SGA SERIES
PRODUCT MANUAL

USB VECTOR SIGNAL GENERATOR

SGA-60
9 kHz - 6 GHz

V1.3
2026/06/24

HAROGIC

SG Series

SGA Series Overview.

BENCHMARK USB VECTOR SIGNAL GENERATOR

The SGA series combines laboratory-grade RF performance—spanning middle range phase noise to clean harmonic suppression with an accessible price. It features a high-resolution 16-bit DAC for precision signal synthesis and supports a 100 MHz playback bandwidth alongside 50 MHz real-time streaming. The integrated FPGA-based interpolator allows for granular sample rate adjustments and minimizes CPU overhead, ensuring a seamless, high-efficiency user experience for demanding test environments.

EASE OF USE AND COMPACT DESIGN

The compact form factor facilitates seamless system integration without compromising RF integrity, drastically reducing both deployment complexity and operational overhead. It is ideally positioned for footprint-sensitive and budget-conscious applications where performance cannot be sacrificed.

POWERFUL API AND ECOSYSTEM

The SGA series features a streamlined yet robust API designed for rapid development across diverse software environments. It offers comprehensive support for C/C++, C#, Python, and MATLAB, as well as seamless integration with industry-standard platforms like Qt, LabVIEW, and GNU Radio. Fully compatible with both Windows and Linux, the API ensures maximum flexibility for cross-platform system architecture

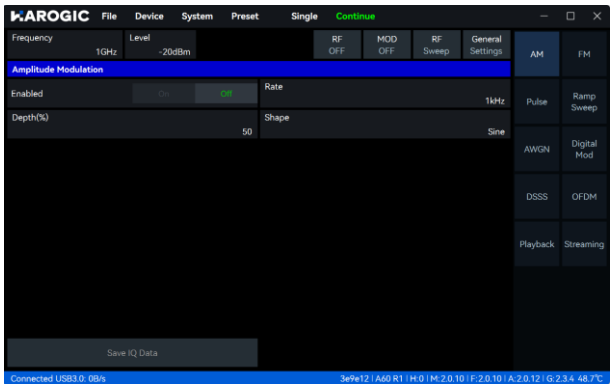
Key Features

- Frequency: 9 kHz to 6 GHz
- Modulation Bandwidth: 100 MHz playback, 50 MHz real-time
- Memory depth: 125 MB (32 M samples)
- 1 GHz phase noise: -124 dBc/Hz@10 kHz
- Maximum output power: 7 dBm to 14 dBm, 25 dBm (opt.)
- Minimum output power: ≤-100 dBm across full frequency range
- Harmonics: ≤-50 dBc (0 dBm output, typical)
- 16-bit DAC for high-quality baseband waveform
- FPGA-based high-performance interpolator
- Fine sampling rate adjustment supported
- Fine reference frequency adjustment supported
- Built-in GNSS for timing, positioning, and frequency calibration
- USB3.0/2.0 Type-C interface
- Support ARM and X86 processor
- Support Windows and Linux system

Vector Signal Generator Software SGStudio Overview

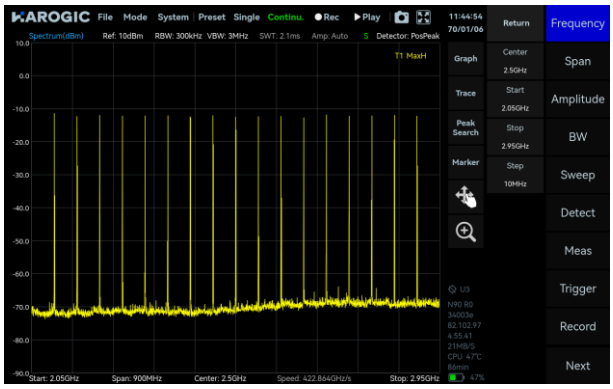
■ Clear and User-Friendly Interface

SGStudio features a streamlined, modular interface designed to maximize operational efficiency. The GUI is logically organized into five key functional areas: Menu Bar, RF Parameter Settings, Mode Selection, Mode Parameter Settings, and Status Information. By integrating all critical controls and real-time feedback into a unified main window, SGStudio ensures an accelerated learning curve and a seamless user experience that rivals traditional benchtop instruments.



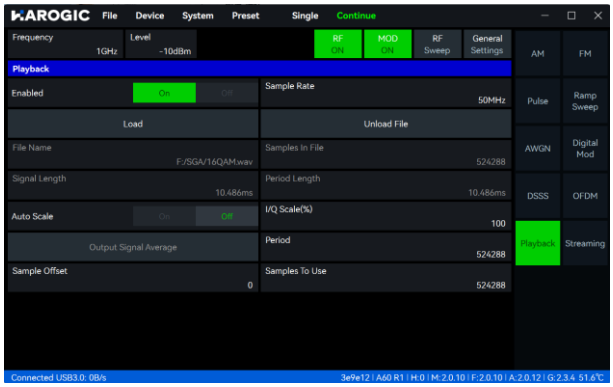
■ RF Frequency and Power Sweep Control

SGStudio provides comprehensive RF control, supporting single-point, frequency sweep, and power sweep modes. It simplifies complex characterization tasks, enabling users to perform automated frequency response and compression point testing directly through the GUI—eliminating the need for custom programming.



■ Real-Time IQ Playback

Support continuous real-time waveform streaming from the host for playback, or buffered playback using on-device memory. The playback mode offers higher signal bandwidth and operates without host intervention, fully offloading host processing. In replay mode, maximum waveform length is limited by the internal memory capacity.



Digital Modulation Signal Output(opt.73)

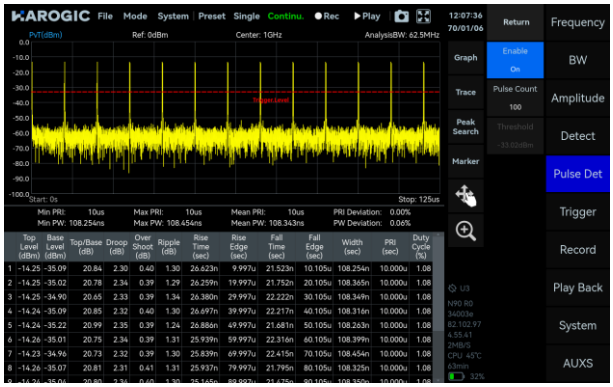
Engineered for versatility, the SGA series supports an extensive library of modulation schemes, ranging from fundamental ASK, FSK, and PSK to high-order 1024QAM. The architecture is specifically optimized for modern wireless standards, featuring native support for DSSS and OFDM to facilitate advanced signal generation for both field testing and R&D verification.

Basic AM/FM Signal Output

SGA series provides robust support for classic analog modulation, including AM and FM signal generation. Users benefit from high-precision control over all modulation parameters—including modulation frequency, depth, and frequency deviation—ensuring accurate simulation for traditional receiver testing and analog system verification.

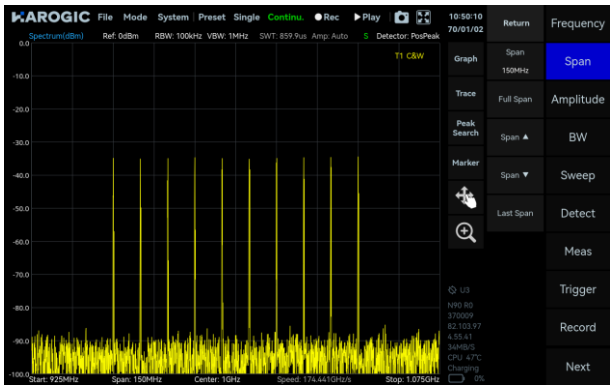
Basic Pulse Signal Output

The SGA series includes integrated pulse signal generation, providing precise control for timing-sensitive applications. Users can fully configure critical parameters—including pulse repetition period, duty cycle, and pulse width—allowing for the accurate simulation of pulsed RF environments and radar signal characteristics.



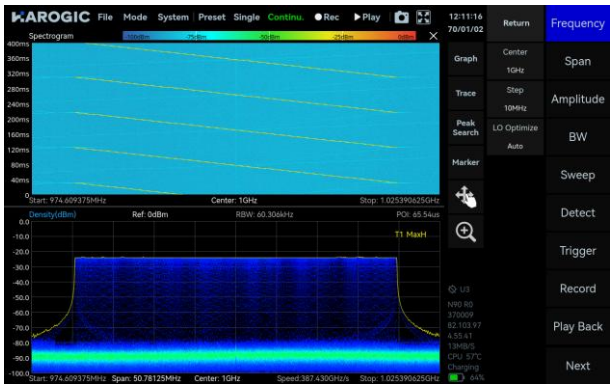
Multitone Signal Output

Generates composite RF signals with multiple discrete tones. Users can configure the number of tones, tone spacing, and phase mode, as well as define an in-band notch relative to the RF center frequency. This function is well suited for dynamic range, intermodulation distortion, and frequency response flatness testing.



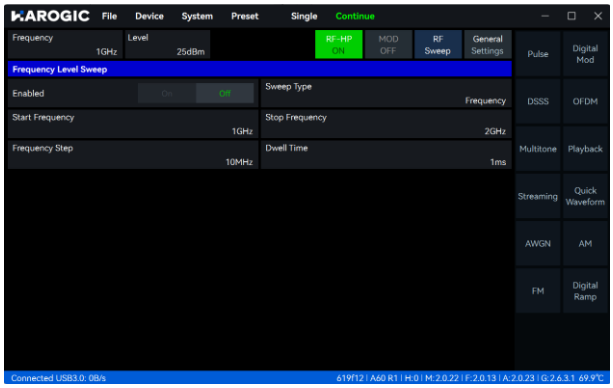
Digital Ramp Sweep

SGA series supports the generation of linear frequency modulated signals, with flexible configurations for sweep width, sweep time, and sweep period. This capability is ideal for radar signal simulation, wideband excitation, and frequency response testing.



Medium Power Output (opt.10)

SGA series supports an optional medium-power RF output port, capable of delivering up to 25 dBm output power across the 10 MHz to 6 GHz frequency range. It is suitable for applications requiring higher excitation levels, such as device testing, system integration, and joint debugging.



Specifications*

FREQUENCY

Frequency range	9 kHz to 6 GHz	
Frequency resolution	0.1 Hz analog tuning, ≤1 uHz digital tuning	
LO switching time	≤100 us pre-programmed; ≤50 ms software controlled	
Reference clock	Internal or external, manual correction or GNSS calibration is available	
Frequency accuracy	TCXO (std.)	<0.5 ppm, manual correction is available
	OCXO (opt.01)	<0.2 ppm, manual correction is available
	OCXO frequency correction via GNSS	≤0.05 ppm, when GNSS is locked
Aging and temperature stability	TCXO (std.)	≤1 ppm/year, ≤1 ppm
	OCXO (opt.01)	≤1 ppm/year, ≤0.15 ppm
Built-in GNSS 1PPS accuracy	± 100 ns	

SPECTRUM PURITY

SSB phase noise (dBc/Hz)

Carrier frequency	1 GHz	3 GHz	6 GHz
1 kHz	-115	-105	-98
10 kHz	-124	-114	-108
100 kHz	-125	-116	-110
1 MHz	-138	-128	-122

Harmonics CW, 0 dBm	100 MHz	≤-45 dBc
	1 GHz	≤-50 dBc
	3 GHz	≤-60 dBc
	6 GHz	≤-75 dBc
Non-harmonic spurious	1 MHz steps size and 20 MHz observation bandwidth Spurious levels are ≤-80 dBc for approximately 98% of frequency points Worst-case spurious ≤-55 dBc	
EVM (Typical)	1 GHz	≤0.3% 1MSPS QAM 16, Alpha = 0.35 ≤0.5% 10MSPS QAM 64, Alpha = 0.35
	6 GHz	≤0.5% 1MSPS QAM 16, Alpha = 0.35 ≤1.0% 10MSPS QAM 64, Alpha = 0.35

AMPLITUDE

	9kHz	100 MHz	1 GHz	3 GHz	6 GHz
Max. output power (dBm)	≥0	≥7	≥14	≥14	≥7
Min. output power (dBm)	≤-100	≤-100	≤-100	≤-100	≤-100
Power accuracy (Guaranteed/Typical)	Output power: ≥-45 dBm			±1.2 dB/0.7 dB	
	Output power: -80 dBm to -45 dBm			±1.5 dB/1.2 dB	
	Output power: -100 dBm to -80 dBm			±2.0 dB/1.8 dB	
Power setting step size	0.1 dB				

SIGNAL PROCESSING

Standard function	Single-tone, Multitone, Frequency sweep, Power sweep, AM, FM Digital ramp sweep, AWGN, IQ playback, Real-Time IQ playback
Modulation bandwidth	100 MHz RAM playback, 50 MHz continuous streaming
Built-in memory depth	125 MB (32 M samples)
IQ sampling rate	195.3125 kHz to 125 MHz, step size ≤10 Hz
Basic modulation signal generation	APSK: 16APSK ASK: 2ASK, 4ASK, 8ASK FSK: 2FSK, 4FSK, 8FSK, 16FSK QAM: 16 QAM,64 QAM,256 QAM,1024 QAM PSK: BPSK, QPSK, 8PSK, 16PSK, DBPSK, DQPSK, D8PSK, Pi/4 DQPSK

GENERAL

Input and output	
Power	Type-C, PD protocol (12 V/3 A std.) Voltage range 9 to 12 V, Ripple <200 mVpp
Data	Type-C, USB3.0 (USB2.0 bandwidth limited) Requires 5 V/1 A power supply
RF output	N(F), Output impedance 50 Ω
External reference clock input	MMCX(F), Amplitude ≥1.5 Vpp, Input impedance 330 Ω
Reference clock output	MMCX(F), Output impedance 50 Ω, 100 MHz
External trigger input	3.3 V CMOS, Input high impedance
External trigger output	3.3 V CMOS
GNSS antenna input	SMA (F)
Power consumption	≤16 W

Overall/core weight	≤360 g/≤120 g	
Overall/core dimensions (L × W × H)	≤163 x 66 x 37 mm/≤63 x 60 x 15 mm	
System requirements	Linux	aarch64, x64
	Windows	x64
Operating/storage temperature (Ambient)	T0 class (std.)	0 to 50 °C/-20 to 70 °C
	T1 class (opt.40)	-20 to 65 °C/-40 to 85 °C
	T2 class (opt.41), only core	-40 to 65 °C/-40 to 85 °C
Packaging accessories	Flash disk * 1, USB 3.0 data cable * 1, USB power cable * 1, Power adapter * 1	

Medium Power Output (opt.10)

Frequency range	10 MHz to 6 GHz	
Max. output power	≥25 dBm, typical	
Min. output power	≤-80 dBm, typical	
Power accuracy (Guaranteed/Typical)	Output power: ≥ -20 dBm	±1.2 dB / 0.7 dB
	Output power: -60 dBm to -20 dBm	±1.5 dB / 0.7 dB
	Output power: -80 dBm to -60 dBm	±2.5 dB / 1.2 dB
Harmonics CW, 0 dBm	100 MHz	≤-55 dBc
	1 GHz	≤-50 dBc
	3 GHz	≤-42 dBc
	6 GHz	≤-46 dBc

*Specification applies under the following conditions:

(1) 10 min warm-up after power-on

(2) Ambient temperature: 25 °C (instrument temperature: 50 °C)

(3) With adequate cooling ensuring both ambient and core temperatures remain within the rated range

*Specifications not listed for the medium-power output port are the same as the standard RF output port

OPTIONS

Code		
01	Built-in OCXO reference clock	built-in hardware
05	Built-in high precise GNSS	built-in hardware
10	Medium power RF output	built-in hardware
40	T1 temperature class	built-in hardware
41	T2 temperature class, only available for core	built-in hardware

www.harogic.com
info@harogic.com
+65-8299 8857