SignalCore™

PRESERVING SIGNAL INTEGRITY

Datasheet

SC5510A & SC5511A

80 MHz to 20 GHz CW Signal Source

Rev 3.1

www.signalcore.com

Table of Contents

1. Definition of Terms

The following terms are used throughout this datasheet to define specific conditions:

Specification (spec)	Defines expected statistical performance within specified parameters which account for measurement uncertainties and changes in performance due to environmental conditions. Protected by warranty.
Typical Data (typ)	Defines the expected performance of an average unit without specified parameters. Not protected by warranty.
Nominal Values (nom)	Defines the average performance of a representative value for a given parameter. Not protected by warranty.
Measured Values (meas.)	Defines the expected product performance from the measured results gained from individual samples.

Specifications are subject to change without notice. For the most recent product specifications, visit www.signalcore.com.

2. Description

The SC5510A and SC5511A are high performance VCO based synthesized signal sources with frequency range from 80 MHz to 20 GHz. The SC5510A is in the PXI single slot form-factor and the SC5511A is a compact module with USB and RS232 or SPI interfaces. Boasting low phase noise of -137 dBc/Hz @ 10 kHz offset from a 1 GHz carrier, tuning the entire band at 1 Hz resolution, and having amplitude step resolution of 0.01 dB over the range of < -20 dBm to +15 dBm set these products apart from other small modular synthesizers. Furthermore, using a unique multiple phase-locked loop architecture the phase spurs are typically kept below -65 dBc across the tuning range, even at 1 Hz step resolution. Furthermore, using a high fundamental frequency VCO (20 GHz) and eliminating multipliers, sub-harmonics due to dividers are typically less than -70 dBc and far out spurious signals are also kept below -70 dBc.

There is also an additional independent RF2 port whose frequency range covers 100 MHz to 3 GHz with tuning resolution of 25 MHz. This makes the modules ideal as local oscillators for both single-stage and dual-stage RF conversion systems. They are also great as general-purpose laboratory signal sources where demanding low phase noise and signal purity are needed, or ideal choices as integrated clock sources for fast DAC and ADC applications, especially those that require variable sampling rates.

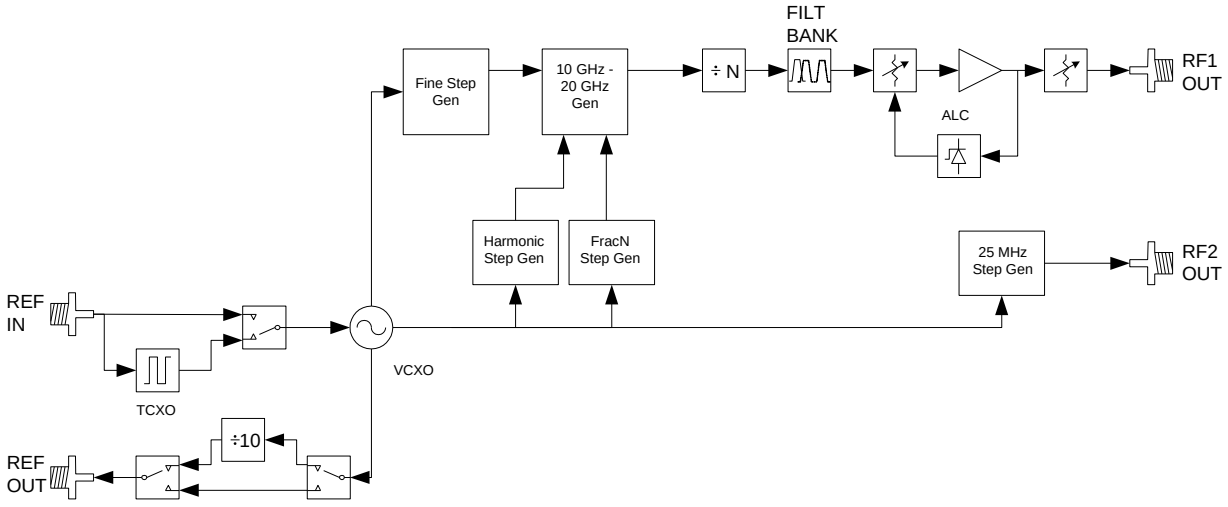


Figure 1. SC5510A/SC5511A Block Diagram

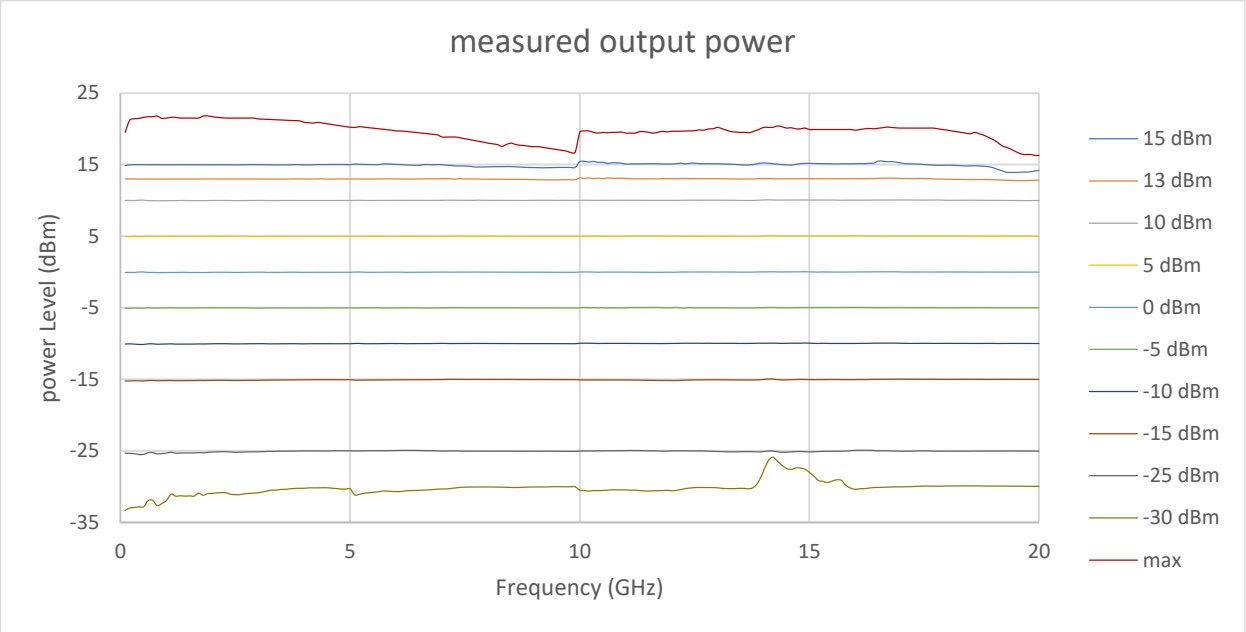
3. Port 1 Frequency Specifications[1]

RF Output Range [2]		100 MHz to 20 GHz
Resolution		1 Hz
Switching speed		
Automatic leveling on		500 us
Automatic leveling off		350 us
List Mode		
Dwell time		0.5ms to 30s
Dwell step		0.5ms
Step points		2024
Trigger		Software, External logic
Frequency Accuracy	Same as accuracy of internal time base or external reference	
Time base accuracy [3]	± [(last adjustment x aging) ± temp effects ± cal. accuracy]	
Aging	Daily, after 30 days	± 3 ppb
	Yearly	± 0.6 ppm
Temp effects		± 20 ppb
Init cal. accuracy [4]	Calibration precision	± 200 ppb
Reference Output		
Amplitude	100 MHz	> 3 dBm
	10 MHz	> 3 dBm
Reference Input		
Frequency		10 MHz/100 MHz
Lock range		± 3 ppm
Amplitude	(nominal)	0 to 7 dBm

[1] PXI: 27±5 ^{O}C ambient. Modular: 40 ±5 ^{O}C device temperature.
[2] Tunes from 87.5 MHz to 21.0 GHz by design.
[3] Based on the internal 10 MHz OCXO reference, after 20 minutes of warmup time.
[4] Factory adjustment of the reference DAC with respect to a NIST traceable 10 MHz rubidium clock standard.

4. Port 1 Amplitude Specifications[5]

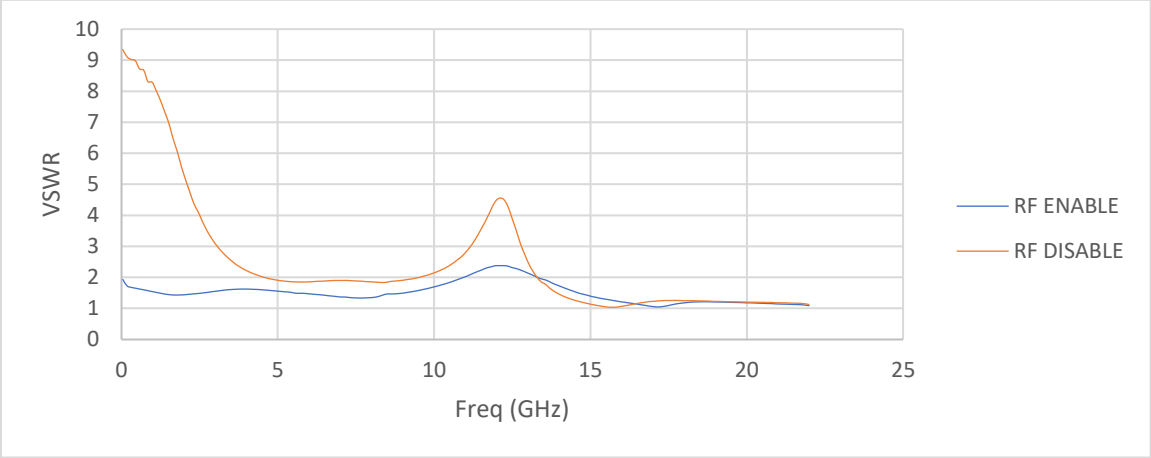
Leveled Output Range [6]	100 MHz to 18 GHz	-20 to +15 dBm
	18 GHz to 20 GHz	-20 to +10 dBm
Maximum Output [7]	100 MHz to 18 GHz	+ 18 dBm, typical
	18 GHz to 20 GHz	+13 dBm, typical
Adjustment resolution		0.01 dB, nominal
Absolute level accuracy		± 0.75 dB (typical)
	100 MHz to 12 GHz	± 1.25 dB
	12 GHz to 15 GHz	± 2.0 dB
	15 GHz to 20 GHz	± 1.5 dB



[5] PXI: 27 ± 5 ^{O}C ambient. Modular: 40 ± 5 ^{O}C device temperature.
[6] Leveled range implies that the set amplitude is maintained over the frequency band.
[7] Maximum output is typical and does not guarantee that the value holds true for the frequency range. The minimum output level is < -20 dBm.

Output voltage standing wave ratio (VSWR)

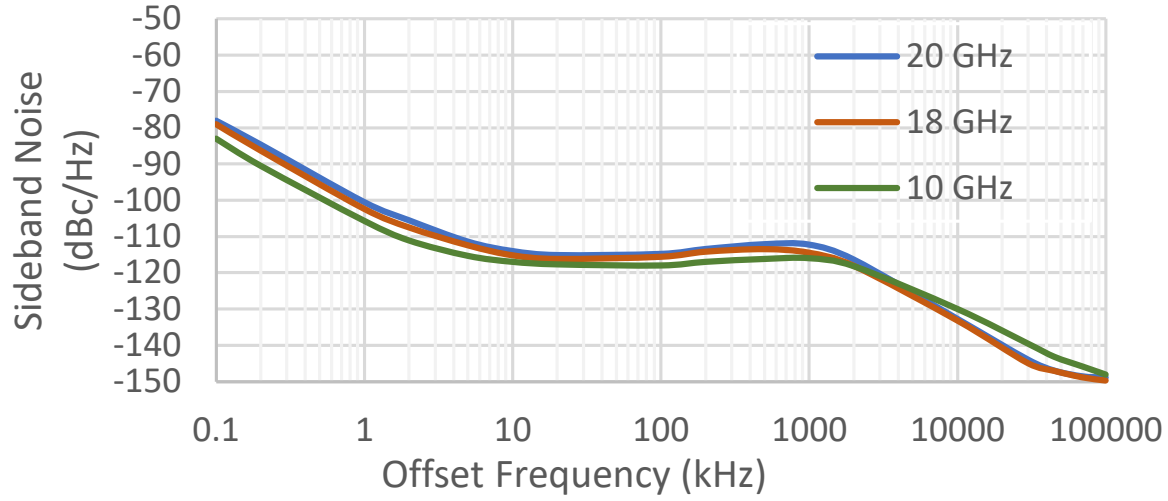
160 MHz to 10 GHz	< 2.0 typical
10 GHz to 15 GHz	< 2.5 typical
15 GHz to 20 GHz	< 1.8 typical



5. Port 1 Spectral Specifications[8]

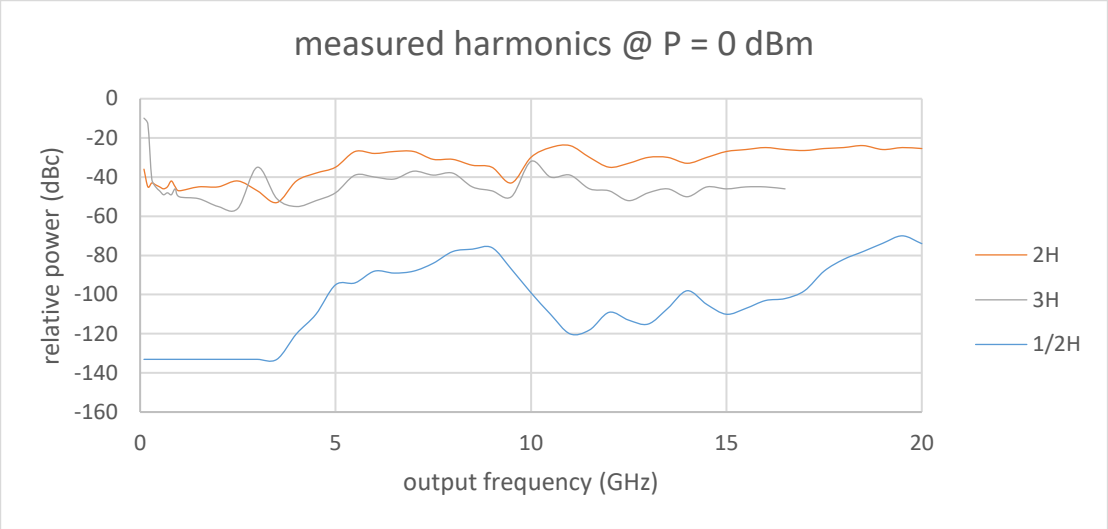
Phase Noise (Normal loop gain, dBc/Hz)

	RF Frequency							
	1 GHz		5 GHz		10 GHz		20 GHz	
Offset	Typ	max	Typ	max	Typ	max	Typ	max
100	-100	-79	-86	-66	-80	-74	-74	-68
1 kHz	-122	-117	-109	-103	-103	-98	-97	-91
10 kHz	-137	-131	-123	-117	-117	-112	-111	-106
100 kHz	-138	-132	-124	-117	-118	-112	-112	-107
1 MHz	-137	-130	-123	-117	-116	-112	-110	-106
10 MHz	-150	-147	-139	-133	-133	-130	-131	-130
Floor	-153	-149	-150	-147	-147	-145	-145	-145



[8] PXI: 27 ± 5 °C ambient. Modular: 40 ± 5 °C device temperature.

Harmonics	100 MHz to 400 MHz	< -10 dBc
	400 MHz to 10 GHz	< -25 dBc
	10.0 GHz to 20.0 GHz	< -20 dBc
Subharmonics		< -80 dBc typical
		< -70 dBc



Nonharmonics

	Close-in Spurs[9]		Far-out Spurs[10]	
Frequency	typical	max	typical	max
100 MHz to 5.0 GHz	< -70 dBc	-55 dBc	< -70 dBc	-60 dBc
5.0 GHz to 10.0 GHz	< -60 dBc	-50 dBc	< -65 dBc	60 dBc
10.0 GHz to 20.0 GHz	< -60 dBc	-47 dBc	< -65 dBc	-55 dBc

[9] < 10 MHz from center carrier frequency
[10] > 10 MHz from center carrier frequency

6. Port 2 Specifications[11]

Frequency range		100 MHz to 3.0 GHz
Resolution		25 MHz
Harmonics	100 MHz to 18 GHz	< - 12 dBc
Output power	Fixed	+5 dBm typical
Phase Noise @ 1 GHz	1 kHz	-110 dBc/Hz
	10 kHz	-118 dBc/Hz
	100 kHz	-118 dBc/Hz
	1 MHz	-142 dBc/Hz
	10 MHz	-160 dBc/Hz

[11] PXI: 27 ± 5 ^{O}C ambient. Modular: 42 ± 5 ^{O}C device temperature.

7. General Specifications

Environmental		
Internal Device Operating Temperature	SC5511A	-10°C to +75°C
Ambient temperature	SC5510A	-10°C to +55°C
Ambient Storage Temperature		-40°C to +90°C
Operating Relative Humidity		10% to 90%, non-condensing
Storage Relative Humidity		5% to 90%, non-condensing
Operating Shock		30 g, half-sine pulse, 11 ms duration
Storage Shock		50 g, half-sine pulse, 11 ms duration
Operating Vibration		5 Hz to 500 Hz, 0.31 g_{rms}
Storage Vibration		5 Hz to 500 Hz, 2.46 g_{rms}
Altitude		Up to 10,000 feet (de-rate max device temperature to 60°C)
Physical		
Dimensions (W x H x D, max envelope)	SC5511A	3.7” x 0.75” x 5.75”
	SC5510A	Single PXI Slot
Weight		1.0 lb.
RF Output Connectors		SMA
Reference Connectors		SMA
PXI Backplane Clock Connector	SC5510A	MCX
RF Connector Nominal Impedance		50 Ω
Power and digital Interface Connector	SC5511A	TFM-115-01-L-D-RA
Communication Interface		PXIe, USB and RS-232 / SPI
Input Voltage	SC5511A	10 to 15 VDC
	SC5510A	5V, 12V
Current	Peak (initial)	2.7 A max @ 12V
	Steady (average)	1.7 A @ 12V
Power Consumption		21 W max

Electromagnetic Compatibility (EMC)

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Basic immunity
- EN 55011 (CISPR 11): Class A Radiated emissions
- EN 55011 (CISPR 11): Class A Conducted emissions
- EN 61000-4-2: Electrostatic Discharge
- EN 61000-4-3: Radiated Immunity
- EN 61000-4-6: Conducted Immunity
- FCC 15.109: Radiated emissions
- ICES-003: Class A emissions

CE

This product meets the essential requirements of applicable European Directive:

- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Warranty

3 years on parts and labor on defects in materials or workmanship.

8. Revision Table

Revision	Revision Date	Description
3.0	05/01/2023	Document reformatted
		Document combines specifications of SC5510A and SC5511A
		Changes to accuracy and harmonic values
		Added measured power level plot
		Added VSWR plot
		Added harmonics plot
3.1	11/2/2023	Intial frequency accuracy updated

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