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USG5000V Series RF Vector Signal Generators

Data Sheet

V 1.2

February，2026

USG5000V Series RF Vector Signal Generators

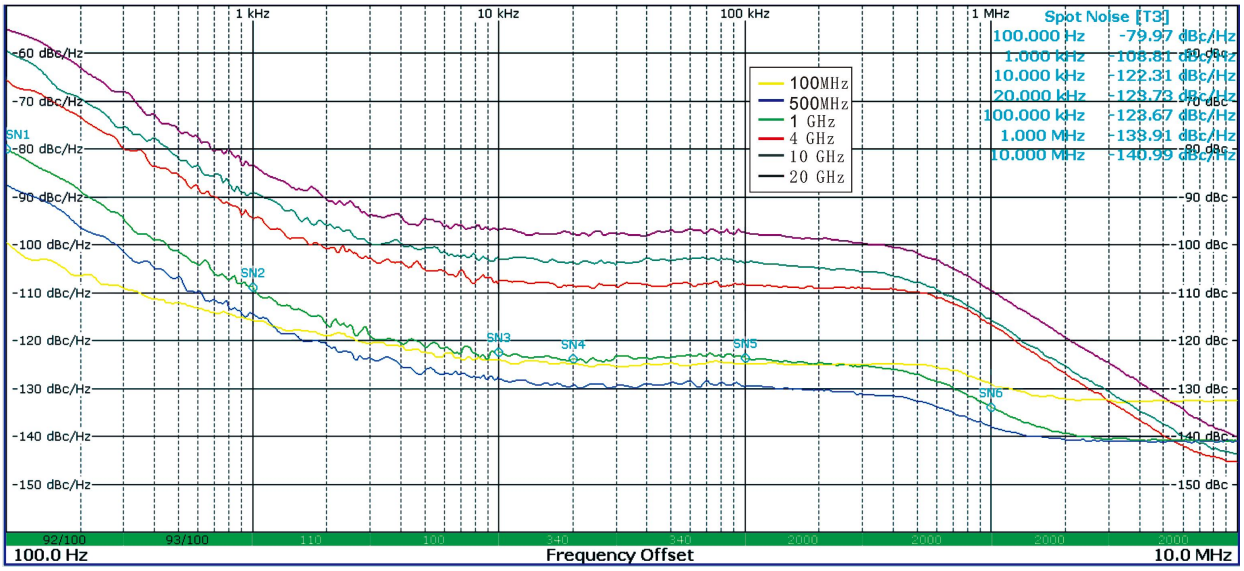
Key Features

- Maximum output frequency: 14 GHz and 22 GHz
- Output frequency resolution: 0.001 Hz
- Level range: -135 dBm to 25 dBm
- Phase noise:<-122 dBc/Hz @ 1 GHz, offset 20 kHz (Typ.)
- Amplitude accuracy: ≤0.7 dB (Typ.)
- Analog modulation: AM, FM, ΦM (Phase modulation)
- Analog modulation sources: Internal, external, and internal + external
- Supports general modulation and can output various real-time modulated signals, including QAM, FSK, ASK, and PSK
- Supports waveform file playback, waveform sequence generation and playback, multi-tone, and IoT signal generation and playback
- Capable of generating signals for common communication protocols (e.g., 5G NR, WLAN, LTE, Bluetooth, IoT) when paired with mobile communication signal simulation software
- Supports real-time IQ baseband AWGN (Additive White Gaussian Noise), precisely controlling signal and noise power without additional measurements for receiver testing
- Standard high-stability clock source (OCXO)
- Built-in 50 MHz function/arbitrary waveform generator
- Optional power meter control kit allows convenient power measurement, output control, and line loss correction
- Optional pulse modulation with an on-off ratio up to 80 dB and customizable pulse sequence
- Optional narrow pulse modulation supports pulses with a minimum width of 40 ns and a resolution up to 10 ns

Design Feature

High spectral purity ensures that advanced testing can be conducted with greater precision and reliability

USG5000V series RF vector signal generator delivers high-purity spectrum signals, with typical single-sideband (SSB) phase noise of -122 dBc/Hz at a 20 kHz offset (Typ.) for a 1 GHz carrier.



* Measured Single Sideband Phase Noise

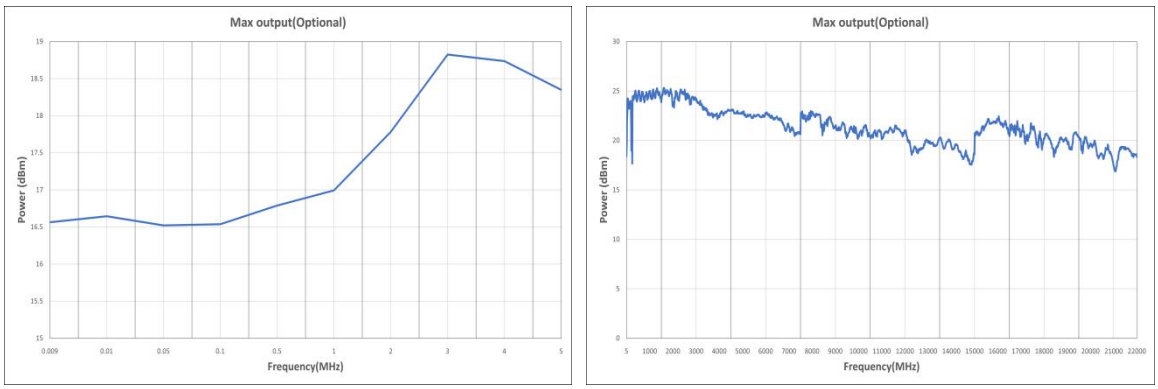
Large Dynamic Range, High-Accuracy Power Output

Maximum output power (Typ.): +25 dBm at 1.6 GHz

Minimum output power: -135 dBm

Dynamic range: up to 160 dB

Excellent power accuracy with a typical value of < 0.7 dB (Typ.)



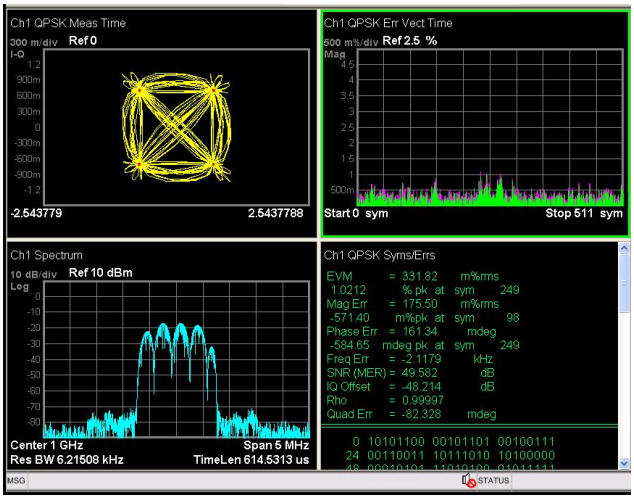
* Measured Maximum Output Power

Excellent Vector Modulation Accuracy for Communication Device Calibration and Testing

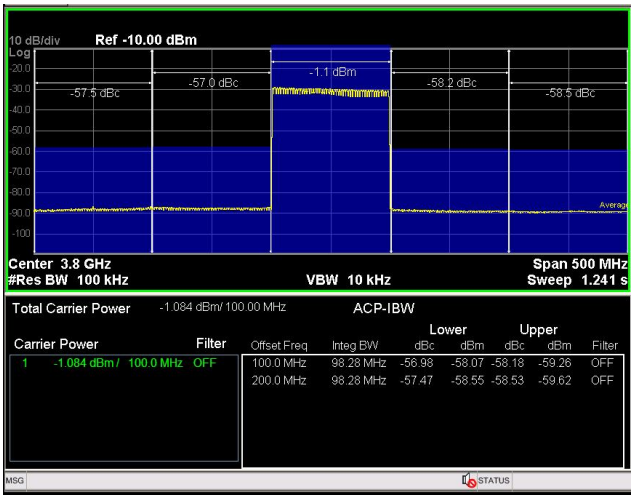
USG5000V series RF vector signal generator delivers outstanding vector modulation accuracy. With QPSK modulation at a 1 GHz carrier, it achieves an EVM (Error Vector Magnitude) of just 0.4%.

It also provides solid adjacent channel power ratio (ACPR) performance: for 5G NR signals, the typical ACPR is < -55 dBc @ 3.8 GHz carrier (Typ.).

These capabilities make the USG5000V series ideally suited for both R&D performance evaluation and production line testing of communication devices.



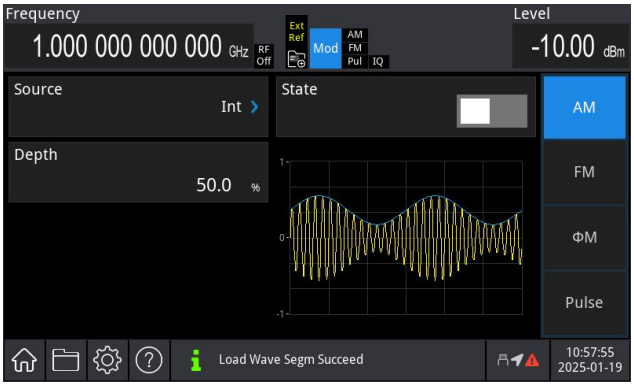
EVM Measurement Results for QPSK



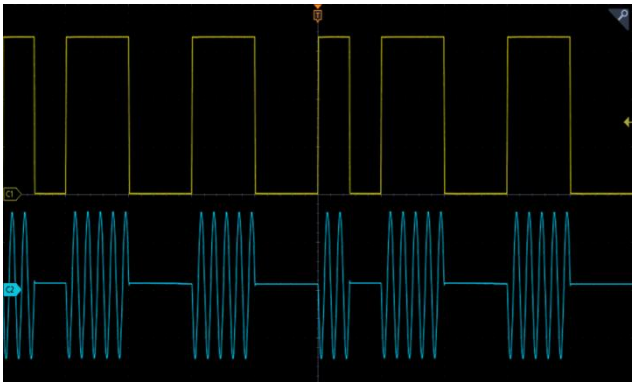
5G NR ACPR Measurement Results at 3.8 GHz Carrier

Comprehensive Analog Modulation

Supports AM, FM, and ΦM, with optional pulse and narrow pulse modulation capable of outputting pulses as short as 40 ns with 10 ns resolution, meeting the testing requirements of applications such as automotive millimeter-wave radar systems.



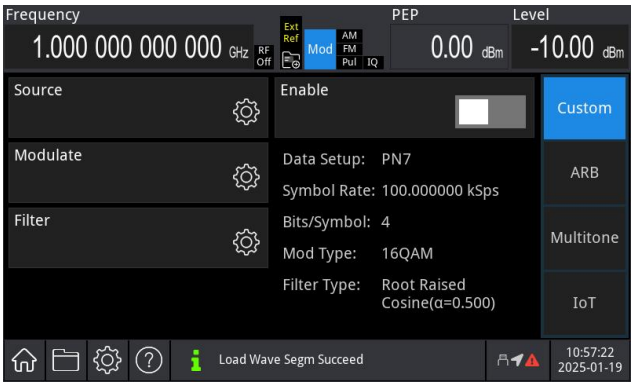
Analog Modulation Setting Interface



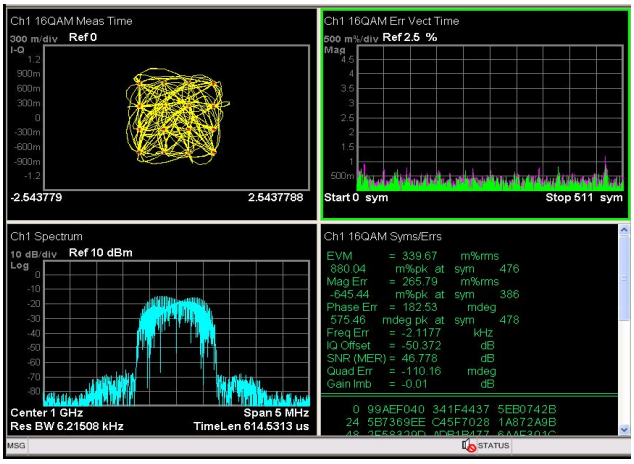
Measured Pulse Modulation Output

Complete Standard Digital Modulation Formats

Generates real-time digital standard modulated signals including PSK, FSK, QAM, and ASK, while also supporting custom modulation types and filling settings, covering all critical frequency bands and digital communication formats.



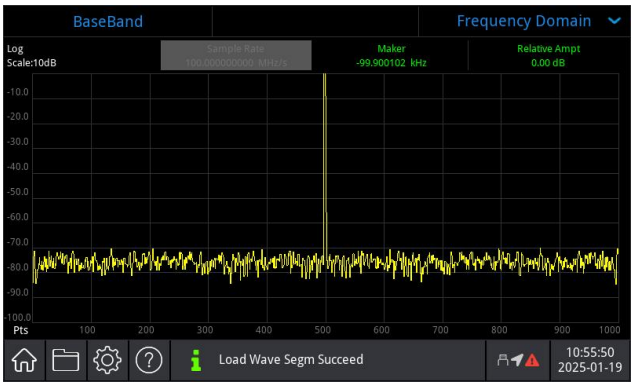
Digital Modulation Settings Interface



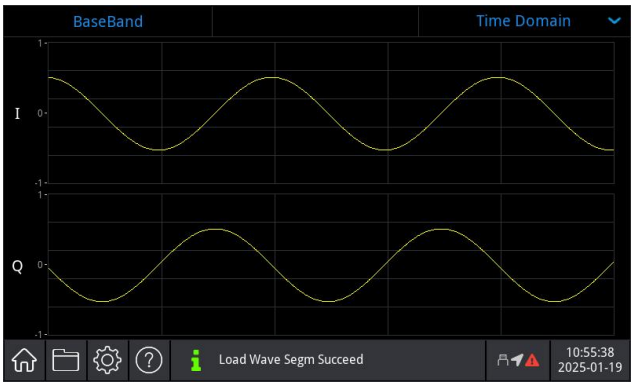
QAM16 Demodulated Signal Measuremen

ARB Playback Mode

Enables playback of user-defined arbitrary waveform data at variable sampling rates. Combined with baseband preview, it allows real-time verification of waveform correctness in both the time and frequency domains.



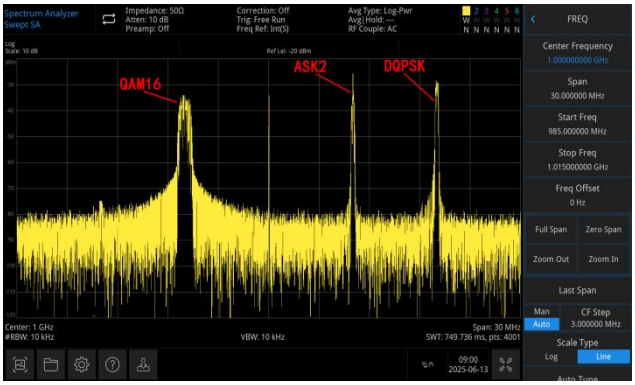
Arbitrary Waveform IQ Spectrum Display



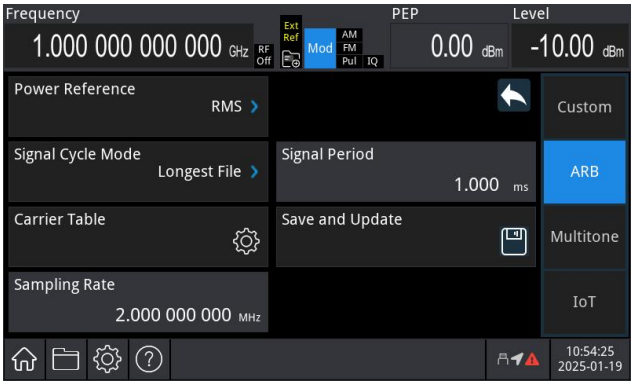
Arbitrary Waveform IQ Display

ARB Multi-Carrier Mode

Supports splitting wideband signals into multiple narrowband subcarriers, with each subcarrier capable of independent modulation and data transmission. This enables simplified construction of complex signal environments.



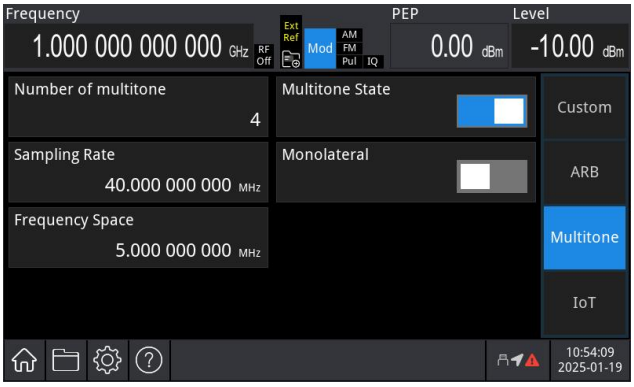
Multi-Carrier with Different Modulation Types



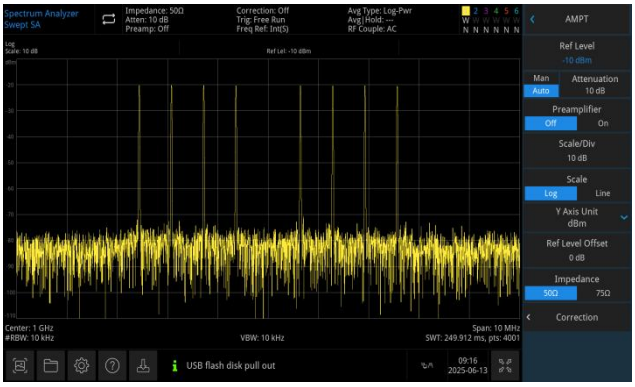
Multi-Carrier Modulation Settings Interface

Multi-Tone Mode

Generates multiple frequency components simultaneously to simulate complex signals. It can reproduce multi-frequency scenarios in frame-based testing, allowing effective verification of device performance under challenging spectrum conditions.



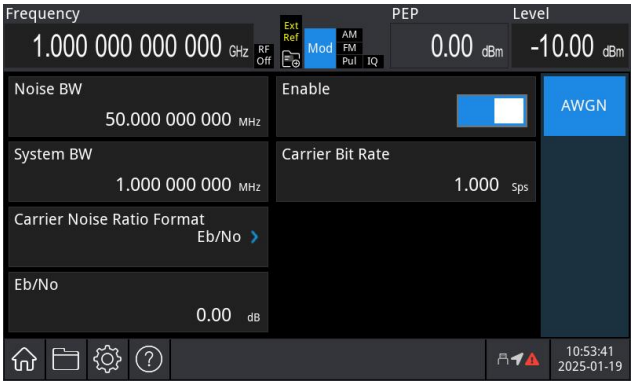
Multi-Tone Modulation Settings Interface



Multi-Tone Modulation Spectrum Display

Multi-Type Noise Injection

Provides output of pure noise and additive white Gaussian noise (AWGN), supporting flexible noise simulation in diverse testing scenarios.



AWGN Settings Interface



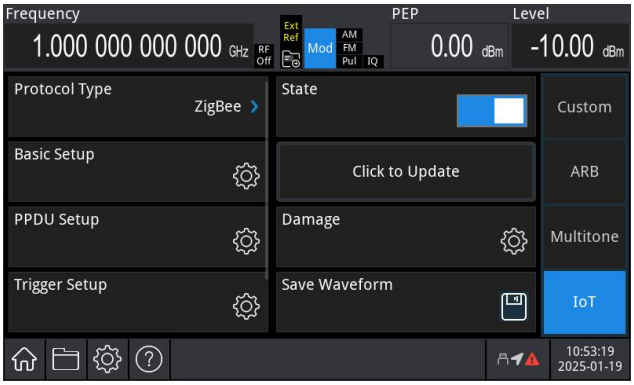
AWGN Spectrum Display

IoT Function

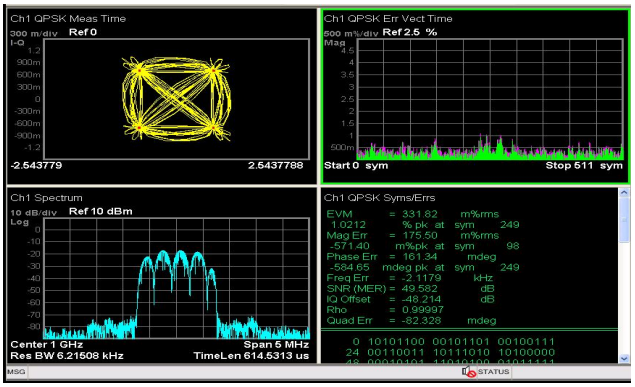
The USG5000V series RF vector signal generator supports IoT-focused configurations, including:

Protocol types: ZigBee, Z-Wave

Modulation parameters: Flexible settings such as modulation count and modulation methods.



IoT Settings Interface

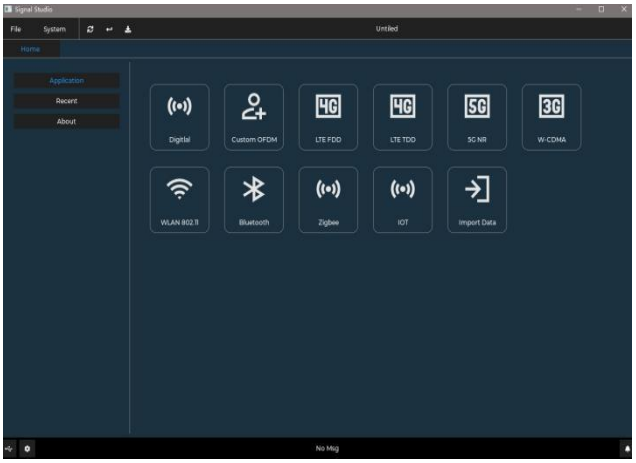


EVM Demodultion Measurement Results

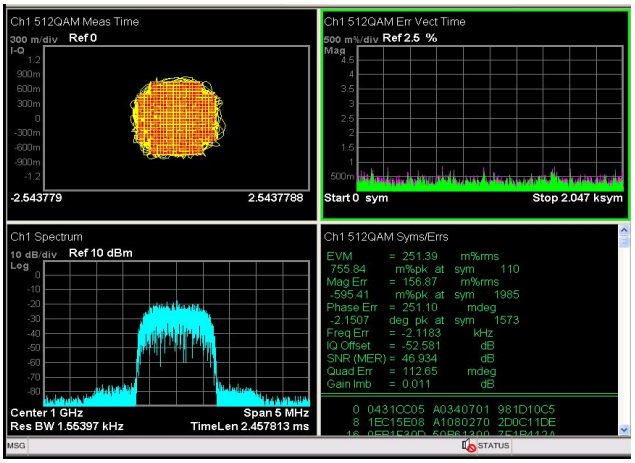
Mobile Communication Signal Simulation: SignalStudio

Designed for the R&D and production of mobile communication base stations and terminals, as well as RF compliance testing required for network access verification and approval.

When combined with mobile communication signal simulation software, the USG5000V series RF vector signal generator supports the simulation, generation, and editing of signals across multiple communication protocols.



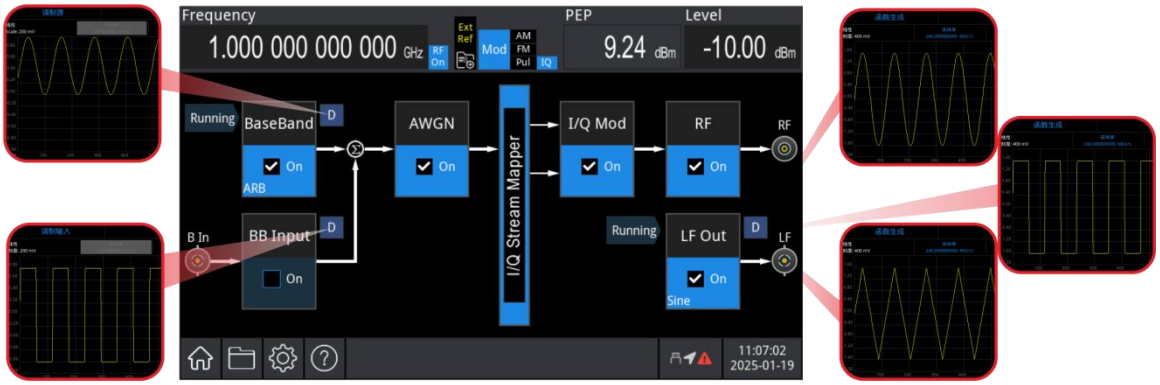
Host PC software



ARB Output 512QAM Signal

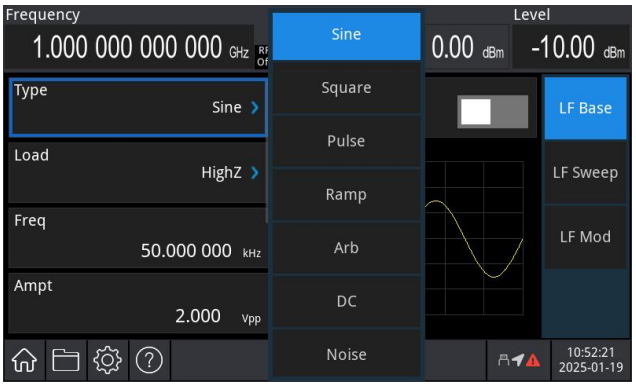
Touch-Controlled Graphical Guided Interaction

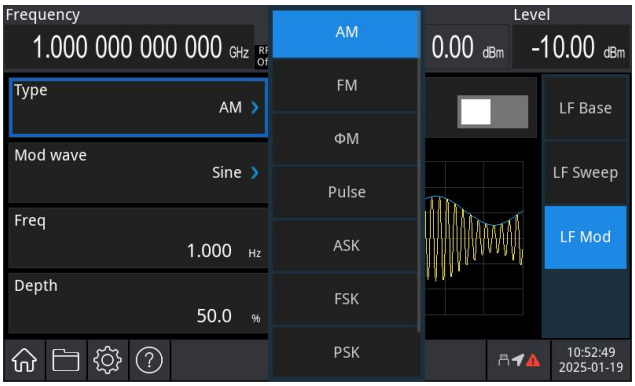
Equipped with a 5.0-inch high-resolution touch screen, it provides a clear view of key parameters and instrument status. The signal flow diagram-guided interface delivers an intuitive display and user-friendly operation.



Low-Frequency Function, Arbitrary Waveform Generator

Built-in 50 MHz function signal generator supports: standard waveform output, sweep functions, and modulation functions.





Convenient Operation

USG5000V series provides multiple control methods, making instrument operation flexible and efficient. Users can operate the instrument directly through the touch screen, connect via LAN/USB/GPIB, or perform remote control through software and SCPI commands.

1. **Touch Screen**

   The USG5000V series offers a human-computer interaction system with full touch control. All functions, except for the power switch, can be operated via the touch interface.

2. **Power Meter Kit**

   An optional power meter kit can be connected to the instrument through the front-panel USB port, enabling power measurement, power output control, and line loss calibration.

3. **LAN and USB Port (Option GPIB)**

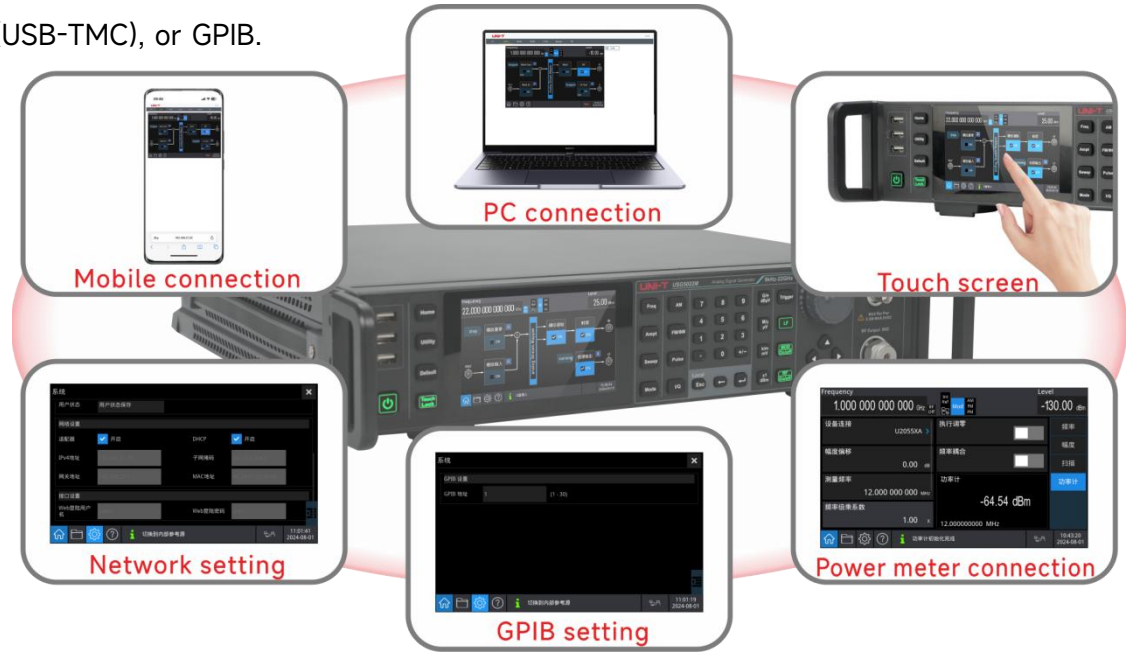
   USG5000V series can be controlled via the LAN, USB, and GPIB ports on the rear panel, either by sending commands directly or through host computer control. It supports the standard SCPI command set, enabling remote operation through these ports. Additionally, users can employ programming tools like Excel and LabVIEW to automate batch command execution, meeting diverse automated testing requirements.

4. **Web Control**

   Users can access the Web Control page by entering the IP address of the USG5000V into a web browser's address bar. The page supports connections from both PC and mobile devices.

5. **Device Manager (V2.5.0 and higher)**

   UNI-T offers free instrument management software for device control. By installing device manager on a PC, users can manage the instrument via LAN (VXI-11, Socket), USB Device (USB-TMC), or GPIB.

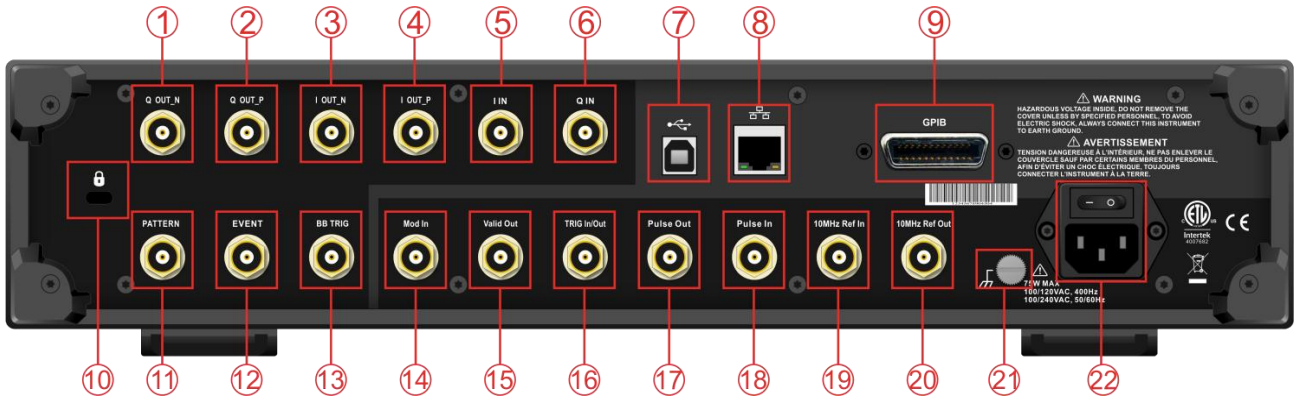


Series Pane Overview



Front Panel

No.	Description	No.	Description
1	USB Host	2	Auxiliary function button
3	Touchscreen display area	4	Function menu button
5	Numeric keypad	6	Output control button
7	Multi-function rotary knob Arrow keys	8	LF output terminal
9	RF output terminal	10	Power switch



Rear Panel

No.	Description	No.	Description
1	I/Q modulation quadrature component output (Differential negative terminal)	2	I/Q modulation quadrature component output (Differential positive terminal)
3	I/Q modulation in-phase component output (Differential negative terminal)	4	I/Q modulation in-phase component output (Differential positive terminal)
5	External modulation I-baseband input	6	External modulation Q-baseband input
7	USB port	8	LAN port
9	GPIB port (Option)	10	Safety lock
11	Pattern triggering input	12	Marked identification point output
13	Baseband triggering input	14	External analog modulation input

15	Signal output interface	16	Trigger signal input/output
17	Pulse signal output	18	Pulse signal input
19	External 10MHz input	20	Internal 10MHz output
21	Ground stud	22	Power switch, AC input

Technical Specification

Definitions:

- The "**Technical Specification**" provides a detailed description of the parametric performance that is covered by the product warranty. Unless otherwise stated, these specifications are valid within a temperature range of 20°C to 30°C.
- **"Typical Value (Typ.)"** refers to performance data that is not covered in the product warranty. It represents the usual performance under standard conditions but does not guarantee adherence to specific performance metrics. When performance exceeds these typical values, 80% of the units are expected to demonstrate the specified performance with a 95% confidence level, within the 20°C to 30°C temperature range. It is important to note that measurement uncertainties are not included in the typical performance values.
- **"Nominal Value (Nom.)"** describes the expected mean or average performance of the product, which is useful in product applications but is not covered under the product warranty.

Conditions:

To meet these specifications, the instrument should first meet the following conditions.

- The instrument must be warmed up for at least 30min within the calibration period.
- If the instrument is stored in an environment that is within the allowable storage temperature range but outside the allowable operating temperature range, it must be allowed to acclimate to the allowable operating temperature range for at least two hours before being powered on.

Product Function and Model Comparison Table

	USG5014V	USG5014V-P	USG5022V-P
Mechanical attenuator	×	●	●
Electronic attenuator	●	×	×
RF output	●	●	●
LF output	●	●	●
High stability clock source	●	●	●
I/Q Mode	●	●	●
IOT	●	●	●
Multi-tone	●	●	●
Baseband generator with real-time capability	●	●	●
Baseband generator 150 MHz RF bandwidth	●	●	●
Pulse modulation	○	○	○
Narrow pulse generator	○	○	○
Power meter kit	○	○	○

GPIB port	○	○	○

Note: ● standard ○ option × Not Available

Frequency Specifications

Frequency Range			
Model		USG5014V/USG5014V-P	USG5022V-P
Frequency range	CW mode	9 kHz to 14 GHz	9 kHz to 22 GHz
	I/Q mode	> 5 MHz to 6 GHz	> 5 MHz to 6 GHz
Resolution		0.001 Hz	
Phase offset		Step of 0.1°	

Frequency Bands		
Band	Frequency Range	N
1	9 kHz ≤ f ≤ 5 MHz	Digital synthesis
2	5 MHz < f ≤ 137.5 MHz	0.0625
3	137.5 MHz < f ≤ 250 MHz	0.125
4	250 MHz < f ≤ 468.75 MHz	0.03125
5	468.75 MHz < f < 937.5 MHz	0.0625
6	937.5 MHz ≤ f < 1,875 MHz	0.125
7	1,875 MHz ≤ f≤ 3,750 MHz	0.25
8	3,750 MHz < f ≤ 7,500 MHz	0.5
9	7,500 MHz < f ≤ 15,000 MHz	1
10	15,000 MHz < f ≤ 22,000 MHz	2

Note: N indicates a factor used to define certain specifications in this document.

Internal Reference Frequency	
Accuracy	± (Time since last adjustment x Aging rate)
	± Temperature effects
	± Line voltage effects
	± Calibration accuracy
Oscillator aging rate	≤ ± 0.2 ppm/year
Initial calibration accuracy	≤ ± 40 ppb
Adjustment resolution	± 1 ppb
Temperature effects	≤ ± 10 ppb
Line voltage effects	≤ ± 10.0 ppb

Reference Output	
Frequency	10 MHz

Amplitude	⩾ 0 dBm (Nom.), 50 Ω
External Reference Input	
Input frequency	10 MHz
Stability	Follows the stability of external reference input signal
Sync range	±10 ppm
Amplitude	0 dBm to +20 dBm (Nom.)
Impedance	50 Ω (Nom.)
Waveform	Sine or square
Sweep Modes (Frequency and Amplitude)	
Operating mode	Step sweep, list sweep
Sweep range	Within instrument frequency range
Dwell time	100 μs to 100 s
Number of points	2 to 65,535 (Step sweep)
	1 to 500 (List sweep)
Step change	Linear or logarithmic
Trigger mode	Free-run, external, key, bus (LAN, USB, GPIB)
Trigger edge	Rising edge, falling edge (required only when the trigger is set to external)
Frequency Switching Speed （The time elapsed from the receipt of the SCPI command or trigger signal until the amplitude stabilizes within 0.2 dB.）	
	Continuous Wave (CW) Mode
SCPI mode	⩽ 40 ms
List/step sweep mode	⩽ 40 ms

Level Specification

ALC (Automatic Level Control) Mode

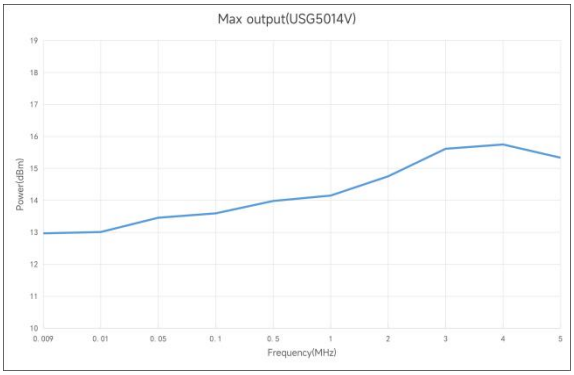
USG5000V series includes three ALC operating modes.

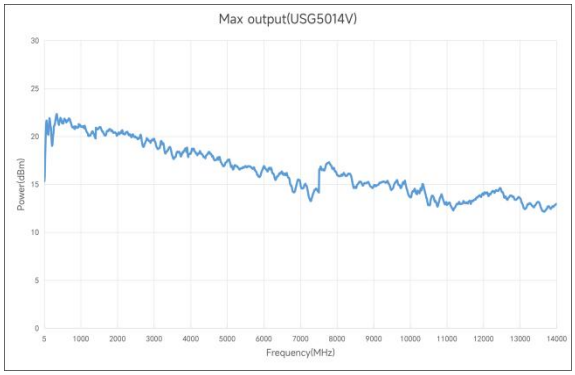
ALC Auto: Automatically sets the optimum ALC mode based on the current operating state.

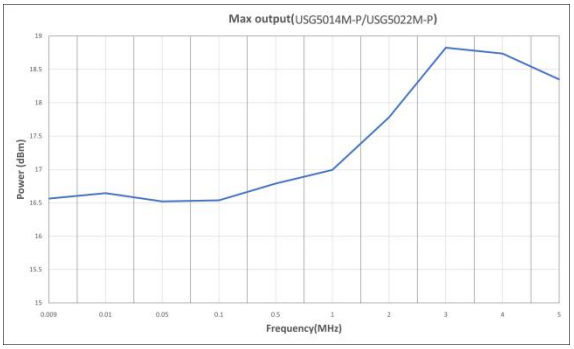
ALC On: When level control is in a closed-loop state, it is suitable for continuous wave (CW), frequency modulation (FM), and phase modulation (ΦM).

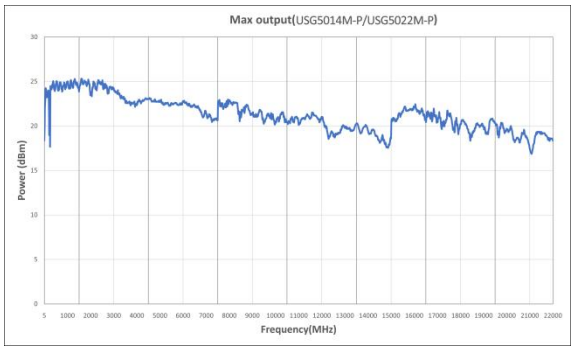
ALC S&H (Off): When frequency or amplitude changes, the level control is initially set to closed-loop. Then, the sampling control voltage is applied to retain the control voltage. When ALC is automatic, amplitude modulation, or pulse modulation can be operated in this state.

Output Parameter	
Settable range	-135 dBm to +25 dBm
Resolution	0.01 dB
Step attenuator (Option)	0 to 110 dB, step of 10 dB
Maximum Output Power	
USG5014V	
Frequency	
9 kHz to 5MHz	+12 dBm
> 5 MHz to 250 MHz	+14 dBm
> 250 MHz to 6.5 GHz	+15 dBm
> 6.5 GHz to 10 GHz	+11 dBm
> 10 GHz to 12 GHz	+9 dBm
> 12 GHz to 14 GHz	+8 dBm
USG5014V-P/USG5022V-P	
Frequency	
9kHz to 5MHz	+16 dBm
> 5MHz to 250MHz	+18 dBm
> 250MHz to 3GHz	+22 dBm
> 3GHz to 14GHz	+17 dBm
> 14GHz to 20GHz	+15 dBm
> 20GHz to 22GHz	+12 dBm





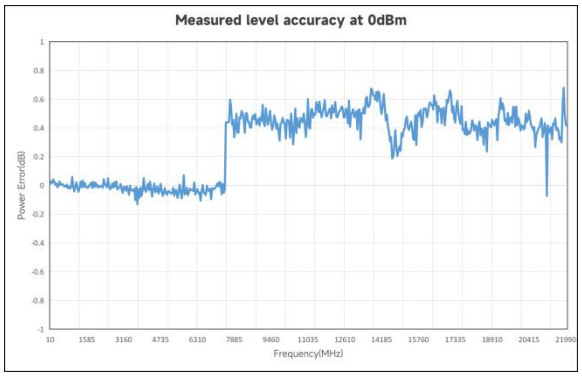


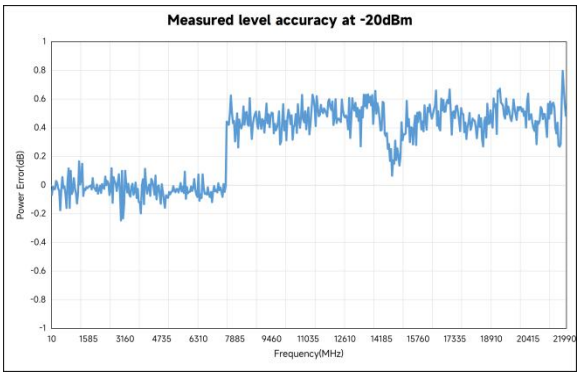


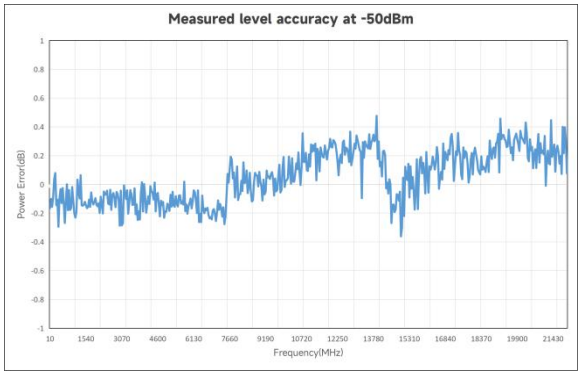
Absolute Level Accuracy in CW Mode (ALC On, Typ.)

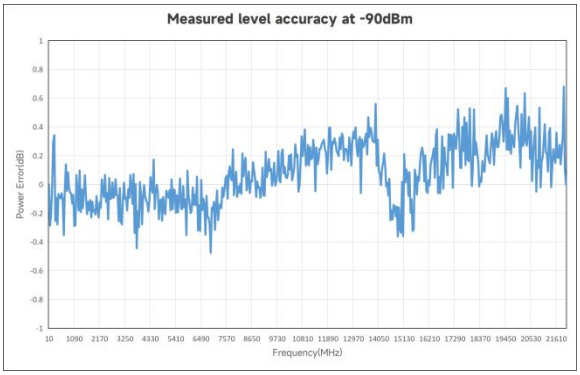
1. Quoted specifications between 20 °C and 30 °C. For temperatures outside this range, absolute level accuracy decreased by 0.01 dB/°C.
2. Output power may drift up to 0.10 dB < 3 GHz and 0.15 dB > 3 GHz per g/kg change in absolute humidity (Nom.).

Range	+10 dBm to -20 dBm	< −20 dBm to > −110 dBm	−110 dBm to −130 dBm
9 kHz to 100 kHz	±0.7 dB	±0.7 dB	±1.0 dB
> 100 kHz to 5 MHz	±0.7 dB	±0.7 dB	±1.0 dB
> 5 MHz to 3 GHz	±0.7 dB	±1.0 dB	±1.2 dB
> 3 GHz to 6.5 GHz	±0.7 dB	±1.0 dB	±1.5 dB
> 6.5 GHz to 20 GHz[1]	±0.7 dB	±1.0 dB	+2.0 dB
> 20 GHz to 22 GHz	±1.5 dB	±1.5 dB	+2.0 dB









1: USG5014V Range > 6.5 GHz to 14 GHz index range: +6 dBm to - 20 dBm, index ± 0.7 dB

Absolute Level Accuracy in CW Mode (ALC Off, power search run, relative to ALC ON)

9 kHz to 6 GHz	±0.15 dB (Typ.)

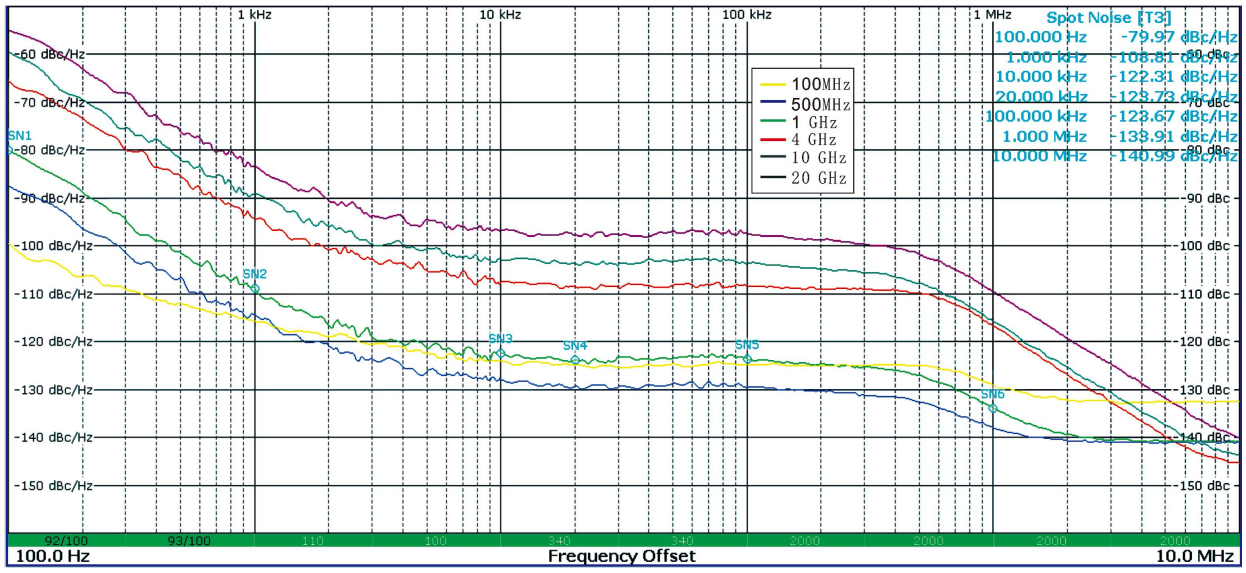
SWR (Standing-wave Ratio) in CW Mode

Range	Attenuator State		
	Undamped	0 to 10 dB	Above 15 dB
≤1.0 GHz	< 1.8： 1 (Nom.)	< 1.6： 1 (Nom.)	< 1.5： 1 (Nom.)
> 1.0 GHz to 6.5 GHz	< 1.8： 1 (Nom.)	< 1.6： 1 (Nom.)	< 1.5： 1 (Nom.)
> 6.5 to 22 GHz	< 2.0： 1 (Nom.)	< 1.6： 1 (Nom.)	< 1.5： 1 (Nom.)

Maximum Reverse Power (Nom.)	
< 1 GHz	0 dBm
> 1 GHz to 2 GHz	25 dBm
> 2 GHz to 22 GHz	25 dBm
Maximum DC voltage	0 VDC
Trip level	25 dBm
Amplitude Switching Speed (The time elapsed from the receipt of the SCPI command or trigger signal until the amplitude stabilizes within 0.2 dB.)	
	CW Mode
SCPI mode	≤ 40 ms
List/step sweep mode	≤ 40 ms

Spectral Purity Specifications

SSB (Single Side Band) (dBc/Hz, CW, at 20 kHz offset, typ.)	
5 MHz to < 250 MHz	-125 dBc/Hz
500 MHz	-128 dBc/Hz
1 GHz	-122 dBc/Hz
4 GHz	-109 dBc/Hz
10 GHz	-102 dBc/Hz
20 GHz	-98 dBc/Hz



Residual FM (CW mode, 300 Hz to 3 kHz BW, CCITT, rms)	
5 MHz to 22 GHz	<N×3 Hz (measured value), see N value in frequency table
Residual AM (CW mode, 300 Hz to 3 kHz BW, rms, 0 dBm)	

100 kHz to 22 GHz	<0.01% (measured value)		
Harmonics (CW Mode)			
Model	USG5022V-P	USG5014V-P	USG5014V
Range	Output Amplitude 0 dBm		
9 kHz to 250 MHz	≤ -40 dBc	≤ -40 dBc	≤ -40 dBc
> 250 MHz to 1 GHz	≤- 45 dBc	≤- 45 dBc	≤- 40 dBc
> 1 GHz to 7.5 GHz	≤ -40 dBc	≤ -40 dBc	≤ -40 dBc
> 7.5 GHz to 14 GHz	≤ -35 dBc	≤ -35 dBc	≤ -30 dBc
> 14 GHz to 22 GHz	≤ -35 dBc	---	---
Non-harmonics (CW Mode)			
Range	> 10 kHz offset		
9 kHz to < 5 MHz	-75 dBc (Nom.)		
5 MHz to < 750 MHz	-60 dBc		
750 MHz to < 7.5 GHz	-65 dBc		
7.5 GHz to < 14 GHz	-60 dBc		
14 GHz to < 22 GHz	-55 dBc		
Sub-harmonics (CW Mode)			
9 kHz to 15 GHz	None		
15 GHz to 22 GHz	-70 dBc		

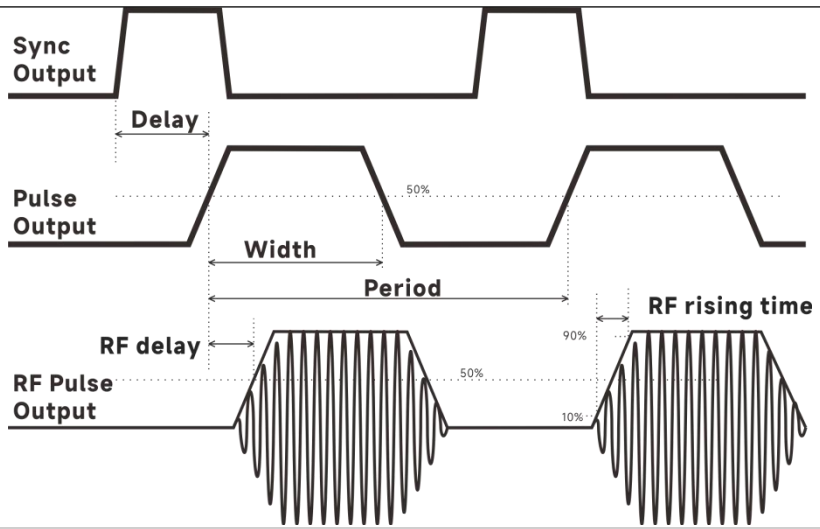
Analog Modulation Specifications

Frequency Band		
Band No.	Frequency Range	N
1	9 kHz ≤ f ≤ 5 MHz	Digital synthesis
2	5 MHz < f≤ 137.5 MHz	0.0625
3	137.5 MHz < f ≤ 250 MHz	0.125
4	250 MHz < f≤ 468.75 MHz	0.03125
5	468.75 MHz < f < 937.5 MHz	0.0625
6	937.5 MHz ≤ f < 1,875 MHz	0.125
7	1,875 MHz ≤ f ≤ 3,750 MHz	0.25
8	3,750 MHz < f ≤ 7,500 MHz	0.5
9	7,500 MHz < f ≤ 15 GMHz	1
10	15 GHz < f ≤ 22 GHz	2
FM (Frequency Modulation)		
Modulation source	Internal, external, internal + external	

Maximum offset	N × 10 MHz (Nom.), see N value mentioned above	
Resolution	0.001 Hz	
Offset accuracy	< ± 2% + 20 Hz (1 kHz rate, offset is N × 50 kHz)	
Modulation frequency respond	Normal bandwidth (3 dB)	0.001 Hz to 50 kHz (Nom.)
Carrier frequency accuracy	< ± 0.2% × set offset + (N ×1 Hz)	
THD (Total harmonic distortion)	1 kHz rate, offset is N × 50 kHz	< 0.4%
FM external modulation input	Sensitivity	+ 1 V peak for offset indication (Nom.)
	Input impedance	50 Ω
	Path	FM summed internally for composite modulation
ΦM (Phase Modulation)		
Modulation source	Internal, external, internal + external	
Maximum offset	N × 5 rad (Nom.)	
Modulation frequency responds	Normal bandwidth (3 dB)	0.001 Hz to 50 kHz (Nom.)
Resolution	0.01 rad/0.1 deg	
Offset accuracy	1 kHz rate	< + 0.5% + 0.01 rad (Typ.)
THD	1 kHz rate	< 0.2% (Typ.)
ΦM external modulation input	Sensitivity	+ 1 V peak for offset indication (Nom.)
	Input impedance	50 Ω (Nom.)
	Path	ΦM summed internally for composite modulation
AM (Amplitude Modulation)		
Modulation source	Internal, external, internal + external	
Modulation depth	0% to 100%	
Resolution	0.1%	
AM depth error (1 kHz modulation frequency and < 80% modulation depth)	f < 5 MHz	< 1.5% of set value+1% (Typ., 0.5% + 1% of set value)
	5 MHz ≤ f ≤ 2 GHz	< 3% + 1% of set value
	2 GHz < f < 3 GHz	< 5% + 1% of set value (Typ., 3% + 1% of set value)
	3 GHz < f < 7.5 GHz	(Typ., set value of 4% + 1%)

	7.5 GHz < f < 22 GHz	(Typ., set value of 4% + 1%)
THD (1 kHz modulation frequency)	f < 5 MHz	30% depth, < 0.25% (Typ.)
		80% depth, < 0.5% (Typ.)
	5 MHz ≤ f < 22 GHz	30% depth, < 3%
		80% depth, < 3%
Modulation frequency responds	30% depth, 3 dB bandwidth	0.001 Hz to 50 kHz
AM external modulation input	Sensitivity	+ 1 V peak for offset indication (Nom.)
	Input impedance	50 Ω (Nom.)
	Path	AM summed internally for composite modulation
Note: The AM specification is applicable up to a 10 dB reduction from the maximum specified output power at 20 to 30°C.		
Pulse Modulation (Option)		
Mode	Free-Run, Square, Ext Triggered, Adjustable Doublet, Ext Trigger Doublet, Gated, Ext Pulse, Pulse Train	
Modulation source	Internal, external	
On-off ratio	1 MHz < f ≤ 6.5 GHz	≥80dBc (Typ.)
	6.5 GHz < f ≤ 22 GHz	≥70dBc (Typ.)
Rising/falling time (10%/90%)	< 20 ns (Typ.)	
Minimum pulse width	100 μs to (Pulse period -1 μs)	
Pulse period	Pulse width +1 μs to 42 s	
Resolution	1 μs	
Adjustable delay	Free-run: 0 to (Period – Pulse width -1 μs)	
	Trigger: 1 μs to (Maximum pulse period-1 μs)	
Level accuracy	< ± 0.5 dB (Relative to CW)	
Width compression	≤ 10 ns (Relative to RF width of pulse output)	
Video feed-through	≤ 50 mV	
External pulse input delay	500 ns (Nom.), external input to pulse output terminal	
Radio-frequency delay	50 ns (Nom.), pulse input to RF output	
Pulse overshoot	≤ 20%	
Input level	+ 1 Vpeak = RF on 50 Ω (Nom.)	

Video delay (variable)
Video pulse width (variable)
Pulse period (variable)
RF delay
RF pulse rising time



Narrow Pulse Generator (Option)	
Pulse period	80 ns to 42 s
Pulse width	40 ns to (Pulse period -40 ns)
Resolution	10 ns
Adjustable delay	Free-run: 0 to (Period-Pulse width-40 ns)
	Trigger: 20 ns to (Maximum pulse period -40 ns)

Simultaneous and Composite Modulation	
Simultaneous modulation	All modulation types (I/Q, FM, AM, ΦM, and pulse) may be simultaneously enabled, except that FM and phase modulation cannot be combined. Additionally, two modulation types cannot be simultaneously generated using the same modulation source.
Composite modulation	AM, FM, and ΦM each consist of two modulation paths which are summed internally for composite modulation; modulation can be any combination of internal or external sources.

Modulation Type	AM	FM	ΦM	PM	IQ
AM	---	●	●	(●)	(●)
FM	●	---	×	●	●
ΦM	●	×	---	●	●
PM	(●)	●	●	---	(●)
IQ	(●)	●	●	(●)	---

● Compatible; × Incompatible; (●) indicates limited compatibility: enables pulse modulation with reduced amplitude modulation. IQ modulation, if RF blanking function is turned on, pulse modulation cannot be used

External Modulation Input	
Mod In	AM, FM, ΦM (50 Ω)
Pulse Out/In	PM (50 Ω)

Internal Function Generator (LF)

Waveform	Sine, Square, Pulse, Triangular, Arbitrary, DC, Noise	
Frequency range	Sine wave	0.001 Hz to 50 MHz
	Square, pulse, arbitrary waves	0.001 Hz to 15 MHz
	Triangular wave	0.001 Hz to 3 MHz
Frequency resolution	0.001 Hz (Nom.)	
Frequency accuracy	Same as RF reference source (Nom.)	
LF output amplitude	1 mVpp to 2 Vpp, 50 Ω	
Accuracy	Typ. (1 kHz sine wave, 0 V offset, > 10 mVpp)	± (1% of set value +1 mVpp)
DC offset accuracy	± 1% of offset set value ± 0.5%	± 2 mV of amplitude set value
Flatness	Typ. (1 kHz sine wave, 1 Vpp)	≤ 100 kHz: ±0.2 dB
		≤ 20 MHz: ±0.4 dB
		≤ 40 MHz: ±0.6 dB
		≤ 50 MHz: ±0.8 dB
LF Frequency Sweep		
Sweep mode	Linear, logarithmic, step	
Sweep shape	Positive/negative sawtooth, positive/negative triangular	
Sweep time	1 ms to 500 s	
Sweep frequency range	0.001 Hz to 50 MHz	
Trigger input	Auto, key trigger, external trigger, bus trigger	
Trigger output	Off, rising edge, falling edge	
LF Modulation		
Modulation mode	AM, FM, ΦM, Pulse, ASK, FSK, PSK, QAM	
Modulation frequency	0.002 Hz to 5 MHz	
Modulation wave	Sine, square, triangular, arbitrary waves	
Carrier type	Sine, square, pulse, triangular, arbitrary waves	
AM depth	0.00% to 120.00%	
FM frequency offset	DC to 25 MHz	
ΦM phase Offset	0.00° to 360.00°	
Pulse duty ratio	0.00% to 100.00%	
Data pattern	PN7, PN9, PN11, PN17, PN19, PN21, PN23, PN25	
ASK mode	2ASK	
FSK mode	2FSK, 4FSK	
PSK mode	2PSK, 4PSK	
QAM mode	QAM4, QAM8, QAM16, QAM32, QAM64, QAM128, QAM256	

Vector Signal Modulation Specifications

I/Q Modulation External Input		
I/Q modulation source	Internal, external, internal + external	
Bandwidth	Baseband I or Q ≤ 75 MHz	
	RF (I + Q) ≤ 150 MHz	
Internal I/Q Baseband Generator Adjustments		
Gain balance	±4 dB (0.01 dB resolution)	
I/Q attenuation	0 to 10 dB (0.01 dB resolution)	
I/Q offset	±20% (0.001% resolution)	
I/Q delay	0 to 250 ns (1 ps resolution)	
Quadrature angle adjustment	±10 deg (0.1 deg resolution)	
External I/Q Baseband Input		
Input Mode	Single-ended	
Full-scale input voltage (50 Ω)	$\sqrt{V_I^2 + V_Q^2} = 0.5V_{rms}$	
Internal I/Q Baseband Output		
Impedance	50 Ω (Nom.), per output	
	100 Ω, differential output	
Maximum voltage per output, sine wave output	Bandwidth ≤ 75 MHz	Single-ended, 0.5 Vpp
		Differential, 1 Vpp
Phase flatness	< 1.0 dB	
Internal Baseband Generator		
Sample rate	1.00 Sa to 250.00 MSa	
RF output bandwidth (I+Q)	150 MHz	
Frequency offset	±60 MHz	
Custom Modulation Arb Mode (ARB)		
Arbitrary wave storage	Maximum playback capacity 500 MSa	
	Non volatile storage space 4 Gbytes	
Wave segment	Wave segment length 200 Sa to 500 MSa	
Wave sequency	Maximum number of waveform segments per sequence: 1,024	
	Maximum repeat count: 65,535	
Trigger	Trigger source	Key trigger, external trigger, bus triggering (GPIB, LAN, USB)

	Trigger type	CW trigger	Free-run, trigger & playback, reset & playback
		Single trigger	Ignore retrigger, buffered trigger, trigger reset
		Gating	Active high, active low
		Segment advance	Single, continous
External trigger delay	0 to 60 s		
External trigger delay resolution	4 ns		
External trigger intrinsic delay	Single trigger, no restart mode: 424 ns + 14 sample periods		
	Single trigger, restart mode: 4.064 μs + 14 sample periods		
Markers	Marker polarity	Negative, positive	
	Marker count	4	
	RF blanking on-off ratio	>70 dBc	
Additive White Gaussian Noise (AWGN)			
Type	Real-time calculation		
Noise Addition Mode	Separate noise output		
	Digitally added to baseband waveform signal		
Bandwidth	50 MHz		
Carrier-to-noise ratio	±100 dB		
Carrier-to-noise ratio type	C/N, Eb/No		
Custom Modulation Real-time Mode (Custom)			
Symbol rate	125 Sps to 75 MSps		
Modulation type	QAM	16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM	
	ASK	2ASK, 4ASK, 8ASK, 16ASK	
	PSK	BPSK, QPSK, 8PSK, DBPSK, DQPSK, D8PSK, OQPSK, PI/4-DQPSK, PI/8-D8PSK	
	FSK	2FSK, 4FSK, 8FSK, 16FSK, MSK	
	User-defined		
Filter type	Raised cosine, root raised cosine, Gaussian, None		
Data type	Internally generated	Pseudo-random code	PN7, PN9, PN15, PN23
		User-defined	Arbitrary 4-bit sequence
Multi-Tone			

Number of tone	2 to 20
Symbol rate	128 Hz to 120 MHz
Frequency spacing	100 Hz to 93.75 MHz
Phase (per tone)	Same

3GPP WCDMA Distortion Performance

Offset	Configuration	Frequency	Level ≤ 4 dBm (RMS power)
Adjacent (5 MHz)	1DPCH, 1 carrier	1800 MHz to 2200 MHz	72 dBc (Typ.)
Adjacent (10 MHz)			74 dBc(Typ.)
Adjacent (5 MHz)	Test mode 1, 64DPCH, 1 carrier	1800 MHz to 2200 MHz	69 dBc (Typ.)
Adjacent (10 MHz)			71 dBc (Typ.)

3GPP LTE-FDD Distortion Performance

Offset	Configuration	Frequency	Level ≤ 4 dBm (RMS power)
Adjacent (10 MHz)	10MHz E-TM1.1 QPSK	1800 MHz to 2200 MHz	65 dBc (Typ.)
Adjacent (20 MHz)			65 dBc (Typ.)

GSM/EDGE Output RF Spectrum Distortion Performance

			GSM	EDGE
Offset	Configuration	Frequency	Level amplitude power)	≤ 4 dBm (RMS
200 kHz	1 normal timeslot, bursted	800 MHz to 900 MHz 1800 MHz to 1900 MHz	36 dBc (Typ.)	38 dBc (Typ.)
400 kHz			41 dBc (Typ.)	42 dBc (Typ.)
600 kHz			71 dBc (Typ.)	72 dBc (Typ.)
800 kHz			82 dBc (Typ.)	82 dBc (Typ.)
1200 kHz			84 dBc (Typ.)	84 dBc (Typ.)

5G NR FR1 Waveform Distortion Performance

Offset	Configuration	Frequency	Level ≤ 4 dBm
Adjacent (100 MHz)	100 MHz, 256QAM, 60kHz SCS, NRB=135	2 GHz	-58 dBc
Adjacent (200 MHz)			-59 dBc
Adjacent (100 MHz)		3.55GHz	-58 dBc
Adjacent (200 MHz)			-55 dBc
Adjacent (100 MHz)		4.5GHz	-55 dBc
Adjacent (200 MHz)			-57 dBc
Adjacent (100 MHz)		5GHz	-56 dBc
Adjacent (200 MHz)			-56 dBc

EVM Performance Data

	W-CDMA	LTE FDD	GSM	EDGE	CDM2000
Modulation type	QPSK	64QAM	GMSK (burst)	3 PI/8PSK (burst)	QPSK
Modulation rate	3.84 Mcps	10MHz BW	270.833 Ksps	70.833 Ksps	1.2288 Mcps
Channel configuration	1 DPCH	E-TM 3.1	1 timeslot	1 timeslot	Pilot channel
Frequency	1800 MHz to 2200 MHz	1800 MHz to 2200 MHz	800 MHz to 900 MHz; 1800 MHz to 1900 MHz	800 MHz to 900 MHz; 1800 MHz to 1900 MHz	800 MHz to 900 MHz; 1800 MHz to 1900 MHz
Power level	< 4 dBm				
EVM rms	< 0.4%(Typ.)	<0.45%(Typ.)	< 0.4% (Typ.)	< 0.8% (Typ.)	< 1.1% (Typ.)
EVM Performance Data					
Modulation type		QPSK		16QAM	
Modulation type		4 Msps (root-Nyquist filter α=0.25)			
Frequency		100 MHz to 6 GHz		100 MHz to 6 GHz	
Power level		≤ 4 dBm		≤ 4 dBm	
EVM		≤ 1.5% (Typ.)		≤ 1.5% (Typ.)	

Input and Output Terminal

Connector on Front Panel	
RF output	NMD 2.92 male header, 50 Ω (Nom.)
Internal function generator LF output	BNC female header, 50 Ω (Nom.)
Connector on Rear Panel	
External trigger output	BNC female header, high resistance (Nom.), TTL (supports multiple level input)
Trigger output	BNC female header, LVTTL
Mod In (Analog modulation input)	BNC female header, 50 Ω (Nom.), ± 1 V
Pulse input	BNC female header, 50 Ω (Nom.), (Input amplitude > 1 V)
Pulse output	BNC female header, 50 Ω (Nom.), (Input amplitude > 1 V)
10MHz Ref In	BNC female header, 50 Ω (Nom.), 0 dBm to +20 dBm
10MHz Ref Out	BNC female header, 50 Ω (Nom.), > 0 dBm
I OUT	BNC female header, single-ended 50 Ω, differential 100 Ω, 1 Vpp

Q OUT	BNC female header, single-ended 50 Ω, differential 100 Ω, 1 Vpp
I IN	BNC female header, 50 Ω (Nom.)
Q IN	BNC female header, 50 Ω (Nom.)
PATTERN	BNC female header, high resistance, LVTTL
EVENT	BNC female header, high resistance, LVTTL
BB TRIG	BNC female header, high resistance, LVTTL
Signal Out	BNC female header, LVTTL
Communication Port	
USB-HOST	USB-A 2.0
USB-DEVICE	USB-B 2.0
LAN	LAN (VXI-11,10/100/1000Base,RJ-45)
GPIB	GPIB IEEE-488.2

General Specifications

Power Supply	
Power voltage	100 to 240 VAC (Fluctuation: ±10%), 50 Hz/60 Hz 100 to 120 VAC (Fluctuation: ±10%) , 400 Hz
Power consumption	＜75 W
Display Screen	
Display type	5-inch capacitive multi-touch panel
Display resolution	800×480
Environmental Requirements	
Temperature range	Operating: 0°C to +40°C
	Non-operating: -20°C to +60°C
Cooling	Fan-forced cooling
Humidity	Below +35°C: ≤ 90% RH.
	+35°C to +40°C: ≤ 60% RH.
Altitude	Operating: Below 2,000 meters
	Non-operating: Below 15,000 meters
Pollution degree	2
Operating environment	For indoor use only
Machine Specifications	
Dimensions	449mm×100mm×474mm (W×H×D)
	426mm×88mm×400mm (W×H×D), excluding handle, feet, pads, and side brackets

Weight	< 20 kg	
Calibration period	One year	
Regulatory Requirement		
Electromagnetic compatibility	Compliant with EMC (2014/30/EU); compliant with or superior to IEC 61326-1:2021/EN61326-1:2021, IEC 61326-2-1:2021/EN61326-2-1:2021	
Conducted emission	CISPR 11/EN 55011	CLASS B group 1, 150 kHz-30 MHz
radiation disturbance	CISPR 11/EN 55011	CLASS B group 1, 30 MHz-1 GHz
Electro-static discharge (ESD)	IEC 61000-4-2/EN 61000-4-2	±4.0 kV (Contact), ±8.0 kV (Air)
Radio frequency electromagnetic field immunity	IEC 61000-4-3/EN 61000-4-3	3 V/m (80 MHz to 1 GHz) 1 V/m (1.4 GHz to 6 GHz)
Electrical fast transient (EFT)	IEC 61000-4-4/EN 61000-4-4	1 kV (AC input port)
Surge	IEC 61000-4-5/EN 61000-4-5	0.5 kV (Live line to zero line) 1 kV (Live/zero line to ground)
RF continuous conduction immunity	IEC 61000-4-6/EN 61000-4-6	3 V, 0.15-80 MHz
Voltage dips and short interruptions	IEC 61000-4-11/EN 61000-4-11	Voltage dips: 0% UT during 0.5 cycle 0% UT during 1 cycles 70% UT during 25/30 cycles Short interruptions: 0% UT during 250/300 cycles
Safety Regulation		
	EN 61010-1:2010+A1:2019 EN IEC61010-2-030:2021+A11:2021 UL 61010-1:2012 Ed.3+ R:19 Jul2019 UL 61010-2-030:2018 Ed.2 CSA C22.2#61010-1:2012 Ed.3+U1;U2;A1 CSA C22.2#61010-2-030:2018 Ed.2	

Order Information and Warranty Period

	Description		Order No.
Model	Vector signal generator, frequency 9 kHz to 14 GHz;		USG5014V
	Vector signal generator, frequency 9 kHz to 14 GHz; Mechanical attenuator		USG5014V-P
	Vector signal generator, frequency 9 kHz to 22 GHz; Mechanical attenuator		USG5022V-P
Accessory (Standard)	National standard power cord x1		
	USB data cable x1		UT-D14
	RF connector 2.92-KKG dual female head x1		UT-C04-40GHz
Accessory (Option)	UT-CK02	UT-W03-40GHz-2.92J RF cable x1	UT-W03-40GHz
		RF connector 2.92-KKG dual female head x2	UT-C04-40GHz
		UT-C03-18GHz RF Adapter SMA-N x1	UT-C03-18GHz
Option	Pulse modulation	Pulse modulation	USG5000-PM
		Narrow pulse generator	USG5000-PG
	Power meter kit		USG5000-PK
	GPIB port		USG5000-GPIB
	Signal Studio	Bluetooth, waveform playback	USG5000V-BT
		Custom OFDM, waveform playback	USG5000V-OFDM
		Custom Digital, waveform playback	USG5000V-DM
		IOT, waveform playback	USG5000V-VIOT

Options ordering and installation

1. Purchase options: Based on your requirements, please purchase the specified function options from UNI-T Sales Personnel and provide the serial number of the instrument that needs the option installed.
2. Receive certificate: You will receive the license certificate based on the address provided in the order.
3. Register and obtain license: Visit the UNI-T official website license activation session for registration. Use the license key and instrument serial number provided in the certificate to obtain the option license code and license file.
4. Install the option: Download the option license file to the root directory of a USB storage device and connect the USB storage device to the instrument. Once the USB storage device is recognized, the Option Install menu will be activated. Press this menu key to begin installing the option.

Limited Warranty and Liability

UNI-T guarantees that the Instrument product is free from any defect in material and workmanship within three years from the purchase date. This warranty does not apply to damages caused by accident, negligence, misuse, modification, contamination, or improper handling. If you need a warranty service within the warranty period, please contact your seller directly. UNI-T will not be responsible for any special, indirect, incidental, or subsequent damage or loss caused by using this device. For the probes and accessories, the warranty period is one year. Visit instrument.uni-trend.com for full warranty information.

Learn more at: www.uni-trend.com

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