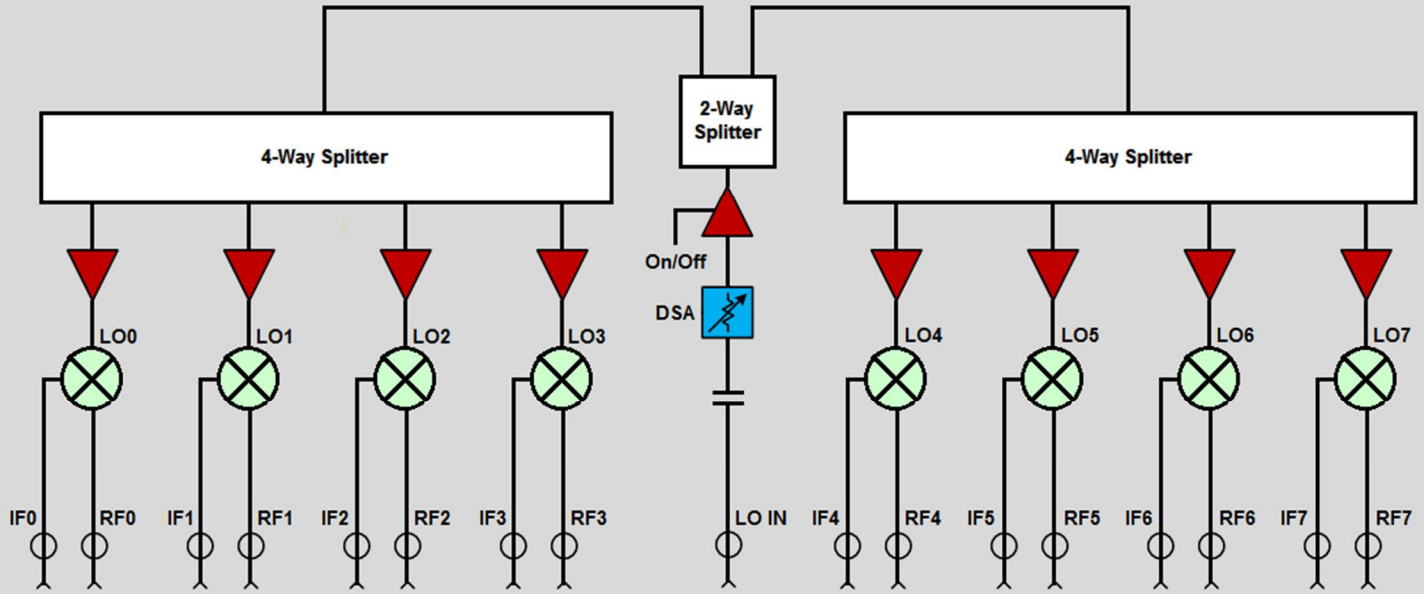


Figure 2 – LO Block Diagram

Hardware Front Panel

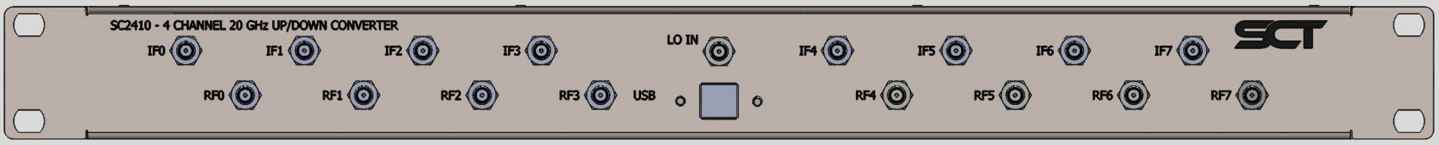


Figure 3 – Front Panel

Hardware Rear Panel

Figure 4 – Rear Panel

Definitions

The following definitions describe the specifications listed below:

- *Typical* values cover the expected performance for the majority of units operating in an ambient temperature range of 23 °C ± 5 °C.

Specifications are subject to change without notice. For the most recent SC2410 specifications, visit *www.signalcraft.com*.

Firmware Control

The onboard micro controller allows for enabling and disabling of the common path amplifier as well as the setting of the DSA (digital step attenuator). It can be accessed over a PC com port via the USB type-B (female) connector on the front panel.

Common Path Amplifier	Can be enabled or disabled Power on default = disabled Command = AMP 0|1 for Off|On The eight power amplifiers are always on
Digital Step Attenuator (DSA)	6 bit digital step attenuator with 31.5 dB of range in 0.5 dB steps for a total of 64 settings (0 to 63) Used to help correctly set the power level at the LO port of all mixers Command = DSA 0|…|63 DSA 0 = min attenuation DSA 63 = max attenuation
Unit ID	A number between 0 and 31 is returned by the micro controller. The number matches the last two digits of the unit's serial number. Command = ID

IF Port Specifications

Frequency Range	2 – 18 GHz	Usable to 20 GHz
Coupling	DC	
Maximum DC Input Current	0 mA	
Matching	50 ohms nominal	
Connector	SMA (female)	
VSWR – Typical	< 2.8 < 2.5 < 2.3	2 - 4 GHz 4 - 8.5 GHz 8.5 – 20 GHz

RF Port Specifications

Frequency Range	5 – 18 GHz	Usable to 20 GHz
Coupling	DC	
Maximum DC Input Current	0 mA	
Matching	50 ohms nominal	
Connector	SMA (female)	
VSWR – Typical	< 2.7 < 2.5 < 2.2	5 – 9 GHz 9 – 12 GHz 12 – 20 GHz

LO Port Specifications

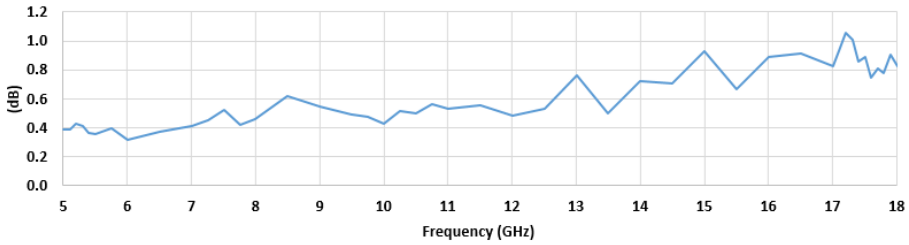
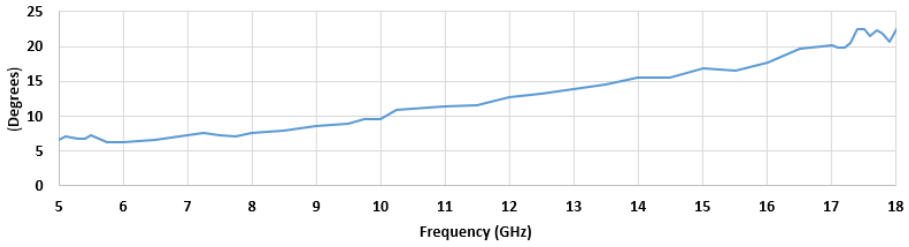
Frequency Range	5 – 18 GHz	
Coupling	AC	
Matching	50 ohms nominal	
Maximum Input Power	14 dBm	5-18 GHz
Connector	SMA (female)	
VSWR – Typical (worst case for all DSA settings)	< 2 < 2.4 < 2.2	5 – 8.5 GHz 8.5 – 11.5 GHz 11.5 – 18 GHz

LO Path Specifications

The ideal power level at the mixer inputs is approximately +15 dBm. To achieve this for any frequency between 5 and 18 GHz a calibrated look up table will be provided for each unit.[4] Based on the desired LO frequency and available power level, the DSA setting needed to achieve +15 dBm can be determined. The following table provides examples of typical values for a few sample frequencies. In general, an LO power level in the range of approximately -13 to +11 dBm is required at the front panel port (frequency dependent). Note: The final Power Amplifiers are in slight compression when +15 dBm is applied at the mixer inputs. Therefore linear changes in the DSA setting do not result in linear changes in power at the mixer LO ports.

	Power into front panel LO port (dBm) →												
Frequency (GHz)	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
6.00	0	1	3	4	6	8	10	12	14	15	17	19	21
12.00								1	3	5	7	9	11
18.00												0	2
	Power into front panel LO port (dBm) →												
Frequency (GHz)	0	1	2	3	4	5	6	7	8	9	10	11	
6.00	23	25	27	29	31	32	34	35	37	39	41	43	
12.00	13	15	16	18	20	22	24	26	28	30	31	33	
18.00	3	6	8	10	11	13	16	18	19	21	23	25	

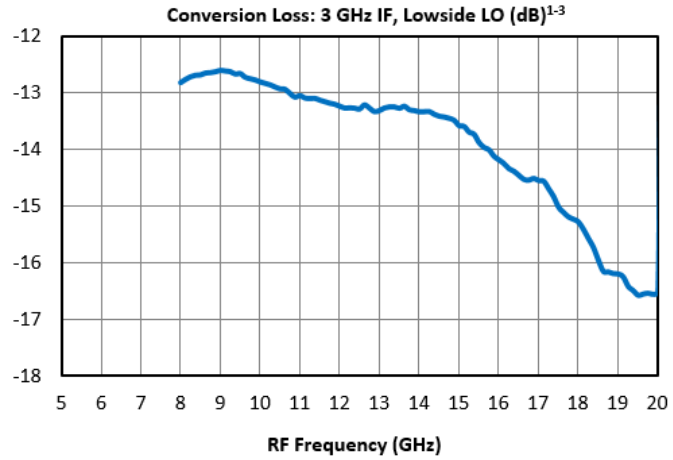
Table 1 – DSA Setting Look Up Table (Typical Values)

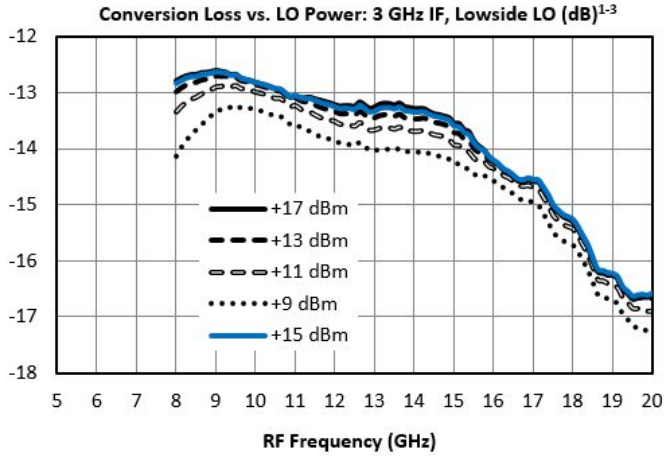
Recommended Power Level at Mixer LO Ports	+15 dBm	Useful range = +9 to +17 dBm
LO Signal Amplitude Imbalance Range (typical range of power levels found at eight mixer ports LO0 to LO7)		
LO Signal Phase Imbalance Range (typical range of phase values found at eight mixer ports LO0 to LO7)		

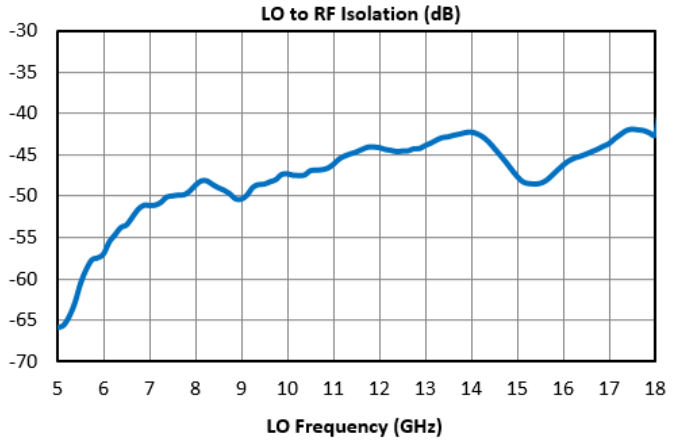
Mixer Specifications

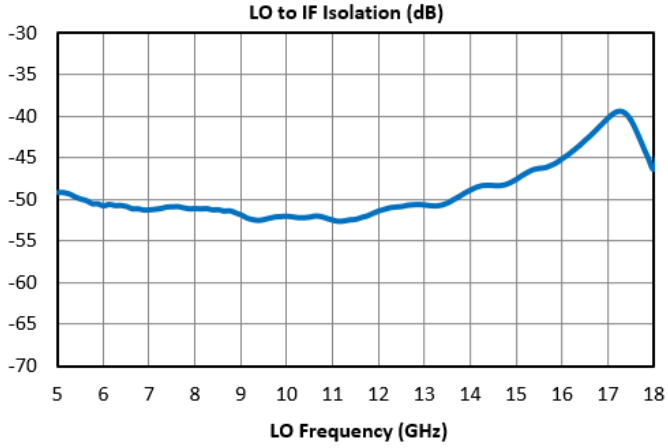
Max RF Input Power	27 dBm @ 25C 20 dBm @ 100C (derate linearly)	Power input into either IF or RF port. Assumes +15 dBm at LO port.

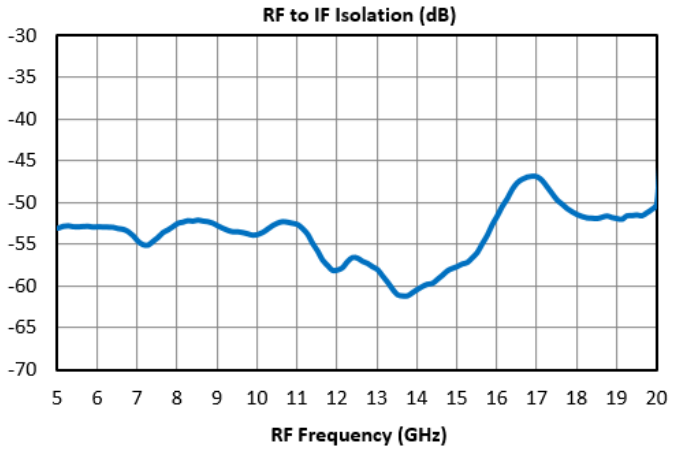
Typical Performance



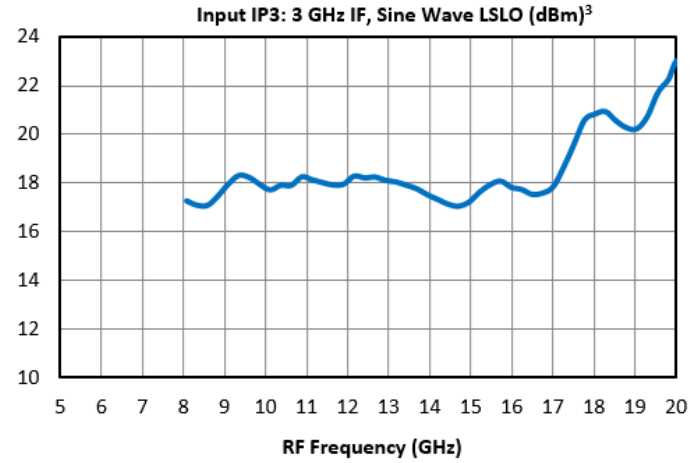


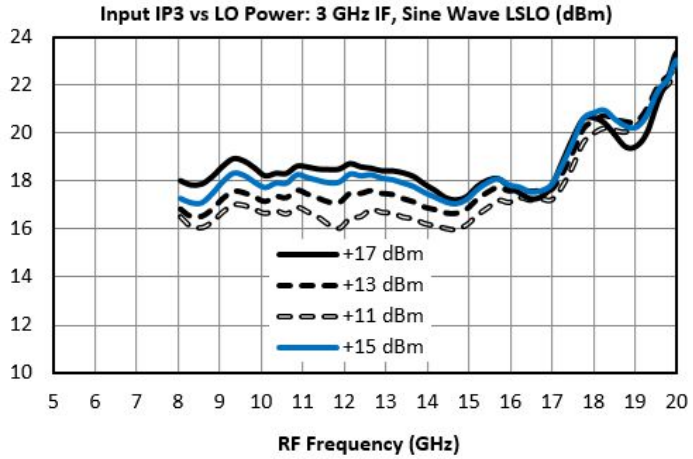


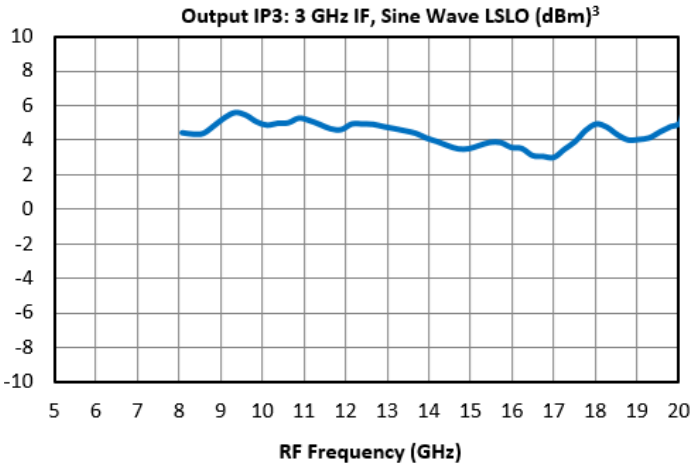


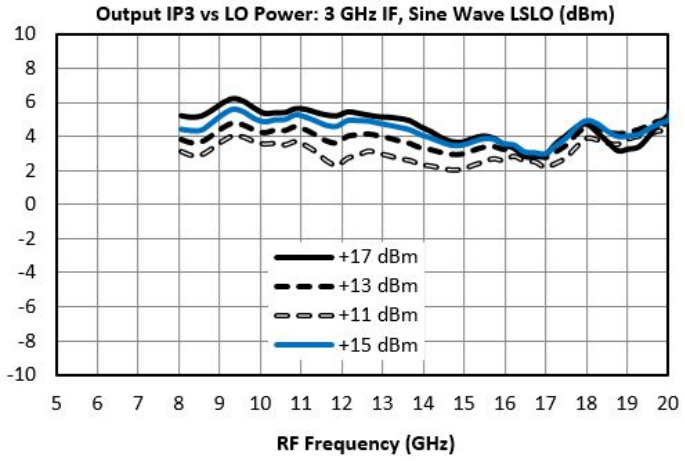


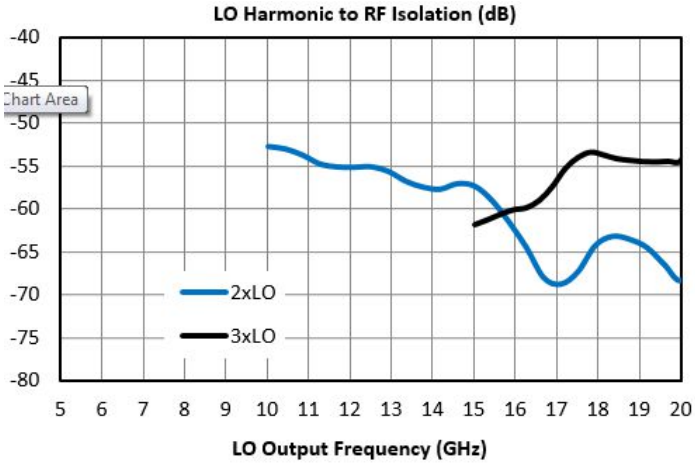
Typical Performance

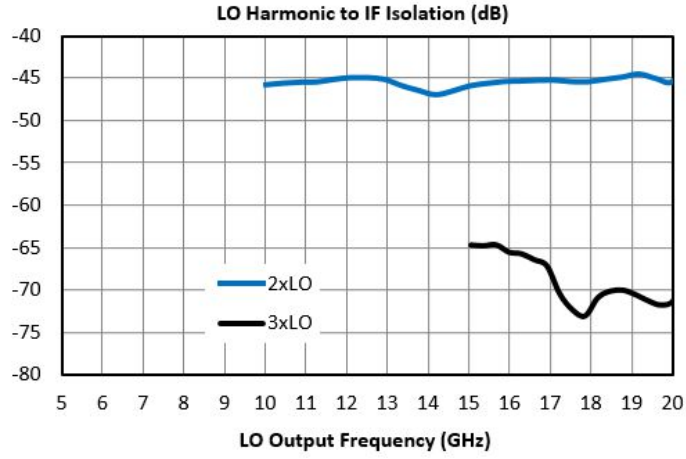




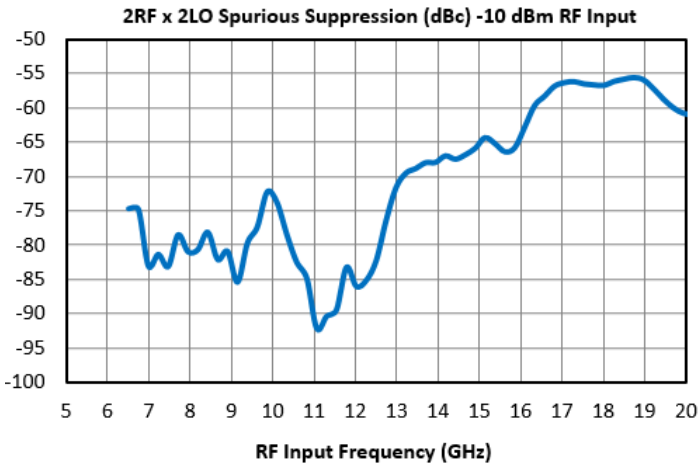


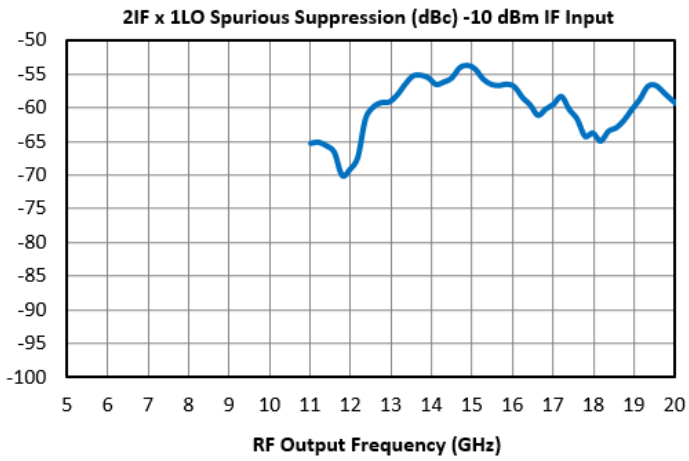






Typical Performance





Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (±mLO±nRF) within the RF/LO bands, which create a 3 GHz IF spurious output. The mixer is swept across the full spurious band and the mean is calculated. The numbers shown in the table below are for a -10 dBm RF input. Spurious suppression is scaled for different RF power levels by (n-1), where "n" is the RF spur order. For example, if the 2RFx2LO spur is 59 dBc for a -10 dBm input, a -20 dBm RF input creates a spur that is (2-1) x (-10 dBm) dB lower, or 69 dBc.

Typical Downconversion Spurious Suppression (dBc): Sine Wave

-10 dBm RF Input	**0xLO**	**1xLO**	**2xLO**	**3xLO**	**4xLO**	**5xLO**
1xRF	36	Reference	36	14	38	29
2xRF	65	57	63	59	64	70
3xRF	85	61	84	71	83	72
4xRF	152	82	113	116	115	116
5xRF	177	123	140	122	139	132

Table 2 – Mixer Downconversion Spurs

Upconversion Spurious Suppression

Spurious data is taken by mixing a 3 GHz IF signal with LO frequencies (±mLO±nRF), which creates an RF signal within the RF band. The mixer is swept across the full spurious output band and the mean is calculated. The numbers shown in the table below are for a -10 dBm IF input. Spurious suppression is scaled for different IF input power levels by (n-1), where "n" is the IF spur order. For example, if the 2IFx1LO spur is typically 60 dBc for a -10 dBm input, a -20 dBm IF input creates a spur that is (2-1) x (-10 dBm) dB lower, or 70 dBc.

Typical Downconversion Spurious Suppression (dBc): Sine Wave

-10 dBm RF Input	**0xLO**	**1xLO**	**2xLO**	**3xLO**	**4xLO**	**5xLO**
1xRF	38	Reference	41	12	43	22
2xRF	71	54	60	67	70	68
3xRF	90	69	89	71	88	68
4xRF	114	107	113	115	121	116
5xRF	134	125	138	119	141	123

Table 3 – Mixer Upconversion Spurs

Power Requirements

Power Supply	120 VAC Fused Power Entry Module with Switch.
Power Consumption	32 W

Physical Characteristics

Dimensions	19" rack compatible stainless steel 1U enclosure with 2.0m (5.56') detachable power cord 4.5 x 43.2 x 46.4 cm (1.75 × 17.0 × 18.25 inches)
Weight	~8.2 kg (~18 lb)

Environment

Ambient Operating Temperature Range	0°C to 60°C
Relative Humidity Range	10% to 90%, noncondensing

[1] Typical DSA settings for an ambient temperature of 23C.
[2] Mixer Noise Figure typically measures within 0.5 dB of conversion loss.
[3] Unless otherwise specified, data is measured with +15 dB at LO port of mixers.
[4] A csv file will be provided on a USB thumb drive.

SIGNAL CRAFT TECHNOLOGIES

Support

Technical support is available through our website, www.signalcraft.com/support, or by contacting us at support@signalcraft.com.

Warranty

Full one-year parts and labor when used under normal installation and operation conditions. Repair services are available for products no longer covered under warranty.

Ordering Information

Send inquiries to info@signalcraft.com.