VSG20XX Series
Vector Signal Generator

Contents

1. Product Introduction

Saluki vector signal source products have a frequency range of 100kHz to 3/6/12/20/44/50/67GHz, an output power range of -110dBm to 15dBm a phase noise of -138dBc/Hz@1GHz, a frequency offset of 10kHz, ultra-low phase noise and spurious, an internal baseband real-time modulation bandwidth of up to 1GHz, and an external IQ input with a maximum modulation bandwidth of up to 2GHz. It supports the generation of a variety of modulation signals and has functions such as pre-distortion calibration.

Key Features:

- ✦ Frequency range: 100kHz to 3/6/12/20/44/50/67GHz
- ✦ Output power range: -120dBm to +15dBm
- ✦ Internal baseband maximum modulation bandwidth: 2GHz
- ✦ External baseband maximum modulation bandwidth: 2GHz
- ✦ Support digital modulation
- ✦ Support multi-tone signal
- ✦ Support multi-carrier digital modulation
- ✦ Support pulse radar
- ✦ Support continuous wave radar
- ✦ Support gaussian noise
- ✦ Support frequency hopping signal
- ✦ Ultra-low phase noise and spurious

2.Frequency technical indicators

Frequency characteristics		
Frequency range	VSG2003A	100kHz≤f≤3GHz
	VSG2006A	100kHz≤f≤6GHz
	VSG2012A	100kHz≤f≤12GHz
	VSG2020A	100kHz≤f≤20GHz
	VSG2044A	100kHz≤f≤44GHz
	VSG2050A	100kHz≤f≤50GHz
	VSG2067A	100kHz≤f≤67GHz
Resolution	0.001Hz	
Frequency switching speed	≤20ms	
Time base aging rate (typical value)	±5*10-10/day (after 30 days of continuous power supply)	

3.Power technical indicators

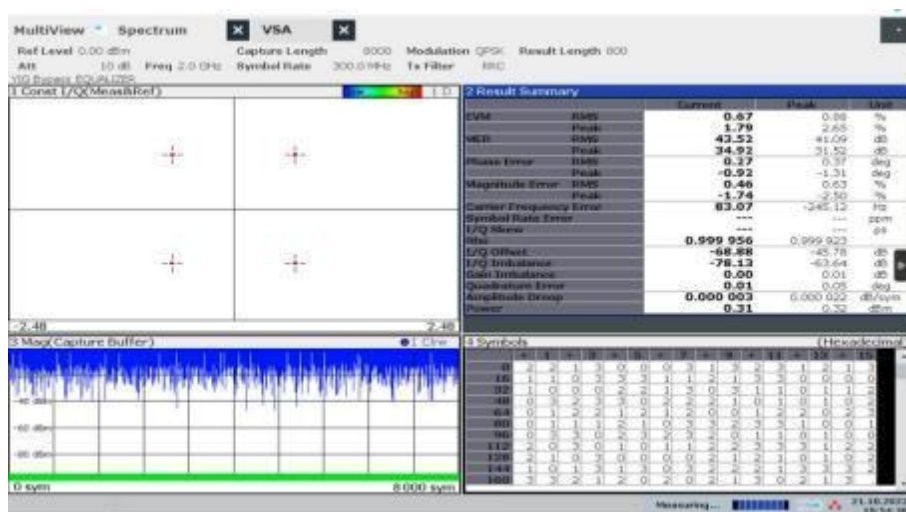| Power characteristics			
Minimum output power	Model	Standard	
	VSG2003A	-120dBm	
	VSG2006A	-120dBm	
	VSG2012A	-120dBm	
	VSG2020A	-120dBm	
	VSG2044A	-120dBm	
	VSG2050A	-100dBm	
	VSG2067A	-100dBm	
Maximum Power（PEP)	Frequency range	Standard	
	VSG2003A		
	100kHz≤f≤10MHz	+13dBm	
	10MHz < f≤3GHz	+15dBm	
	VSG2006A		
	100kHz≤f≤10MHz	+13dBm	
	10MHz < f≤6GHz	+15dBm	
	VSG2012A		
	100kHz≤f≤10MHz	+13dBm	
	10MHz < f≤6GHz	+15dBm	
	6GHz < f≤12GHz	+15dBm	
	VSG2020A		
	100kHz≤f≤10MHz	+13dBm	
	10MHz < f≤6GHz	+15dBm	
	6GHz < f≤12GHz	+15dBm	
	12GHz < f≤20GHz	+15dBm	
	VSG2044A		
	100kHz≤f≤10MHz	+13dBm	
	10MHz < f≤6GHz	+15dBm	
	6GHz < f≤12GHz	+15dBm	
	12GHz < f≤20GHz	+15dBm	
	20GHz < f≤40GHz	+13dBm	
	40GHz < f≤44GHz	+5dBm	
	VSG2050A		
	100kHz≤f≤10MHz	+13dBm	
	10MHz < f≤6GHz	+15dBm	

|	6GHz < f≤12GHz	+15dBm		
	12GHz < f≤20GHz	+15dBm		
	20GHz < f≤40GHz	+13dBm		
	40GHz < f≤50GHz	+13dBm		
	VSG2067A			
	100kHz≤f≤10MHz	+13dBm		
Maximum Power（PEP)	50MHz < f≤6GHz	+15dBm		
	6GHz < f≤12GHz	+15dBm		
	12GHz < f≤20GHz	+15dBm		
	20GHz < f≤40GHz	+15dBm		
	40GHz < f≤50GHz	+10dBm		
	50GHz < f≤60GHz	+9dBm		
	60GHz < f≤67GHz	+5dBm		
	Power / Frequency	-120dBm < P≤-70dBm	-70dBm < P≤-20dBm	-20dBm < P
	100KHz≤f≤10MHz	≤±2.0dB	≤±1.3dB	≤±1.0dB
Power accuracy	10MHz < f≤20GHz	≤±2.5dB	≤±1.0dB	≤±0.5dB
	20GHz < f≤40GHz	≤±3.0dB	≤±1.5dB	≤±1.0dB
	40GHz < f≤67GHz	≤±3.0dB	≤±2.0dB	≤±1.5dB
Power resolution	0.01dB			
Power temperature stability	0.02dB/℃(Typical value)			
Output Impedance	50Ω(Rated value)			
	100kHz≤f≤2GHz	＜ 1.40∶ 1@Attenuator attenuation10dB		
VSWR	2GHz < f≤20GHz	＜ 1.50∶ 1@Attenuator attenuation10dB		
	20GHz < f≤44GHz	＜ 1.80∶ 1@Attenuator attenuation10dB		
	44GHz < f≤67GHz	＜ 2.0∶ 1@Attenuator attenuation10dB		
Maximum reverse power	0.5W （0V DC）(Rated value)			

4.Spectral purity technical indicators

| Spectral purity								
	Frequency	Standard						
	100kHz≤f≤10MHz	< -30dBc						
	10MHz < f≤200MHz	< -40dBc						
	200MHz < f≤24GHz	< -50dBc						
Sub-harmonics Output power: 10dBm	10MHz≤f≤2GHz	< -85dBc						
	2GHz < f≤10GHz	< -80dBc						
	10GHz < f≤20GHz	< -70dBc						
	20GHz < f≤44GHz	< -65dBc						
	44GHz < f≤67GHz	< -60dBc						
Non-harmonic Output achievementRate: 0dBm	Frequency	Options 1		Option 2 (Ultra-low phase noise option)				
	100kHz≤f≤10MHz	< -65dBc		< -65dBc				
	10MHz < f≤6GHz	< -75dBc		< -85dBc				
	6GHz < f≤12GHz	< -70dBc		< -80dBc				
	12GHz < f≤24GHz	< -65dBc		< -75dBc				
	24GHz < f≤40GHz	< -60dBc		< -70dBc				
	40GHz < f≤67GHz	< -55dBc		< -65dBc				
Phase noise dBc/Hz dBc/Hz(outputpower:10dBm)	Frequency / Frequency Deviation	10Hz	100Hz	1kHz	10kHz	20kHz	1MHz	10MHz
	Standard							
	1GHz	-	-105	-128	-138	-138	-138	-145
	5GHz	-	-92	-116	-124	-124	-126	-145
	10GHz	-	-86	-112	-120	-120	-120	-140
	20GHz	-	-80	-106	-114	-114	-114	-134
	40GHz	-	-75	-95	-105	-105	-110	-120
	67GHz	-	-70	-90	-100	-100	-105	-115
	Frequency / Frequency Deviation	10Hz	100Hz	1kHz	10kHz	20kHz	1MHz	10MHz
	Ultra-low phase noise option							
	1GHz	-88	-108	-135	-146	-146	-154	-155
	5GHz	-78	-98	-127	-136	-136	-146	-150
	10GHz	-72	-92	-122	-130	-130	-140	-155
	20GHz	-66	-86	-116	-124	-124	-133	-149
	40GHz	-60	-80	-110	-117	-117	-127	-143
	67GHz	-55	-75	-105	-112	-112	-122	-135

5.Modulation characteristics

Working Mode	Internal baseband IQ or external baseband IQ ;
Maximum modulation bandwidth	2GHz
EVM	≤2% Symbol rate 400Msps, QPSK@20GHz
Storage Depth	512Msa(standard) 1GSa2GSaoptional
Modulation format	
QAM	4、 16、 32、 64、 128、 256、 512、 1024、 2048、 4096
PSK	BPSK、 QPSK、 8PSK、 16PSK、 OQPSK、 、 D8PSK、 π/4-QPSK、 π/4-DQPSK、 π/8-D8PSK、 π/4-QPSK、 π/2-DBPSKetc
FSC	2-FSK、 4-FSK、 8-FSK、 16-FSK、 32-FSKetc
APPROVED	16APSK ,32APSK,64APSK,128APSK,256APSK,etc.,theconstellationradiusratiocanbedefined
MSK	MAK,GMSK,ASK
Arbitrary Waveform Mode	User-defined waveform file playback
Shaping filter	Rectangular / Raised Cosine / Gaussian etc. optional
Forming roll-off factor	0.1-1 , default 0.35
Baseband information optional	PN9/PN11/PN15/PN23/ etc. custom files
Analog Modulation	AM , FM , PM
Scanning characteristics	
Scan Mode	Step sweep, list sweep, power sweep

2GHz   QPSK Symbol rate300MHz EVM
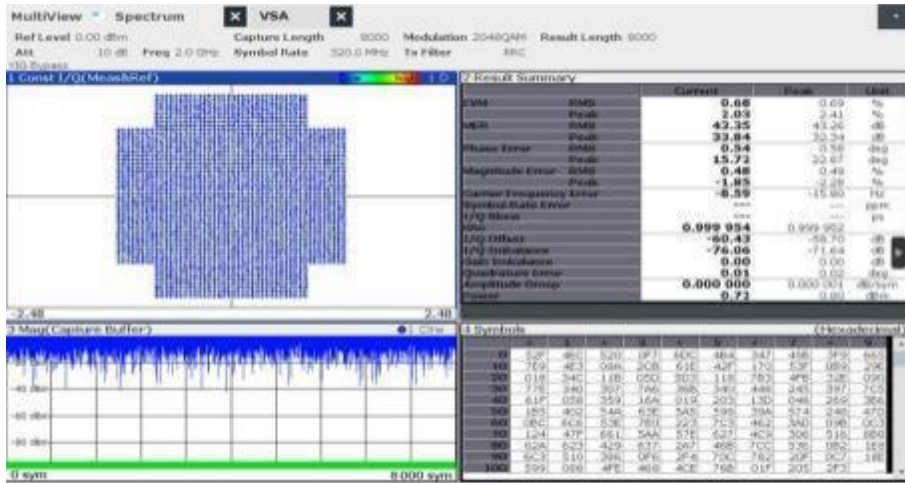
2GHz 2048QAM symbol rate 320MHz EVM
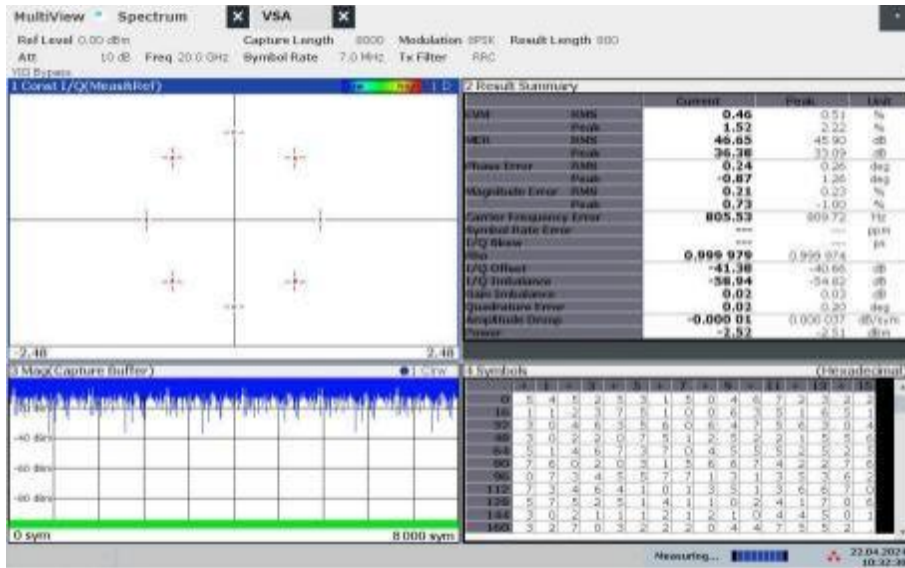
20GHz8PSK symbol rate7MHz EVM

6.Internal and external reference characteristics

Reference Features With inside and outside 10MHz Reference switching function	
Internal reference frequency stability	±2e-8 0 ℃~ +50 ℃
External reference input power	5dBm±3dBm
Internal reference output power	+10dBm±3dB

7.Interface and structure

RF Output	2.92/2.4/1.85mm panel connector, output impedance 50Ω internal
Pulse output	BNC
External pulse input	BNC
External reference input	BNC
Internal reference output	BNC
External trigger input	BNC
external IQ enter	BNC
internal IQ Output	BNC
Control interface	RJ-45(TCP/IP over Ethernet)/ RS422

8.Signal generation software

The signal generation software mainly includes functional units such as general digital modulation, multi-carrier digital modulation, pulse radar, continuous wave radar, multi-target radar, multi-tone signal, Gaussian noise, single-tone signal, complex electromagnetic environment, frequency hopping signal, and pre-distortion calibration.

8.1 Radar Signals

| Radar signal |
| --- |
| Create one or more pulse groups |
| Define each pulse group independently, and use different pulse groups to simulate the scenario where multiple target echoes arrive at the same time |
| Define frequency and amplitude between and within pulses |
| Define all pulse parameters, including start time, rise time, end time, fall time, pulse width, etc. |
| Defining the PRI |
| Creating a custom pulse sequence |
| Supports various types of intra-pulse modulation, including linear frequency modulation, Barker code, Frank, FMCW frequency modulation continuous wave, etc. |
| Support frequency sliding, frequency diversity, etc. |
| Supports frequency stagger, frequency sliding, frequency group change, etc. |
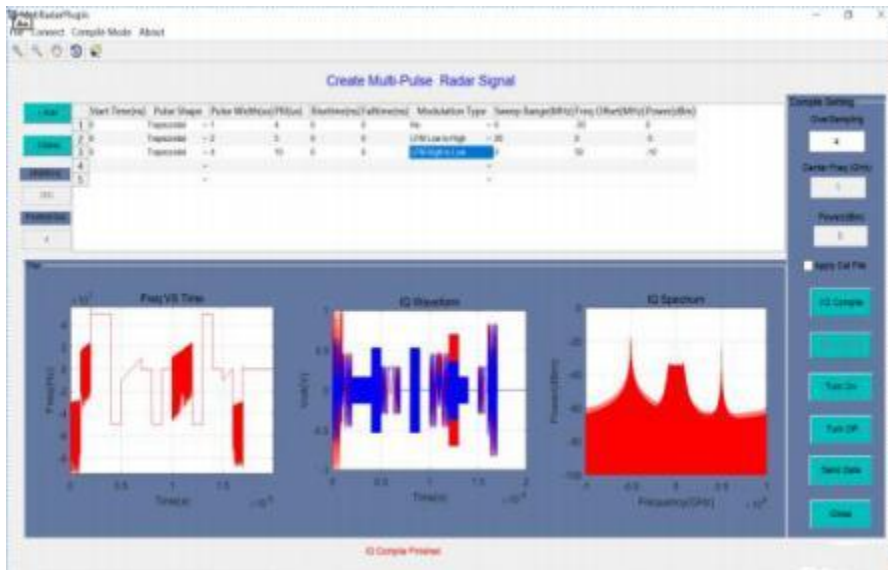
8.2 Communication Signals

| Communication Signal	
	Define baseband IQ signals, IF signals, and RF signals using various modulation schemes
	Generate single or multi-carrier modulated signals, each carrier can be defined independently
	Supports multiple modulation formats, including
	BPSK, Pi/2 BPSK, QPSK, OQPSK, Pi/4-QPSK, Pi/2-QPSK, 8-PSK, O-8PSK, Pi/2-8PSK, 16-PSK, QAM16, Pi/2-QAM16, QAM32, QAM64, QAM128, QAM256, QAM512, QAM1024, QAM2048, QAM4096, APSK16, APSK32, APSK64, APSK128, APSK256, PAM4, QAM8, CPM, DPSK, DQPSK, Pi/2-DPSK, Pi/4-DQPSK, 8-DPSK, 16-DPSK, PAM8, PAM16, 2-FSK, 4-FSK, 8-FSK, 16-FSK, 32-FSK, ASK, OOK, MSK,
	Supports I-Q impairments such as quadrature error and gain imbalance
	Supports shaping filter types: raised cosine, rectangular, RMS raised cosine, Gaussian, etc.
	Up to 50 modulation formats
	Support multi-carrier modulation
	Define baseband IQ signals, IF signals, and RF signals using various modulation schemes
	Generate single or multi-carrier modulated signals, each carrier can be defined independently
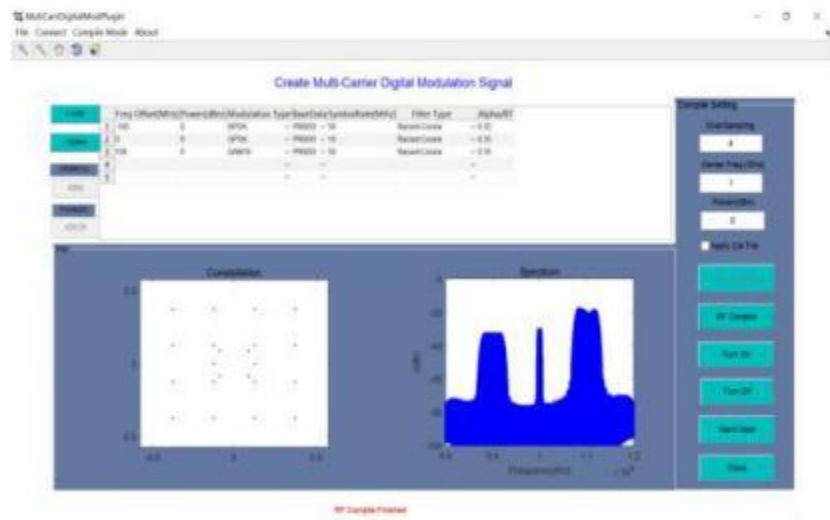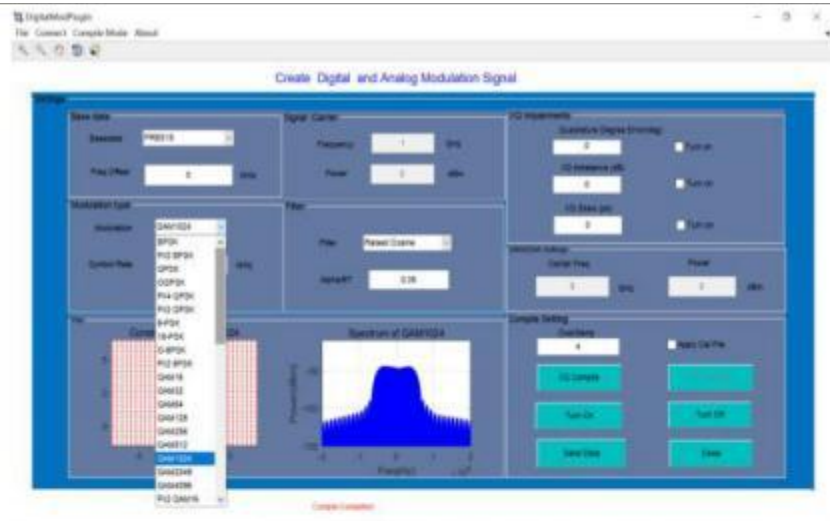
8.3 Multi-tone Signal

Multi-tone signal	
	Multi-tone signals can define baseband IQ signals, IF signals, and RF signals
	The number of polyphonic sounds and the frequency steps of polyphonic sounds can be customized
	The frequency and power of each tone can be customized
	You can set the starting phase: random phase or custom phase
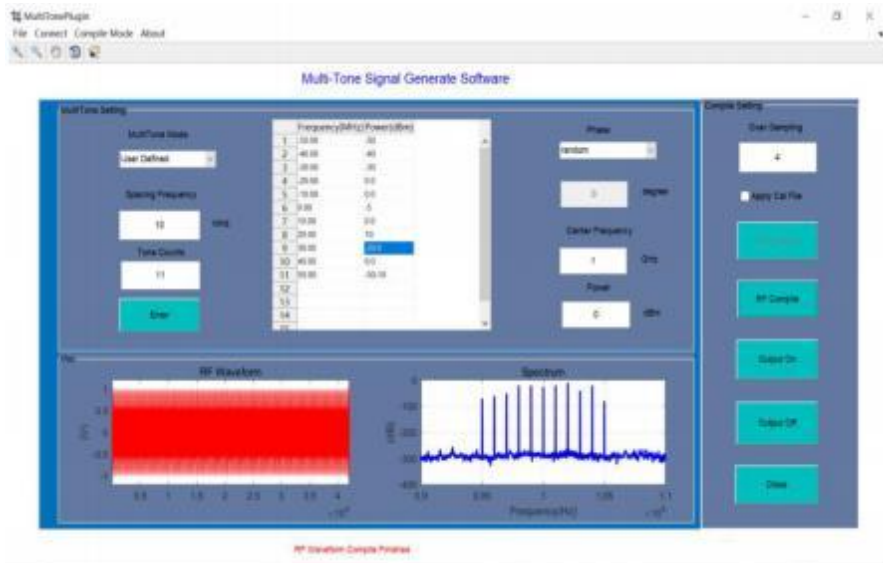
8.4 Noise Signal

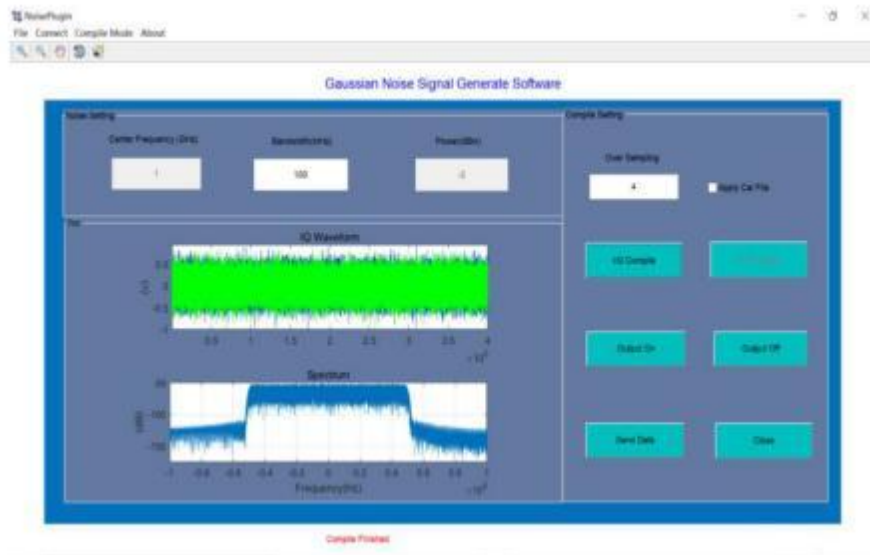| Noise signal |
|---|
| Noise signals define baseband IQ signals, IF signals, and RF signals |
| The center frequency and bandwidth of the noise signal can be set |
| The noise power can be set |

8.5 Complex Electromagnetic Environment Signals

Complex electromagnetic environment signals
Communication Signal
Radar signal
Multi-tone signal
Noise signal
Single tone signal
Custom Signals

8.6 Predistortion Calibration

Predistortion Calibration
Supports baseband IQ signal, IF signal and direct AWG signal
The start and end frequencies of the calibration can be set
The frequency step of calibration can be set
The number of iterations can be set
Automatically save pre-distortion calibration data files
External custom data files can be loaded for pre-distortion compensation
The difference in amplitude-frequency and phase characteristics before and after pre-distortion calibration can be compared
Automatic online system calibration can be performed through simple and convenient operation to improve system broadband performance

8.7 Frequency Hopping Signal

Frequency Hopping Signal
Creating Custom Frequency Hopping
Creating pseudo-random frequency hopping
Create custom frequency random hopping
Definable skip speed
Frequency hopping with different intervals can be defined
The power of each hopping frequency can be defined
The frequency hopping start frequency, end frequency and frequency hopping step can be defined

9.General Features

General Parameters	
powered by	AC,198 ~ 242VAC, 45Hz~ 55Hz, 150W (MAX)
Operating temperature	0 to 55°C
Storage temperature	-40 to 70 ℃
Relative humidity	20% ~ 80% (+30 ℃)
Recommended calibration cycle	36 months
ISOCertification	The instrument is manufactured by an ISO9001 certified unit and complies with the quality system requirements.
size	VSG2003A/VSG2006A/VSG2012A/VSG2020A:Width*Height*Depth 448*132*425 VSG2044A/VSG2050A: Width* Height * Depth 448*132*574 VSG2067A/ VSG20 20D/ VSG2044D : Width* depth* height 450*583*220
Power consumption	VSG2003A/VSG2006A/VSG2012A/VSG2020A:≤150w VSG2044A/ VSG2050A/VSG2067A/VSG2020D/VSG2044D:≤250w
weight	VSG2003A/VSG2006A/VSG2012A/VSG2020A:≤18kg VSG2044A/VSG2050A:≤20kg VSG2067A/VSG2020D/VSG2044D:≤30kg

10.Ordering Information

10.1 Host

Host	
VSG2003A	Vector signal source 100kHz≤f≤3GHz
VSG2006A	Vector signal source 100kHz≤f≤6GHz
VSG2012A	Vector signal source 100kHz≤f≤12GHz
VSG2020A	Vector signal source 100kHz≤f≤20GHz
VSG2044A	Vector signal source 100kHz≤f≤44GHz
VSG2050A	Vector signal source 100kHz≤f≤50GHz
VSG2067A	Vector signal source 100kHz≤f≤67GHz
VSG2020D	Dual channel vector signal generator, 100kHz≤f≤20GHz
VSG2044D	Dual channel vector signal generator, 100kHz≤f≤44GHz

10.2 Standard

Serial number	Name	Illustrate
1	Power Cord Assembly	Standard power cord
2	User Manual	

10.2 Options

Option		
Option No.	name	Functional and performance requirements
VS-PN002	Ultra-low phase noise option	Optimized phase noise, 10GHz@10kHz : -130dBc/Hz .
VS-BB200	200MHz Modulation bandwidth	The internal modulation bandwidth is 200MHz .
VS-BB500	500MHz modulation bandwidth	The internal modulation bandwidth is 500MHz .
VS-BB1000	1GHz modulation bandwidth	The internal modulation bandwidth is 1GHz .
VS-BB2000	2GHz modulation bandwidth	The internal modulation bandwidth is 2GHz .
VSD-BB200	Channel 2 modulation bandwidth 200MHz	aisle 2The internal modulation bandwidth is 200MHz .
VSD-BB500	Channel 2 modulation bandwidth 500MHz	aisle 2The internal modulation bandwidth is 500MHz .
VSD-BB1000	Channel 2 modulation bandwidth 1GHz	aisle 2The internal modulation bandwidth is 1GHz .
VSD-BB2000	Channel 2 modulation bandwidth 2GHz	aisle 2The internal modulation bandwidth is 2GHz .
VSD-C001	Coherent extension function	Realize phase coherent input and output interface connection.
VS-M001	Arbitrary wave modulation function	Supports arbitrary wave data download and playback, generating baseband signals or realizing signal playback.
VS-M002	Multi-tone modulation function	Realize multi-tone modulation function.
VS-M003	Intra-pulse modulation function	Intra-pulse linear frequency modulation, Barker code and other functions.
VS-M004	Additive white Gaussian noise generation function	Supports pure noise generation, additive white Gaussian noise (AWGN) and continuous wave interference functions.
VS-M005	Multi-carrier signal generation function	Realize multi-carrier signal output.
VS-M006	Frequency hopping signal generation function	Realize the frequency hopping signal generation function.
VS-M007	Analog modulation function	Added analog modulation capabilities, including AM ,FM, ΦM
VS-M008	Wave file playback function	Plays user files in a specific format.
VS-M009	Sequence file playback function	Play one or more files in sequence or by external trigger, and Adjustable trigger delay.
VS-P001	Pulse modulation function	Add pulse modulation function, minimum pulse width 50ns
VS-P002	Narrow pulse modulation function	Add pulse modulation function, minimum pulse width 20ns
VS-S001	Power sweep function	Added power scan function