

Keysight N9310A

RF Signal Generator

9 kHz to 3.0 GHz

Data Sheet



Definitions and Conditions

“**Specifications**” describe the performance of parameters covered by the product warranty and apply to the full temperature range of 5 to 45 °C, unless otherwise noted.

“**Typical**” values describe additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 80 percent of the units exhibit with a 95 percent confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.

“**Nominal**” values indicate expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty.

The signal generator will meet its specifications when:

- It is within its calibration cycle
- It has been turned on at least 45 minutes
- It has been stored at an ambient temperature within the allowed operating range for at least two hours before being turned on; if it had previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range

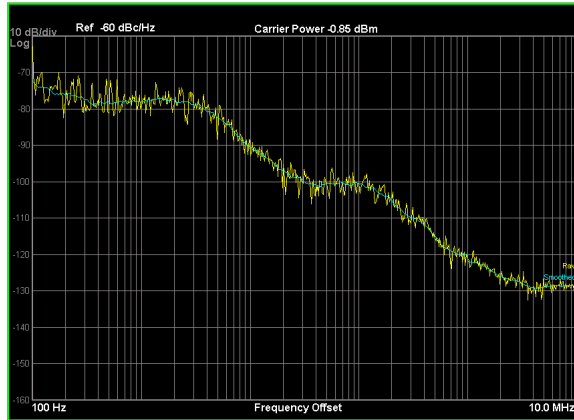
Specifications

| | | Supplemental information |
|----------------------------------|---|---|
| Frequency | | |
| Range | 9 kHz to 3.0 GHz | |
| Resolution | 0.1 Hz | |
| Switching speed | < 10 ms | Typical; Within 0.1 ppm of final frequency |
| Frequency reference | | |
| | Option PFR | Standard |
| Aging rate | $\pm 1 \times 10^{-7}$ /year $\pm 1.5 \times 10^{-7}$ /2 years | $\pm 1 \times 10^{-6}$ / year |
| Temperature stability | $\pm 1.5 \times 10^{-8}$ (20 to 30 °C) $\pm 5 \times 10^{-8}$ (5 to 50 °C) | $\pm 1 \times 10^{-6}$ (5 to 45 °C) |
| Timebase reference output | | |
| Frequency | 10 MHz | |
| Amplitude | > 0.35 Vrms level into 50 Ω | |
| Connector | BNC female | |
| External reference input | | |
| Range | 2 MHz, 5 MHz, 10 MHz | |
| Amplitude | 0.5 to 2 Vrms | |
| Connector and impedance | 50 Ω ; BNC female | |
| Output | | |
| Power | -127 to +13 dBm | +20 dBm settable |
| Resolution | 0.1 dB | |
| Accuracy | < ± 1 dB | $F_c \geq 100$ kHz, $-120 \leq \text{Level} \leq +13$ dBm, 20 to 30 °C |
| Switching speed | < 10 ms | Typical; < 0.3 dB deviation |
| VSWR (typical) | < 1.6 < 1.8 | 1.5 MHz $\leq F_c \leq 2.5$ GHz 2.5 GHz $\leq F_c \leq 3$ GHz |
| Output connector and impedance | N-type; 50 Ω nominal | |
| Reversal power protection | | |
| DC voltage | 30 V | |
| RF power | +36 dBm | 1 minute; the warning for reversed power protection is nominally at +25 dBm |
| Spectral purity | | |
| SSB phase noise | < -95 dBc/Hz | Typical, $F_c = 1$ GHz at 20 kHz offset |
| Residual FM | < 30 Hz rms; < 90 Hz peak < 20 Hz rms | CW mode, $F_c = 1$ GHz; BW = 0.3 to 3 kHz Res FM optimized mode |
| Harmonics | < -30 dBc | Level ≤ 0 dBm, $F_c \geq 1$ MHz |
| Non-harmonics | < -50 dBc | Level ≤ 0 dBm, ≥ 10 kHz from carrier |

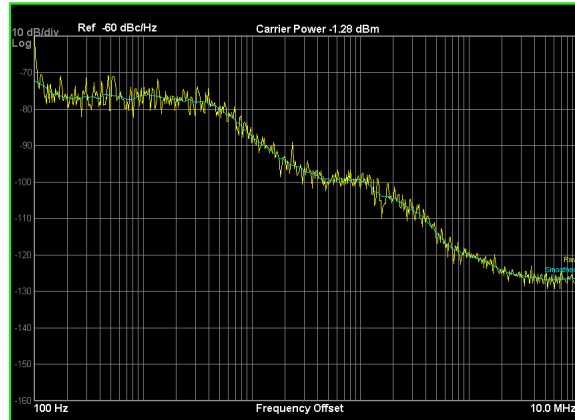
Specifications (continued)

Supplemental information

Characteristic SSB phase noise



fc = 1,000 MHz



fc = 2,000 MHz

Sweep modes RF and LF

| | |
|----------------|-----------------|
| LF sweep range | 20 Hz to 80 kHz |
| RF sweep range | 9 kHz to 3 GHz |
| Sweep points | 2 to 1,001 |
| Dwell time | 10 ms to 1 s |

Amplitude

| | |
|--------------|-----------------|
| Sweep range | -127 to +13 dBm |
| Sweep points | 2 to 1,001 |
| Dwell time | 10 ms to 1 s |

Simultaneous modulation ¹

| | | AM | | I/Q | FM | | ØM | Pulse | |
|-------|----------|----------|----------|-----|----------|----------|----|----------|----------|
| | | Internal | External | | Internal | External | | Internal | External |
| AM | Internal | – | • | – | • | • | • | – | – |
| | External | • | – | – | • | • | • | – | – |
| I/Q | | – | – | – | • | • | • | • | • |
| FM | Internal | • | • | • | – | • | – | • | • |
| | External | • | • | • | – | – | – | • | • |
| ØM | | • | • | • | – | – | – | • | • |
| Pulse | Internal | – | – | • | • | • | • | – | – |
| | External | – | – | • | • | • | • | – | – |

1. The N9310A has one external modulation input connector. The simultaneous external modulations are applied to the same input signal.

Specifications (continued)

| | | Supplemental information |
|-----------------------------------|-----------------------------------|--|
| Amplitude modulation | | |
| | (Fc ≥ 100 kHz) | |
| Operating modes | Internal, external AC | |
| Range | 0 to 100% | Envelope peak < maximum specified power |
| Resolution | 0.1% | |
| Rates | 20 Hz to 20 kHz | |
| Accuracy | < ± (5% of setting +0.2%) | 1 kHz, 0 dBm and 80% modulation, 0.3 to 3 kHz bandwidth |
| Distortion | < 2% | 1 kHz, 0 dBm and 80% modulation, 0.5 to 15 kHz bandwidth |
| External input | MOD IN connector | |
| Sensitivity | 0.5 V _{peak} | Input voltage for 100% modulation depth |
| Input impedance | BNC; > 100 kΩ | Nominal |
| Frequency modulation | | |
| | (Fc ≥ 100 kHz) | |
| Operating modes | Internal, external AC | |
| Frequency deviation | 20 Hz to 100 kHz | |
| Resolution | < 1% | Minimum 1 Hz |
| Rates | 20 Hz to 80 kHz | |
| Distortion | 1% | 1 kHz rate, 0.3 to 3 kHz bandwidth, deviation = 50 kHz |
| Deviation accuracy | < ± (5% of FM deviation +300 Hz) | 1 kHz, 0 dBm and 50 kHz deviation, 0.3 to 3 kHz bandwidth |
| Carrier frequency deviation | < 200 Hz | Relative to carrier; external mode |
| External input | MOD IN connector | |
| Sensitivity | 0.5 V _{peak} | Input voltage for 100 kHz modulation deviation |
| Input impedance | BNC; > 100 kΩ | Nominal |
| Phase modulation | | |
| | (Fc ≥ 100 kHz) | |
| Operating modes | Internal | |
| Phase deviation | 0 to 10 rad | Rate ≤ 10 kHz |
| | 0 to 5 rad | 10 kHz < rate ≤ 20 kHz |
| Resolution | < 1% | |
| Rates | 300 Hz to 20 kHz | |
| Deviation accuracy | < ± (5% of FM deviation +0.2 rad) | 1 kHz rate, 0.3 to 3 kHz bandwidth |
| Distortion | < 1.5% | 1 kHz rate, 0.3 to 3 kHz bandwidth, deviation = 5 rad |
| Input impedance | BNC; > 100 kΩ | Nominal |
| Pulse modulation | | |
| Operating modes | Internal, external | |
| On/Off ratio | ≥ 40 dB | |
| Rise/Fall time | < 3 μs | |
| Pulse width | 100 μs to 1 s | Internal, external |
| Pulse period | 200 μs to 2 s | Internal |
| Time resolution | 1 μs | |
| Input connector and voltage level | BNC female; TTL | |

Specifications (continued)

| | Supplemental information | |
|---|---|--|
| Internal modulation source | Provides a modulation signal for AM, FM, phase modulation, and LF out | |
| Waveform | Sine | |
| Frequency range | 20 Hz to 80 kHz | |
| Resolution | 0.1 Hz | |
| Accuracy | 0.005% | Typical |
| LF out (Internal modulation source) | | |
| Amplitude | 0 to 3 V _{peak} | Level to high impedance |
| Output voltage resolution | < 1% | 1 mV minimum resolution |
| Frequency response | < ± 0.2 dB | 20 Hz to 20 kHz |
| Total harmonic distortion | < 0.1% | Typical; 20 Hz to 20 kHz, 30 kHz low pass filter |
| Connector and impedance | BNC female; < 1Ω | Front panel |
| Precision frequency reference (option PFR) | | |
| Output frequency | 10 MHz | |
| Accuracy | ± [(time since last adjustment × aging rate) + temperature stability + calibration accuracy ²] ³ | |
| Temperature Stability | | |
| 20 to 30 °C | ± 1.5 × 10 ⁻⁸ | |
| 5 to 50 °C | ± 5 × 10 ⁻⁸ | |
| Aging | | |
| 1 year | ± 1 × 10 ⁻⁷ | |
| 2 years | ± 1.5 × 10 ⁻⁷ | |
| Achievable Initial Calibration Accuracy | ± 4 × 10 ⁻⁸ | |
| Output level | > +4 dBm | |
| Connector | BNC female, 50 Ω nominal, rear panel | |
| Calibration connection | Mini USB port, rear panel | |
| I/Q modulation (Option 001 only) | | |
| Operating mode | External I/Q inputs | |
| VSWR | < 1.5 | |
| Full scale input | $\sqrt{I_2 + Q_2} = 0.5 \text{ Vrms}$ | |
| Modulation frequency range | DC to 20 MHz | At 3 dB points |
| Carrier suppression | 40 dBc | Typical; modulation frequency = 10 kHz |
| QPSK EVM | 3% | Typical; 1 Msps; 0.22 RRC filter |
| GMSK phase error | 1.2 °rms | Typical; 1 Msps; BT = 0.5 |
| Connector and impedance | BNC female; 50 Ω | Rear panel |

2. Calibration accuracy depends on how accurately the frequency standard was adjusted to 10 MHz. If the adjustment procedure is followed, the calibration accuracy is given by the specification of the achievable initial calibration accuracy.
3. The specification applies after the generator has been powered on for four hours.

Specifications (continued)

| | | Supplemental information |
|---|--|--|
| USB connector | | |
| USB host interface | 3 x A plug | V 1.1 protocol |
| USB device interface | 1 x B plug | V 1.1 protocol |
| General | | |
| Recommended calibration cycle | 2-year | Keysight Technologies, Inc. has verified that the stability of this product's architecture justifies a longer calibration interval of 2 years. |
| Power requirement | 100 to 240 Vac; 50 to 60 Hz | Auto-ranging |
| Power consumption | 65 W | |
| Temperature range | 5 to 45 °C -20 to 70 °C | Operating Storage |
| Weight | 9.2 kg | Nominal |
| Dimensions | 132.5 x 320 x 400 mm | H x W x D |
| Display | | |
| Resolution | 640 x 480 | |
| Size | 165.1 mm (6.5 in) diagonal (nominal) | |
| Data storage | | |
| Internal | 16 MB nominal | |
| External | Supports USB 2.0-compatible memory devices | |
| EMC | | |
| Complies with European EMC Directive 2004/108/EC | | |
| <ul style="list-style-type: none"> - IEC/EN 61326-1 or IEC/EN 61326-2-1 - CISPR Pub 11 group 1, class A - AS/NZS CISPR 11:2004 - ICES/NMB-001:2004 | | |
| This ISM device complies with Canadian ICES-001 | | |
| Cet appareil ISM est conforme à la norme NMB-001 du Canada | | |
| Safety | | |
| Complies with European Low Voltage Directive 2006/95/EC | | |
| <ul style="list-style-type: none"> - IEC/EN 61010-1 2nd edition - Canada: CSA C22.2 No. 61010-1-04 - USA: UL 61010-1 2nd edition | | |
| Audio noise | | |
| Acoustic noise emission | Geraeuschemission | |
| LpA < 70 dB | LpA < 70 dB | |
| Operator position | Am Arbeitsplatz | |
| Normal position | Normaler Betrieb | |
| Per ISO 7779 | Nach DIN 45635 t.19 | |
| Environmental stress | | |
| Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to, temperature, humidity, shock, vibration, altitude, and power line conditions. Test methods are aligned with IEC 60068-2 and levels are similar to MILPRF-28800F Class 3 | | |

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