

SSG5000X Series RF Signal Generator



Datasheet - 2020.04

SSG5040X

SSG5060X

SSG5040X-V

SSG5060X-V

General Description

SIGLENT'S SSG5000X series of signal generators can generate analog and vector signals, and have a frequency range of 9 kHz to 4 GHz/6 GHz. They feature the industry-leading performance in phase noise, spectral purity, bandwidth, EVM, output power. The internal IQ modulation generator and waveform playback function make it easy to create even the most complex signal types. They also cover the most important RF band for digital wireless communications and include standard waveform files. The SIGLENT SSG5000X are powerful and cost effective sources that are ideal for R&D, education, and manufacturing.

Features and Benefits

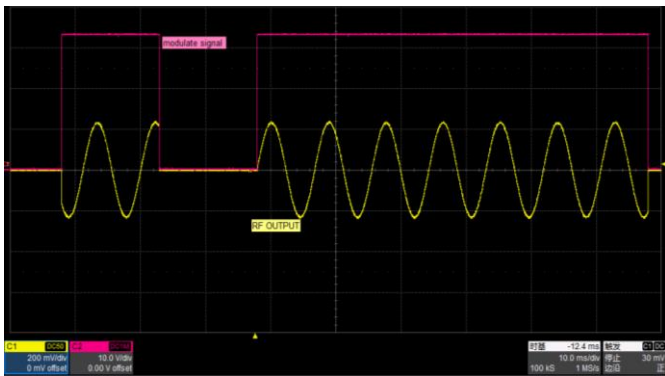
- Frequency up to 4 GHz/6 GHz
- 0.001 Hz frequency setting resolution
- Maximum output power up to +26 dBm (typ.)
- Phase Noise: -120 dBc/ Hz @ 1 GHz, 20 kHz offset (typ.)
- User programmable flatness correction
- Provides AM, FM, PM analog modulation with internal, external or Int+Ext source
- Single pulse, double pulse and pulse train generator (option)
- Internal IQ modulation with 150 MHz modulation bandwidth with perfect in-factory calibration
- Built-in digital communication standard waveform files such as 5G-NR,LTE, WCDMA, WLAN, Blue-Tooth, CDMA
- Internal Custom mode generate common IQ signals such as QAM, FSK, ASK, MSK
- Analog differential I/Q outputs
- External analog I/Q input
- USB-power meter measurement
- 5 inch TFT capacitive touch screen, mouse and keyboard supported
- Web browser remote control on PC and mobile terminals
- Standard interface includes USB Host, USB Device (USB TMC), LAN (VXI-11, Socket, Telnet). Optional interface: GPIB

Model and Main index

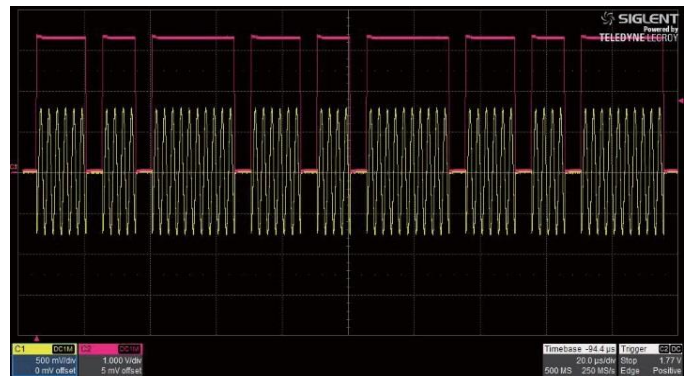
| Model | SSG5040X | SSG5060X | SSG5040X-V | SSG5060X-V |
|----------------------|------------------------------------------------|---------------------|---------------------------------------------|-------------------------------------------|
| Frequency Range | CW MODE 9 kHz-4 GHz | CW MODE 9 kHz-6 GHz | CW MODE 9 kHz-4 GHz IQ MODE 10 MHz-4 GHz | CW MODE 9 kHz- GHz IQ MODE 10 MHz- GHz |
| Frequency Resolution | 0.001 Hz | | | |
| Amplitude Resolution | 0.01 dB | | | |
| Phase noise | -120 dBc/Hz @1 GHz, offset 20 kHz (typ.) | | | |
| Display | 5 inch capacitance touch screen, RGB (800*480) | | | |

Design Features

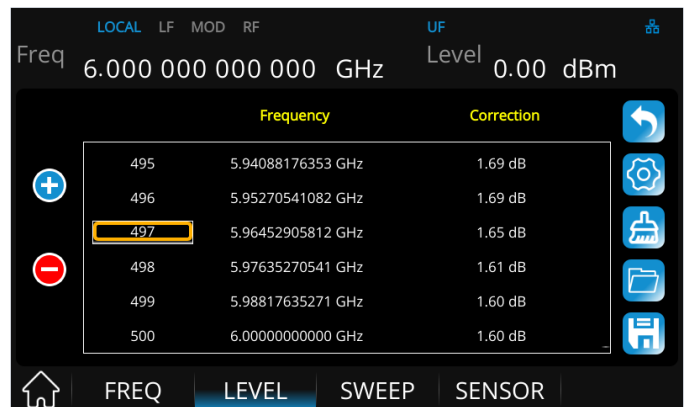
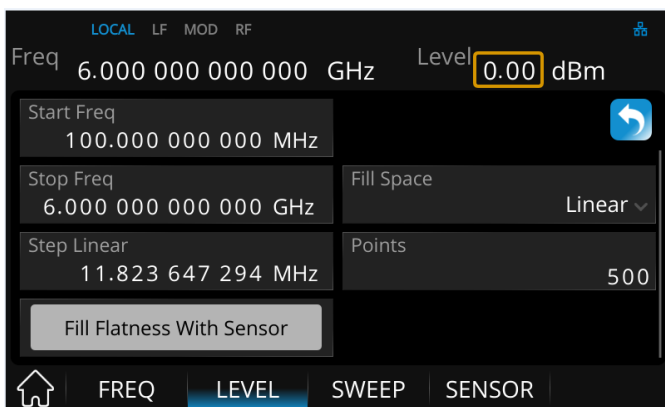
Double pulse modulation



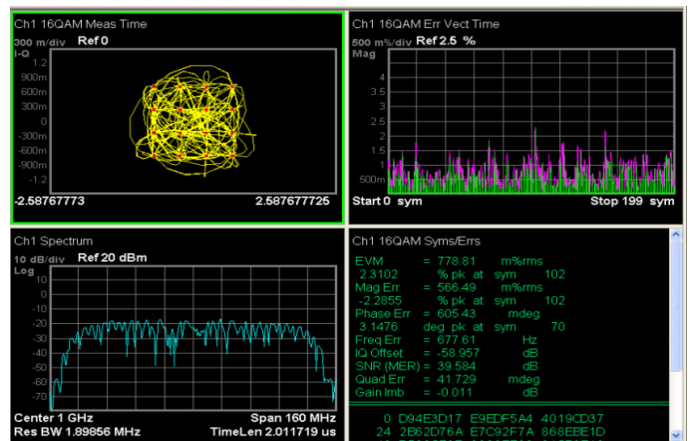
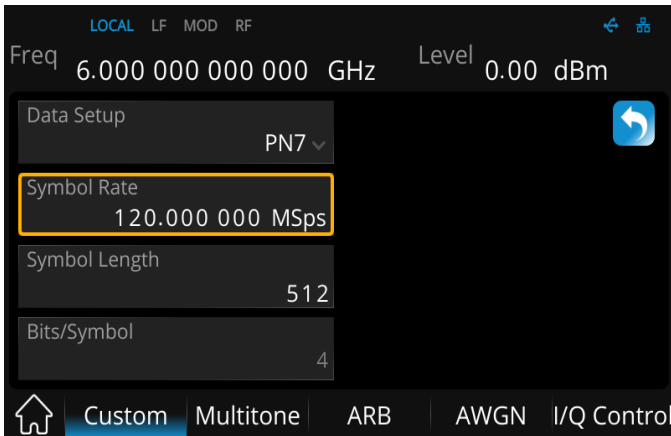
Pulse train generator



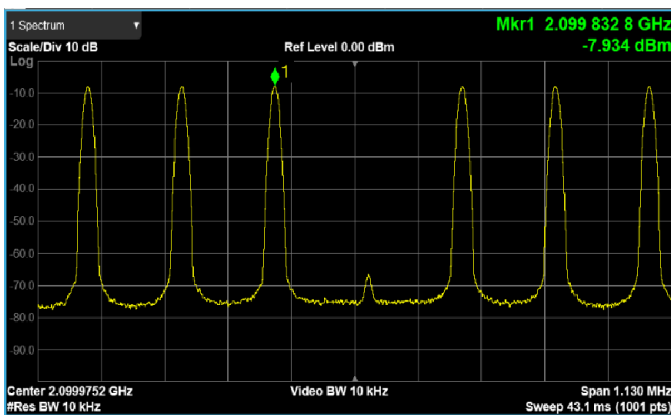
Use an external USB power sensor to compensate cable losses



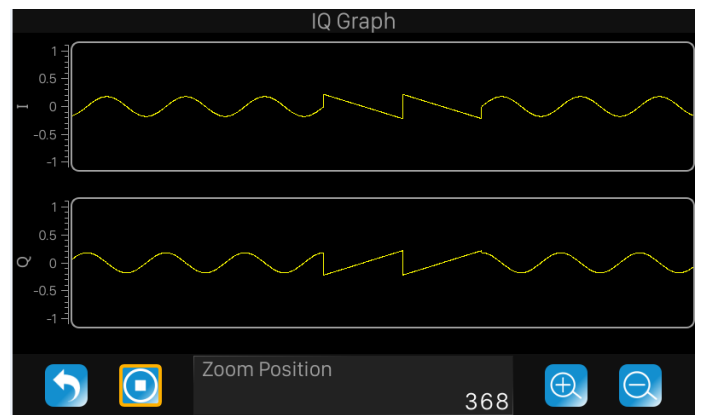
Custom mode can generate IQ modulated signals such as QAM, PSK, ASK, FSK, sample rate up to 120 Msps



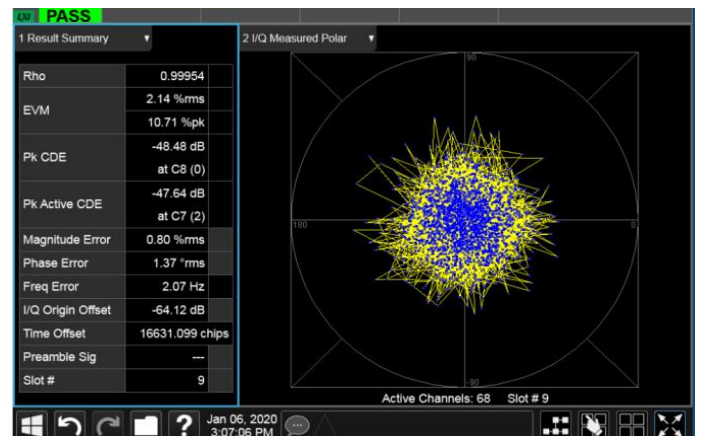
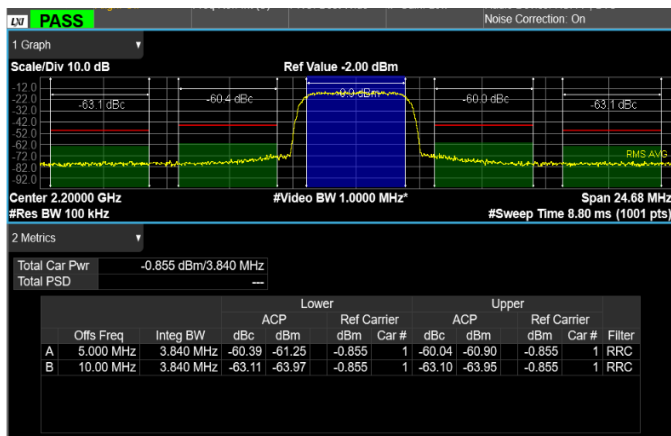
Multi-tone mode to output multi-tone signal



ARB mode to build and replay waveform sequences



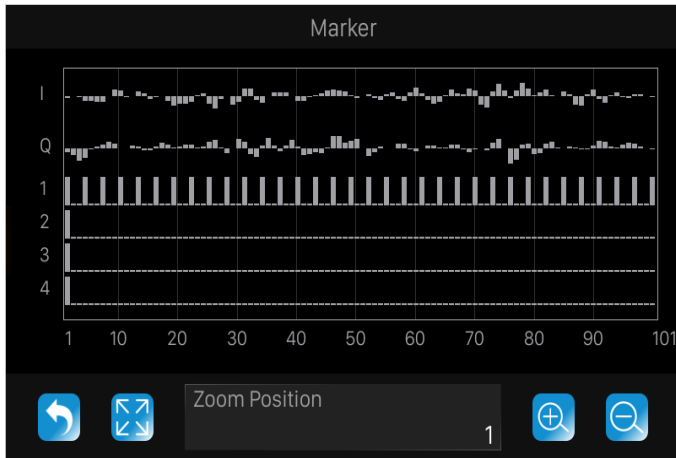
ARB mode to play back digital communication standard waveform files



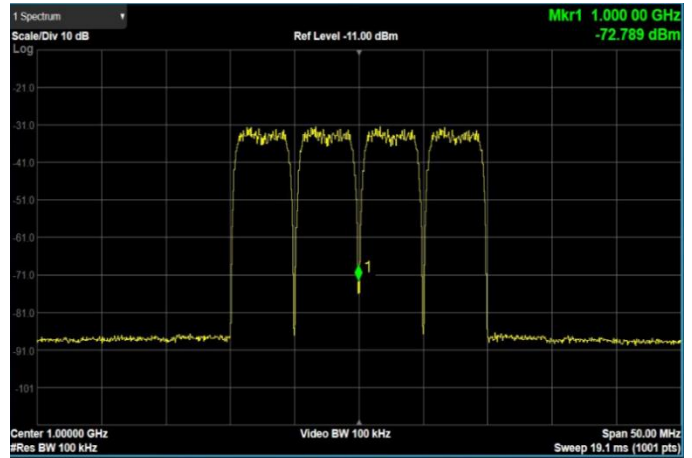
3GPP WCDMA TM1-64DPCH ACPR

3GPP WCDMA TM1-64DPCH EVM

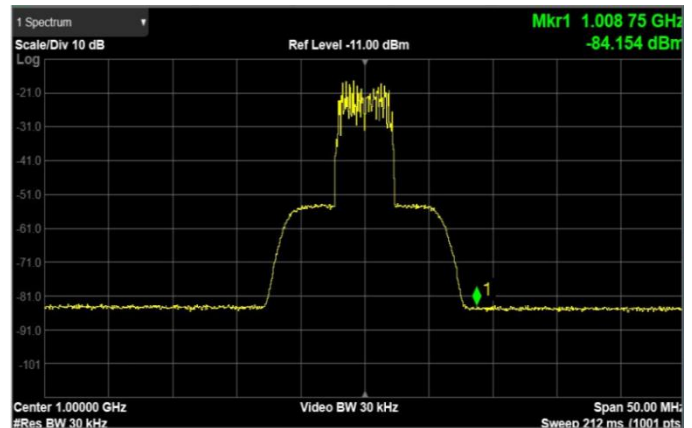
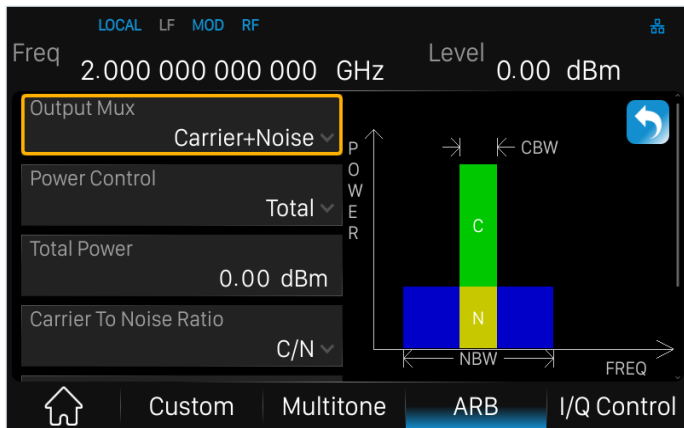
ARB mode can be used to marker label symbols of the waveform files and simultaneously output a pulse from the IQ_Event interface. Perfect for synchronize another device.



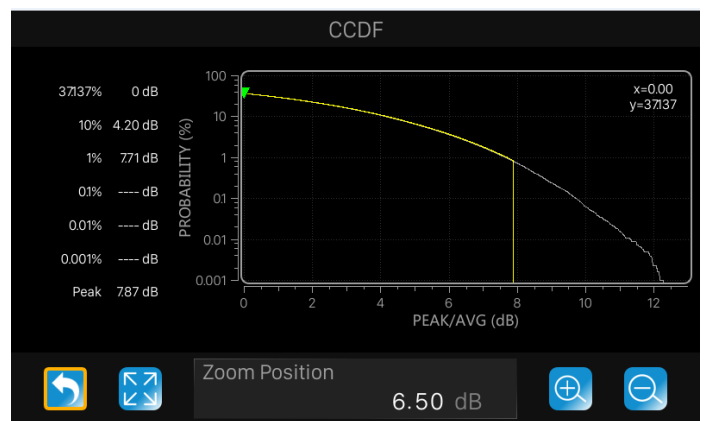
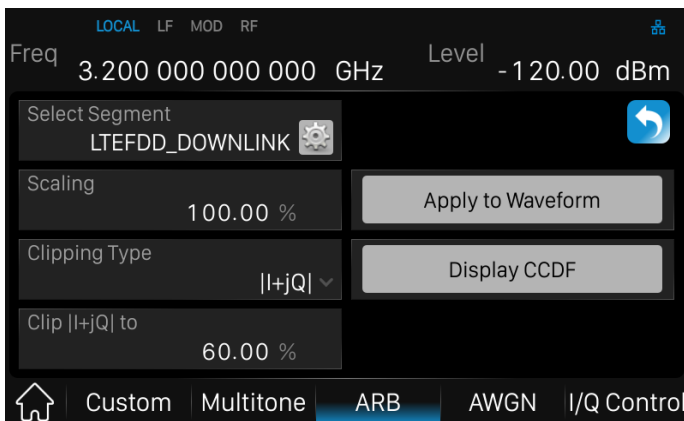
ARB mode to generate multi-carrier signals



ARB mode to add real time AWGN to digital IQ signals for receiver performance tests



ARB mode to clip the signal of the peak power and display the CCDF (cytotoxic cell differentiation factor)



SPECIFICATIONS

Specifications are valid under the following condition: The instrument is within the calibration period, has been stored between 0 and 50°C for at least 2 hours prior to use, and has been powered on and warmed up for at least 40 minutes. The specifications include the measurement uncertainty, unless otherwise noted.

Specifications: All products are guaranteed to meet published specifications when operating temperatures from 5 to 45°C, unless otherwise noted.

Typical (typ.): Performance deemed typical implies that 80 percent of the measurement results will meet the typical published performance with a 95th percentile confidence level at room temperature (approximately 20 °C). Typical performance is not warranted and does not include measurement uncertainty.

Nominal (nom.): This value indicates the expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ohm connector.

| Frequency characteristics | | | |
|-------------------------------------|------------------------------------------------------|---------------------|----------------------|
| Frequency | | | |
| Frequency range | SSG5040X | CW MODE 9 kHz-4 GHz | |
| | SSG5060X | CW MODE 9 kHz-6 GHz | |
| | SSG5040X-V | CW MODE 9 kHz-4 GHz | IQ MODE 10 MHz-4 GHz |
| | SSG5060X-V | CW MODE 9 kHz-6 GHz | IQ MODE 10 MHz-6 GHz |
| Frequency resolution | 0.001 Hz | | |
| Setting time | <5 ms (typ.), ALC ON <10 ms (typ.), ALC OFF (S&H) | | |
| Resolution of phase offset setting | 0.1° | | |
| Frequency Band^[1] | | | |
| Band | Frequency range | N | |
| 1 | 9 kHz ≤ f ≤ 1 MHz | 0.25 | |
| 2 | 1 MHz < f ≤ 250 MHz | 0.5 | |
| 3 | 250 MHz < f ≤ 500 MHz | 0.125 | |
| 4 | 500 MHz < f < 1000 MHz | 0.25 | |
| 5 | 1000 MHz ≤ f < 2000 MHz | 0.5 | |
| 6 | 2000 MHz ≤ f ≤ 4000 MHz | 1 | |
| 7 | 4000 MHz < f ≤ 6000 MHz | 2 | |

[1] N is a factor used to help define certain specifications within the document

Frequency Reference

| | | |
|------------------------------|---------------------------------------|-------------------|
| Reference frequency | 10.000000 MHz | Option 10M_OCXO_L |
| Initial calibration accuracy | <0.2 ppm | ±100 ppb |
| Temperature stability | <1 ppm/year, 0°C ~50°C | ±1 ppb, 0°C ~50°C |
| Frequency aging rate | <0.5 ppm/first year, 3.0 ppm/20 years | 50 ppb/1 year |

Frequency sweep

| | | |
|-------------------------------|---------------------------------------------------------------|---------|
| Sweep type | Frequency step (linear or logarithmic step) arbitrary list | |
| Sweep range | Full frequency range | |
| Sweep shape | Triangle, saw-tooth | |
| Sweep mode | Single, continuous | |
| Step spacing | Linear, logarithmic | |
| Number of points | Step sweep | 2-65535 |
| | List sweep | 2-500 |
| Dwell time range | 10 ms-100 s | |
| Dwell time setting resolution | 0.1 ms | |
| Trigger source | Auto, keyboard, external connector, bus | |
| Trig slope | Positive, negative when trigger source is external | |

Level characteristics

ALC modes

The SSG5000X series offer three ALC modes:

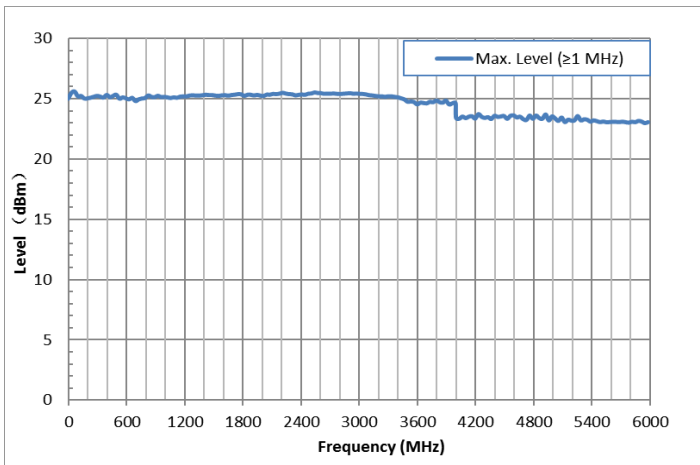
ALC STATE AUTO: The best suited ALC mode is set automatically.

ALC STATE ON: The level control loop is closed. This mode is suitable for CW, FM and PM.

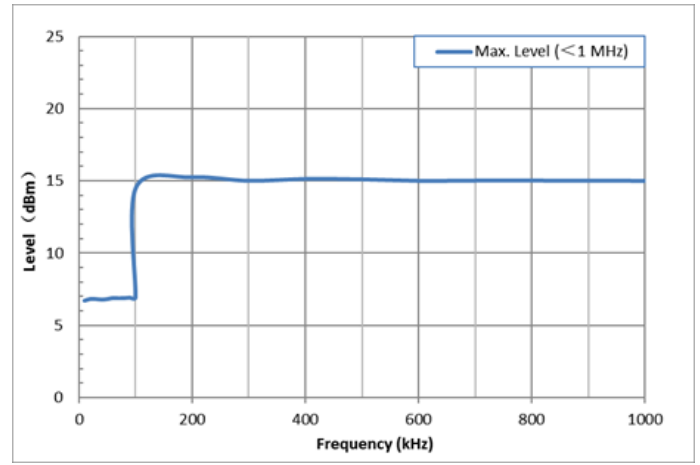
ALC STATE SAMPLE & HOLD (S&H): At every frequency and level change, the level control loop is closed about 3 ms and the level control voltage is sampled. The level control voltage is the clamped. This mode is used internally while in ALC state AUTO for pulse modulation, AM modulation and IQ mode.

| Level characteristics | | | | |
|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------|
| Level setting | | | | |
| Level setting range | $9\text{ kHz} \leq f < 100\text{ kHz}$ | -110 dBm to +7 dBm | | |
| | $100\text{ kHz} \leq f < 1\text{ MHz}$ | -110 dBm to +15 dBm | | |
| | $1\text{ MHz} \leq f \leq 4\text{ GHz}$ | -140 dBm to +26 dBm | | |
| | $4\text{ GHz} < f \leq 6\text{ GHz}$ | -130 dBm to +24 dBm | | |
| Resolution of setting | 0.01 dB | | | |
| Level of performance range | | | | |
| $9\text{ kHz} \leq f < 100\text{ kHz}$ | | -110 dBm to +4 dBm | | |
| $100\text{ kHz} \leq f < 1\text{ MHz}$ | | -110 dBm to +13 dBm | | |
| $1\text{ MHz} \leq f \leq 4\text{ GHz}$ | | -130 dBm to +20 dBm | | |
| $4\text{ GHz} < f \leq 6\text{ GHz}$ | | -120 dBm to +20 dBm | | |
| Level error (ALC on, temperature is 20 °C ~30 °C) | | | | |
| | Max performance power to -40 dBm | -40 dBm to -90 dBm | -90 dBm to -110 dBm | -110 dBm to -130 dBm |
| $9\text{ kHz} \leq f < 100\text{ kHz}$ | $\leq 0.9\text{ dB}$ $\leq 0.7\text{ dB (typ.)}$ | $\leq 0.9\text{ dB}$ $\leq 0.7\text{ dB (typ.)}$ | $\leq 1.1\text{ dB}$ | |
| $100\text{ kHz} \leq f \leq 4\text{ GHz}$ | $\leq 0.7\text{ dB}$ $\leq 0.5\text{ dB (typ.)}$ | $\leq 0.7\text{ dB}$ $\leq 0.5\text{ dB (typ.)}$ | $\leq 1.1\text{ dB}$ $\leq 0.7\text{ dB (typ.)}$ | $\leq 1.1\text{ dB (typ.)}$ |
| $4\text{ GHz} < f \leq 6\text{ GHz}$ | $\leq 0.7\text{ dB}$ $\leq 0.5\text{ dB (typ.)}$ | $\leq 0.7\text{ dB}$ $\leq 0.5\text{ dB (typ.)}$ | $\leq 1.1\text{ dB}$ $\leq 0.7\text{ dB (typ.)}$ | $\leq 1.2\text{ dB (typ.)}$ |
| Additional level error | ALC State Off (S&H) | $< 0.2\text{ dB}$ | | |
| VSWR | | | | |
| Level $\leq 0\text{ dBm}$, ALC State ON | | | | |
| VSWR | $1\text{ MHz} \leq f \leq 6\text{ GHz}$ | $\leq 1.8\text{ (nom.)}$ | | |

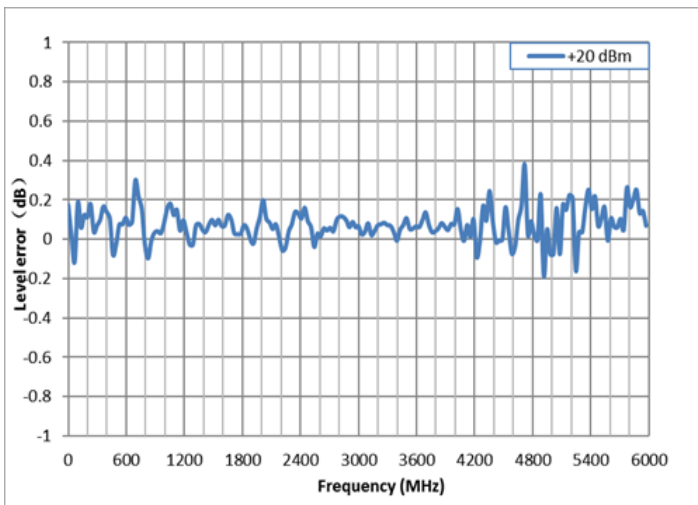
| Level setting | | |
|--------------------------------|---------------------------------------------------------------------------------------------------------|---------|
| Level setting time | Level deviation < 0.1 dB from final value, with GUI update stopped, temperature range from 20 °C -30 °C | < 5 ms |
| | ALC state ON | < 5 ms |
| | ALC state S&H | < 10 ms |
| Reverse power | | |
| Maximum permissible DC voltage | 50 V | |
| Maximum reverse input power | 1 MHz ≤ f ≤ 6 GHz | +30 dBm |
| Level step sweep | | |
| Sweep type | Amplitude step (linear or logarithmic step), arbitrary list | |
| | Full specified level range | |
| Sweep shape | Triangle, saw-tooth | |
| Sweep range | The device output range | |
| Trigger mode | Free run, single | |
| Step spacing | Linear | |
| Sweep points | Step sweep | 2-65535 |
| | List sweep | 1-500 |
| Dwell time setting range | 10 ms-100 s | |
| Dwell time setting resolution | 0.1 ms | |
| Trigger source | Auto, keyboard, external connector, bus | |
| Trigger Slope | Positive, negative | |



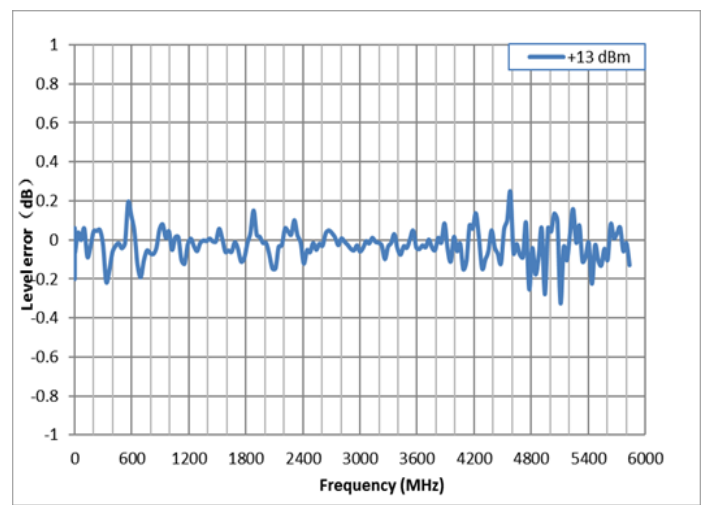
Maximum output power versus frequency, $f \geq 1$ MHz



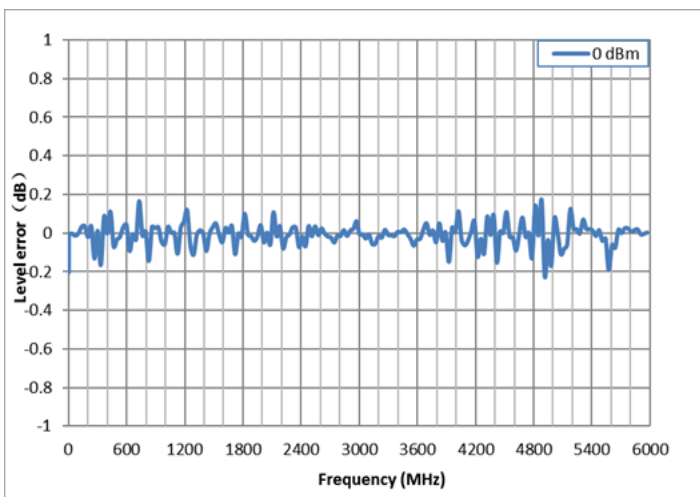
Maximum output power versus frequency, $f < 1$ MHz



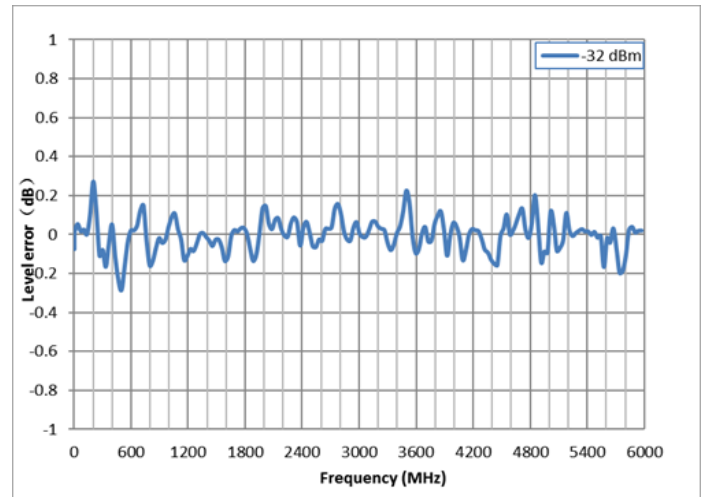
Measured level error versus frequency, Level = +20 dBm



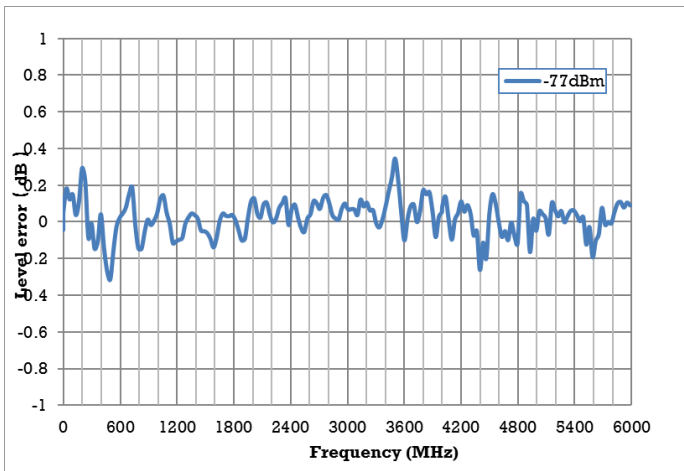
Measured level error versus frequency, Level = +13 dBm



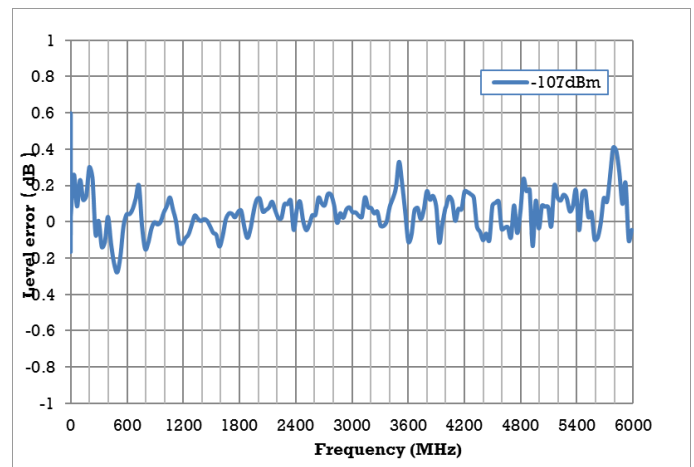
Measured level error versus frequency, Level = 0 dBm



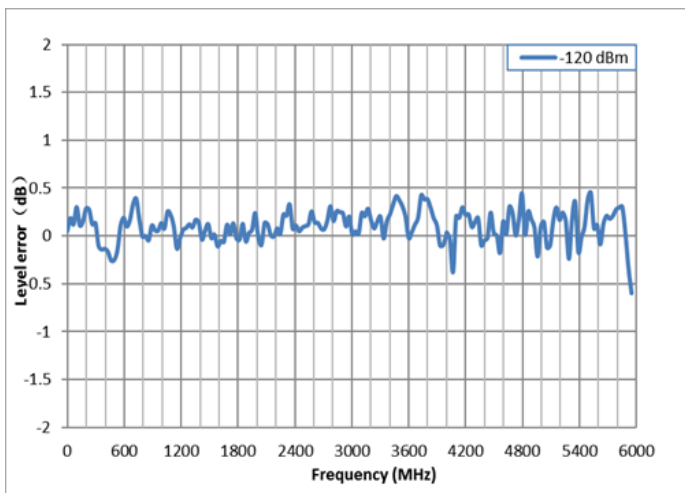
Measured level error versus frequency, Level = -32 dBm



Measured level error versus frequency, Level = -77 dBm



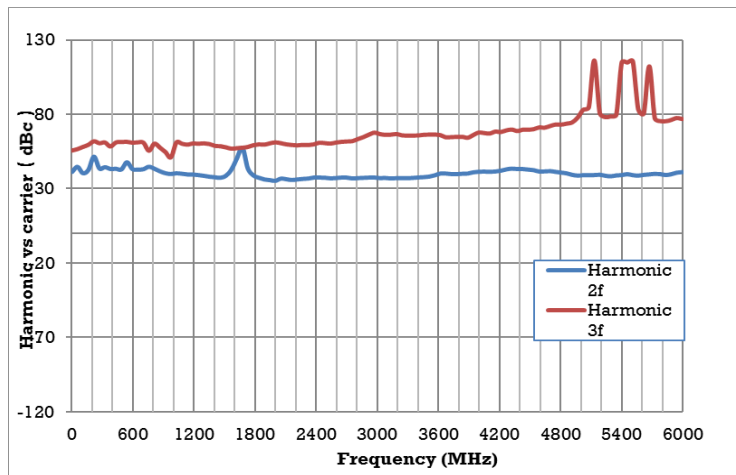
Measured level error versus frequency, Level = -107 dBm



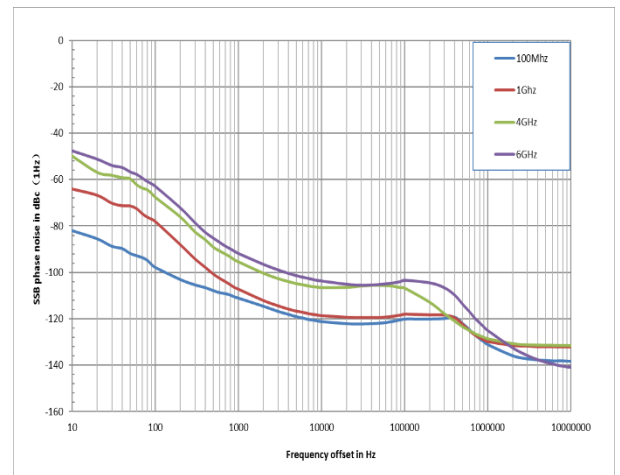
Measured level error versus frequency, Level = -120 dBm

Spectral purity

| | | |
|-----------------|------------------------------------------------------------------------------------------------------------|--------------------------------|
| Harmonics | CW mod, $1 \text{ MHz} < f \leq 6 \text{ GHz}$, Level $< +13 \text{ dBm}$ | $< -30 \text{ dBc}$ |
| Sub harmonics | CW mod, $1 \text{ MHz} < f \leq 6 \text{ GHz}$, offset $> 10 \text{ kHz}$ Level $\leq +13 \text{ dBm}$ | $< -48 \text{ dBc}$ |
| Non-harmonics | CW mod, offset $> 10 \text{ kHz}$, Level $\leq +13 \text{ dBm}$ $1 \text{ MHz} < f \leq 4 \text{ GHz}$ | $< -65 \text{ dBc}$ |
| | CW mod, offset $> 10 \text{ kHz}$, Level $\leq +13 \text{ dBm}$ $4 \text{ GHz} < f \leq 6 \text{ GHz}$ | $< -56 \text{ dBc (typ.)}$ |
| SSB Phase noise | CW mod, offset = 20 kHz, 1 Hz measure bandwidth | |
| | f = 100 MHz | $< -122 \text{ dBc/Hz (typ.)}$ |
| | f = 1 GHz | $< -120 \text{ dBc/Hz (typ.)}$ |
| | f = 4 GHz | $< -106 \text{ dBc/Hz (typ.)}$ |
| | f = 6 GHz | $< -105 \text{ dBc/Hz (typ.)}$ |



Measured harmonics versus carrier frequency at level $\leq +13$ dBm



Measured phase noise

Internal modulation generator (LF)

| | | |
|---------------------------------|-------------------------------------------------|---------------------------------------------|
| Waveforms | Sine wave, square wave, saw-tooth, triangle, DC | |
| Frequency range | Sine wave | 0.1 Hz-1 MHz [2] |
| | Square wave, triangle, saw-tooth | 0.1 Hz-20 kHz |
| Resolution of frequency setting | 0.01 Hz | |
| Frequency error | Similar with RF source | |
| Frequency response | Sine wave < 0.3 dB | |
| Level Offset | Setting range | $\min(2.5V - \frac{1}{2} \text{LEVEL}, 2V)$ |
| | Offset resolution | 0.01 V |
| Output voltage range [3] | Vp at connector | 1 mVpp-3 Vpp |
| | Resolution of amplitude setting | 1 mv |
| Output impedance | 50 Ω (nom.) | |

[2] When use modulation and LF simultaneously, the LF frequency range and wave type will be restricted.

[3] The connector's load is 50 Ω .

LF frequency sweep

| | |
|-------------------------------|-----------------------------------------|
| Operating mode | Digital sweep in discrete steps |
| Step spacing | Linear, logarithmic |
| Sweep shape | Saw-tooth, triangle |
| Sweep direction | Up, down |
| Sweep range | 0.01 Hz-1 MHz |
| Trigger mode | Auto, keyboard, external connector, bus |
| Trigger slope | Positive, negative |
| Dwell time setting range | 1 ms- 500 s |
| Dwell time setting resolution | 0.1 ms |

Analog modulation

| | Simultaneous modulation | | | | |
|----------------------|-------------------------|----------------------|------------------|------------------|---------------|
| | Amplitude modulation | Frequency modulation | Phase modulation | Pulse modulation | IQ modulation |
| Amplitude modulation | | ● | ● | (●) | ● |
| Frequency modulation | ● | | × | ● | ● |
| Phase modulation | ● | × | | ● | ● |
| Pulse modulation | (●) | ● | ● | | (●) |
| IQ modulation | ● | ● | ● | (●) | |

●=compatible, ×=incompatible, (●)=compatible limitations; NO specification Applies to AM distortion.
In IQ mode, if open the RF Blank function in the marker utility, you cannot use the pulse modulation.

Amplitude modulation

| | | |
|-------------------------------|-----------------------------------------|-------------------|
| Modulation source | Internal, external, internal + external | |
| AM depth setting range | 0%~100% | |
| Resolution of setting | 0.1% | |
| AM depth error | f-mod=1 kHz, m<80%, Level≤13dBm | <4% of setting+1% |
| AM distortion | f-mod=1 m < 30%, level < 0 dBm | <3% (typ.) |
| Modulation frequency response | m<80%, 10 Hz-100 kHz | <3 dB (nom.) |

| Frequency modulation | | |
|-------------------------------|--------------------------------------------------------|-------------------------------|
| Modulation source | Internal, external, internal +external | |
| Maximum deviation | N*1 MHz (typ.) | |
| Resolution | 0.1% of set deviation or 1 Hz, whichever is larger | |
| FM deviation error | Fmod=1 kHz, internal | < (2% of setting + 20 Hz) |
| FM distortion | Fmod=1kHz, deviation=N*1 MHz | <0.5% (nom.) |
| Modulation frequency response | 10 Hz-100 kHz | <3 dB (nom.) |
| Phase modulation | | |
| Modulation source | Internal, external, internal + external | |
| Maximum deviation | N*5 rad | |
| Resolution | 0.1% of set deviation or 0.01 rad, whichever is larger | |
| ΦM deviation error | Fmod=1 kHz, internal, deviation ≤ N*5 rad | < (2 % of setting + 0.05 rad) |
| ΦM distortion | Fmod=1 kHz, deviation ≤ N*5 rad | <0.5 % (nom.) |
| Modulation frequency response | 10 Hz-100 kHz | <3 dB (nom.) |
| Pulse modulation | | |
| Modulation source | Internal, external | |
| On/off ration | 1 MHz <f<4 GHz | >70 dBc |
| | 4 GHz <f≤6 GHz | >65 dBc (typ.) |
| Rise/fall time (10 % / 90 %) | 10 % to 90 % of RF amplitude | <50 ns |
| Pulse repetition time | Setting range | 40 ns-300 s |
| Pulse generator | | |
| Pulse modes | Single pulse, double pulse | |
| Pulse source | Internal, external | |
| Pulse polarity | Normal, inverse | |
| Pulse period | Setting range | 40 ns-300 s |
| | Resolution of setting | 10 ns |
| Pulse width | Retting range | 20 ns-300 s |
| | Resolution of setting | 10 ns |
| Double pulse Delay | Setting range | 20 ns-300 s |
| | Resolution of setting | 10 ns |

| | | |
|-----------------------------------------------|--------------------------------------------------------------|-------------|
| #2 Width | Setting range | 20 ns-300 s |
| | Resolution of setting | 10 ns |
| Trigger modes | Auto, keyboard, external trigger, external gate trigger, bus | |
| Trig polarity | Normal, inverse (used in external gate trigger mode) | |
| Trigger Slope | Positive, negative (used in external trigger mode) | |
| External trigger delay | 140 ns-300 s | |
| External trigger delay resolution of setting | 10 ns | |
| Pulse train generator (SSG5000X-PT) | | |
| Number of pulses | 1-2047 | |
| Number of repetitions per pulse | 1 - 65535 | |
| Pulse on time and off time setting range | 20 ns-300 s | |
| Pulse on time and off time setting resolution | 10 ns | |

Vector Modulation Specification

| IQ modulation external inputs | | |
|--------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------|
| Bandwidth | Base Band I or Q < 100 MHz, nominal RF(I+Q) < 200 MHz, nominal | |
| Full scale input drive (I+Q) | $\sqrt{I^2 + Q^2} = 0.5V_{rms}$ 50 Ω | |
| Internal I/Q baseband generator adjustment | | |
| I/Q offset | ± 50 % | |
| I/Q gain | ± 4 dB | |
| Quadrature angle adjustment | $\pm 10^\circ$ | |
| I/Q output | | |
| Impedance | 50 Ω nominal per output | |
| | 100 Ω difference output | |
| Maximum voltage per output | 0.5 V peak-to-peak with sine wave | |
| Bandwidth(I, Q) | Baseband (I or Q) 37.5 MHz, nominal Baseband (I or Q) 75 MHz, nominal (option SSG5000XV-B150) | |
| Amplitude flatness | ± 0.3 dB, measured with channel corrections optimized for I/Q output | |
| Differential mode I or Q offset | ± 3 V into 50 Ω | |
| Common mode I/Q offset | ± 1.5 V into 50 Ω | |
| Internal Baseband generator | | |
| Sample rate | 100 Hz to 120 MHz 100 Hz to 240 MHz (option SSG5000XV_B150) | |
| RF bandwidth(I+Q) | 75 MHz, nominal 150 MHz, nominal (option SSG5000XV_B150) | |
| Frequency offset range | ± 60 MHz | |
| Arbitrary waveform memory | Max playback capacity | 200 MSa |
| | Max storage capacity include markers | 4 G Bytes |
| Waveform segments | Segment length | 200 Sa-200 MSa |
| Waveform sequences | Max. number of segments/sequences | 1024 |
| | Max. number of repetitions | 65535 |
| Triggers | Types | Continuous, single, gated, segment advance |
| | Source | Trigger key, external, bus (GPIB, LAN, USB) |

| | | | |
|---------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------|
| | Modes | Continuous | Free run, trigger and run, reset and run |
| | | Single | NO retrigger, buffered trigger, restart on trigger |
| | | Gated | Negative polarity or positive polarity |
| | | Segment advanced | Single or continuous |
| Trigger latency | 83 ns+8 sample clock period, nominal 83 ns+0.8 us+8 sample clock period, nominal | | |
| Trigger accuracy | 10 ns | | |
| Markers | Marker polarity | | Negative, positive |
| | Number of Markers | | 4 |
| | RF blanking/Burst On/Off ratio | | >70 dBc(typ.) |
| AWGN (Additive White Gaussian Noise) | | | |
| Type | Real time | | |
| Modes of operation | Standalone, or digitally added to signal played by arbitrary waveform | | |
| Bandwidth | 1Hz-75 MHz 1Hz-150 MHz (option SSG5000XV-B150) | | |
| Carrier to noise ratio | ±100 dB | | |
| Carrier-to-noise formats | C/N, Eb/N0 | | |
| Custom digital modulation mode | | | |
| Modulation type | PSK | BPSK, QPSK, 8PSK, DBPSK, DQPSK, 8PSK, OQPSK, PI/4-DQPSK, PI/8-D8PSK | |
| | QAM | 16QAM ,32QAM ,64QAM ,128QAM ,256QAM ,512QAM | |
| | MFSK | 2FSK ,4FSK ,8FSK ,16FSK, MSK | |
| | ASK | 2ASK,4ASK,8ASK,16ASK | |
| User | | | |
| Symbol Rate | 60 Msps 120 Msps (option SSG5000XV-B150) | | |
| Multi-tone | | | |
| Number of tones | 1 to 40, with selectable on/off state per tone | | |
| Frequency spacing | 100 Hz to 120 MHz | | |
| Phase (per tone) | Fixed | | |

3GPP WCDMA distortion performance

Power level \leq 4 dBm

| Offset | Configuration | Frequency | spec |
|------------------|-------------------------------------|------------------|---------|
| Adjacent (5MHz) | 1DPCH,1 carrier | 1800 to 2200 MHz | -60 dBc |
| Adjacent (10MHz) | | | -62 dBc |
| Adjacent (5MHz) | Test mode 1 with 64 DPCH ,1 carrier | 1800 to 2200 MHz | -60 dBc |
| Adjacent (10MHz) | | | -62 dBc |

3GPP LTE-FDD distortion performance

| Offset | Configuration | Frequency | Level \leq 4 dBm |
|------------------|---------------------|------------------|--------------------|
| Adjacent (10MHz) | 10 MHz E-TM1.1 QPSK | 1800 to 2200 MHz | -56 dBc (typ.) |
| Adjacent (20MHz) | | | -60 dBc (typ.) |

GSM/EDGE output RF spectrum

| | | | GSM | EDGE |
|----------|-------------------------|------------------------------------|--------------------------|----------------|
| Offset | Configuration | Frequency | Power level \leq 4 dBm | |
| 200 kHz | 1 normal timeslot burst | 800 to 900 MHz 1800 to 1900 MHz | -35 dBc (typ.) | -35 dBc (typ.) |
| 400 kHz | | | -40 dBc (typ.) | -40 dBc (typ.) |
| 600 kHz | | | -68 dBc (typ.) | -68 dBc (typ.) |
| 800 kHz | | | -78 dBc (typ.) | -78 dBc (typ.) |
| 1200 kHz | | | -80 dBc (typ.) | -80 dBc (typ.) |

3GPP2 CDMA2000 distortion performance

| Offset | Configuration | Frequency | Power level \leq 4 dBm |
|--------------------|------------------------|----------------|--------------------------|
| 885kHz to 1.98 MHz | 9 channel forward link | 800 to 900 MHz | -64 dBc (typ.) |
| >1.98 to 4.0 MHz | | | -82 dBc (typ.) |
| >4.0 to 10 MHz | | | -82 dBc (typ.) |

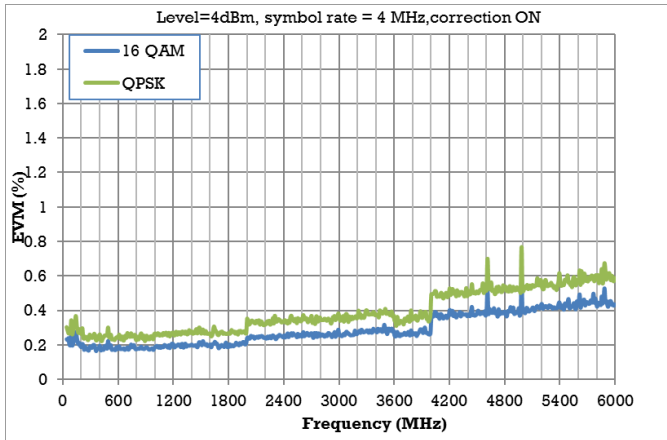
EVM performance

| Format | W-CDMA | LTE FDD | GSM | EDGE | CDM2000 |
|-----------------------|-----------|-----------|--------------|--------------------|---------------|
| Modulation type | QPSK | 64 QAM | GMSK (burst) | 3 pi/ 8PSK (burst) | QPSK |
| Modulation rate | 3.84 Mcps | 10 MHz BW | 270.833 ksps | 70.833 Ksps | 1.2288 Mcps |
| Channel configuration | 1 DPCH | E-TM 3.1 | 1 timeslot | 1 timeslot | Pilot channel |

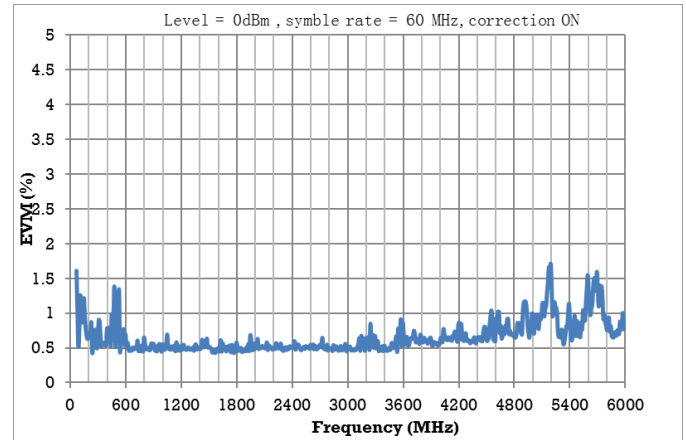
| Frequency | 1800 to 2200 MHz | 1800 to 2200 MHz | 800 to 900 MHz 1800 to 1900 MHz | 800 to 900 MHz 1800 to 1900 MHz | 800 to 900 MHz 1800 to 1900 MHz |
|-----------------|------------------|------------------|------------------------------------|------------------------------------|------------------------------------|
| EVM power level | ≤ 4 dBm | | | | |
| EVM | < 1.2 % | < 0.5 % | < 1.3 % | < 1.3 % | < 1 % |

EVM performance

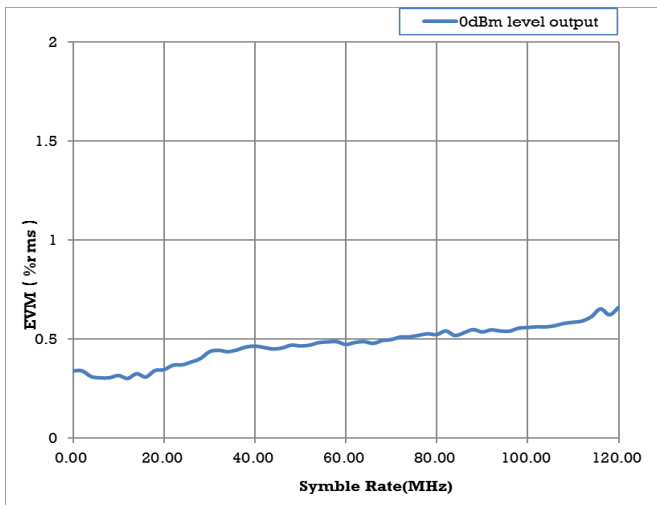
| | | |
|-----------------|---------------------------------------------|--------------|
| Modulation type | QPSK | 16 QAM |
| Modulation type | QPSK | 16 QAM |
| Modulation rate | 4 Msps (root-Nyquist filter $\alpha=0.25$) | |
| Frequency | ≤ 6 GHz | ≤ 6 GHz |
| power level | ≤ 4 dBm | |
| EVM | < 1 % | < 1 % |



Measured EVM performance vs carrier frequency@
symbol rate=4 MHz



Measured EVM performance vs carrier frequency@
symbol rate=60 MHz, QPSK



Measured EVM performance vs symbol rate @2.2 GHz, QPSK

Connectors

| Front panel connectors | | |
|----------------------------------|------------------------|----------------------------------------------|
| RF output | Impedance | 50 Ω |
| | Connector | N female |
| Modulation generator output (LF) | Impedance | 50 Ω |
| | Connector | BNC female |
| Rear panel connectors | | |
| TRIG IN / OUT | Impedance | 100 k Ω |
| | Connector | BNC female |
| | Active trigger voltage | 5 V TTL |
| EXT MOD INPUT | Impedance | High impedance |
| | Connector | BNC female |
| PULSE IN / OUT | Impedance | Input: High impedance Output: 50 Ω |
| | Connector | BNC |
| | Input/output voltage | CMOS 3.3 V |
| 10 MHz IN | Impedance | 50 Ω |
| | Connector | BNC-female |
| | Input power range | -5 dBm~ +10 dBm |
| 10 MHz OUT | Impedance | 50 Ω |
| | Connector | BNC-female |
| | Input power range | >0 dBm |
| SIGNAL VALID | Impedance | 50 Ω |
| | Connector | BNC-female |
| | Output voltage range | CMOS 3.3 V |
| I INPUT | Impedance | 20 k Ω |
| | Connector | BNC-female |
| Q INPUT | Impedance | 20 k Ω |
| | Connector | BNC-female |
| I+ output | Impedance | 50 Ω |
| | Connector | BNC-female |

| | | |
|--------------------------------|---------------------------------|----------------|
| I- output | Impedance | 50 Ω |
| | Connector | BNC-female |
| Q+ output | Impedance | 50 Ω |
| | Connector | BNC-female |
| Q- output | Impedance | 50 Ω |
| | Connector | BNC-female |
| PATTERN_TRIG | Impedance | High impedance |
| | Connector | BNC-female |
| | Input voltage range | CMOS 3.3V |
| IQ_EVENT | Impedance | 50 Ω |
| | Connector | BNC-female |
| | Output voltage range | CMOS 3.3V |
| Communication Interface | | |
| USB host | USB-A 2.0 | |
| USB device | USB-B 2.0 | |
| LAN | LAN (VXI-11, 10/100Base, RJ-45) | |

| General Specification | |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display | TFT LCD, RGB (800*480), 5inch capacitive touch screen |
| Storage | Internal (Flash) 4 G Byte, external (USB storage device) |
| Source | Input voltage range (AC) 100 V~240 V ($\pm 10\%$) AC frequency Supply 100 V to 240 V, 50/60 Hz; Supply 100 V to 120 V, 400 Hz Power consumption 75 W with all Function working |
| Temperature | Working temperature 0 °C to 50 °C, Storage temperature -20 °C to 70 °C |
| Humidity | 0 °C to 30 °C, $\leq 95\%$ relative humidity; 30 °C to 50 °C, $\leq 75\%$ relative humidity |
| Dimensions | W×H×D=338×113×369 mm |
| Altitude | Operating: less than 3 km |
| Weight without package | Contain IQ modulator board 5.3 kg |
| Electromagnetic Compatibility and Safety | |
| EN 61326-1:2013/ | Class A |
| EN 61000-3-2: 2014 | |
| EN 61000-3-3: 2013 | Plt: 0.65 Pst: 1.00, dmax: 4.00 % dc: 3.00 %, dtLim: 3.30 % dt>Lim: 500 ms |
| IEC 61000-4-2: 2008 | AD ± 8.0 kV, CD ± 4.0 kV |
| IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010 | 80 MHz to 1000 MHz: 10 V/m; 1.4 GHz to 2.0 GHz: 3 V/m; 2.0 GHz to 2.7 GHz: 1 V/m |
| IEC 61000-4-4: 2004 + A1: 2010 | AC Line: ± 2100 kV |
| IEC 61000-4-5: 2005 | Line to Line: 1.0 kV, Line to Earth: 2.0 kV |
| IEC 61000-4-6: 2008 | 0.15-80 MHz: 3V 1 kHz 80% AM |
| IEC 61000-4-8: 2009 | 30 A/m, 50/60 Hz |
| IEC 61000-4-11: 2004 | Voltage Dips: 0%/0.5P; 40%/10P; 70%/25P; Short Interruptions Test Level %UT: 0%/250P |
| Safety | |
| IEC 61010-1:2010/EN 61010-1:2010 | |
| Canada: CAN/CSA-C22.2 No.61010-1:2012 | |
| RoHS | |
| 2011/65/EU | |

Ordering Information

| Product Description | SSG5000X Signal Generator | Order Number |
|-------------------------|----------------------------------------------------------------|----------------|
| Product code | Analog Signal Generator 9 kHz~4 GHz | SSG5040X |
| | Analog Signal Generator 9 kHz~6 GHz | SSG5060X |
| | Vector Signal Generator 10 MHz~4 GHz | SSG5040X-V |
| | Vector Signal Generator 10 MHz~6 GHz | SSG5060X-V |
| Standard configurations | Quick start, an USB cable, calibration certificate, power cord | |
| Option | Pulse train generator | SSG5000X-PT |
| | Rack mount kit | SSG-RMK |
| | USB-GPIB adapter | USB-GPIB |
| | Upgrade 4 GHz to 6 GHz | SSG5000X_F60 |
| | Upgrade IQ bandwidth from 75 MHz to 150 MHz | SSG5000XV_B150 |
| | Precision Frequency Reference | 10M_OCXO_L |

SSG5000X Series RF Signal Generator



About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, function/arbitrary waveform generators, RF generators, digital multimeters, DC power supplies, spectrum analyzers, vector network analyzers, isolated handheld oscilloscopes, electronic load and other general purposes test instrumentation. Since its first oscilloscope, the ADS7000 series, was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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