



LUCID SERIES
THINK RF THINK **LUCID**

DATA SHEET

LSX Analog Signal Generator

Modular RF and MW signal generators

50 kHz to 8 GHz, 14 GHz, 20 GHz, and 40 GHz

Introduction

Modular 50 kHz to 8 GHz, 14 GHz, 20 GHz, and 40 GHz ultra-low phase noise, 10 μ s phase coherent switching, multi-channel signal generator

The Lucid-X is a small footprint modular signal generator that is available in multiple form factors including PXIe module, benchtop, rackmount, and portable. It has been designed to provide low phase noise, fast frequency switching with a frequency range all the way up to 40GHz.

Specification Notes

- Warranted specifications represent the tested and verified performance of the instrument at 23 °C \pm 5 °C after a minimum 30-minute warm-up.
- Typical values indicate the expected average performance of most units under nominal conditions; they are not guaranteed and may vary.
- Minimum and maximum limits define the design-verified operating range, established through design validation and/or production testing.
- Warranted limits include appropriate guard bands to account for statistical performance variations, measurement uncertainty, and environmental effects.
- Specifications and performance characteristics are subject to change without notice as part of ongoing product improvement.

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Specifications & Graphs

Frequency Parameters / Range

| Parameter | Min | Typical | Max | Note |
|-------------------------|--------|----------|---------|-------------------------|
| Frequency Range | 50 kHz | 8 GHz | | LSX808xy ⁽¹⁾ |
| | 50 kHz | 14 GHz | | LSX149xy ⁽¹⁾ |
| | 50 kHz | 20 GHz | | LSX209xy ⁽¹⁾ |
| | 50 kHz | 40 GHz | | LSX409xy ⁽¹⁾ |
| Resolution | | 0.001Hz | | |
| Phase Offset | 0 deg | | 360 deg | 0.01 deg resolution |
| Phase Resolution | | 0.01 deg | | |
| Switching Speed | | | | |
| CW Mode | | | | |
| Sweep / List Mode | | 500 μs | | Standard |
| Sweep / List Mode | | 100 μs | | FS Option |
| Sweep / List Mode | | 10 μs | | UFS Option |

⁽¹⁾ x = Number of channels, y=X/R/B/D/P=PXIe/Rackmount/Benchtop/Desktop/Portable.



Figure 1: Frequency Switching Option FS Option

SSB Phase Noise

Typical Values (dBc/Hz), CW Level 0 dBm

| | 1 Hz | 10 Hz | 100 Hz | 1 kHz | 10 kHz | 100 kHz | 1 MHz | 10 MHz | 100 MHz |
|--------------------------|------|-------|--------|-------|--------|---------|-------|--------|---------|
| Carrier Frequency | | | | | | | | | |
| 100 MHz | -68 | -90 | -112 | -142 | -148 | -149 | -149 | -149 | -150 |
| 1 GHz | -49 | -70 | -92 | -123 | -133 | -138 | -140 | -145 | -157 |
| 4 GHz | -36 | -58 | -80 | -111 | -121 | -127 | -128 | -134 | -154 |
| 8 GHz | -31 | -52 | -74 | -105 | -115 | -121 | -122 | -128 | -155 |
| 10 GHz | -29 | -50 | -72 | -103 | -114 | -119 | -120 | -126 | -139 |
| 20 GHz | -23 | -44 | -66 | -97 | -108 | -113 | -114 | -121 | -142 |

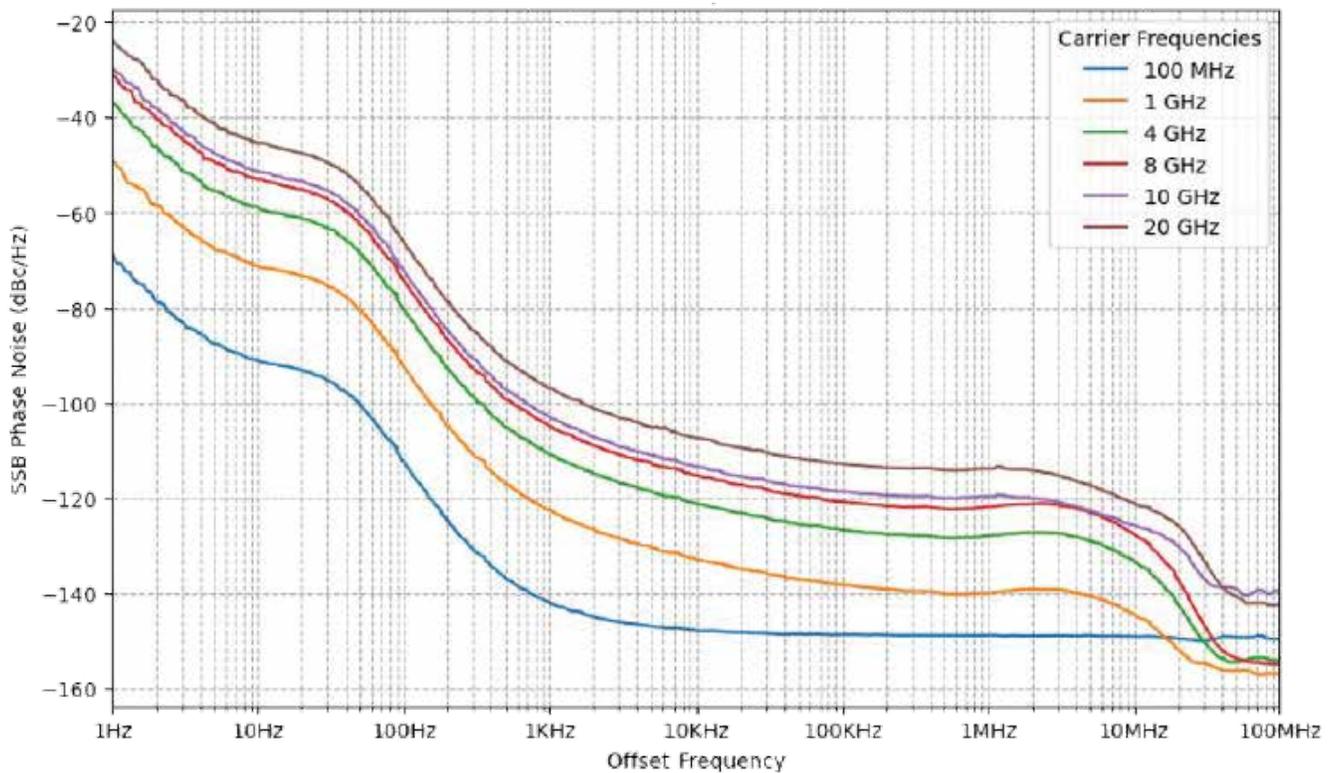


Figure 2: Phase Noise vs. Frequencies at 0 dBm

Spectral Purity

| Parameter | Min | Typical | Max | Note |
|---|-----|----------|---------|--|
| Harmonics @ 0 dBm Output Power | | | | |
| <1.5 GHz | | <-50 dBc | | |
| 1.5 GHz to 8 GHz | | <-50 dBc | -45 dBc | |
| 8 GHz to 12 GHz | | <-40 dBc | -37 dBc | |
| 12 GHz to 17 GHz | | <-43 dBc | -40 dBc | |
| 17 GHz to 20 GHz | | <-55 dBc | -51 dBc | |
| Harmonics @ +10 dBm Output Power | | | | |
| <1.5 GHz | | -40 dBc | | |
| 1.5 GHz to 8 GHz | | -35 dBc | -33 dBc | |
| 8 GHz to 12 GHz | | -32 dBc | -28 dBc | |
| 12 GHz to 17 GHz | | -35 dBc | -34 dBc | |
| 17 GHz to 20 GHz | | -50 dBc | -43 dBc | |
| Sub Harmonics | | | | |
| Up to 20 GHz | | -75 dBc | | |
| Non-Harmonic Spurious | | | | |
| Up to 20 GHz | | -90 dBc | -60 dBc | Max is defined by boundary spurs that may appear @ -100 MHz to +100 MHz offset from CW |

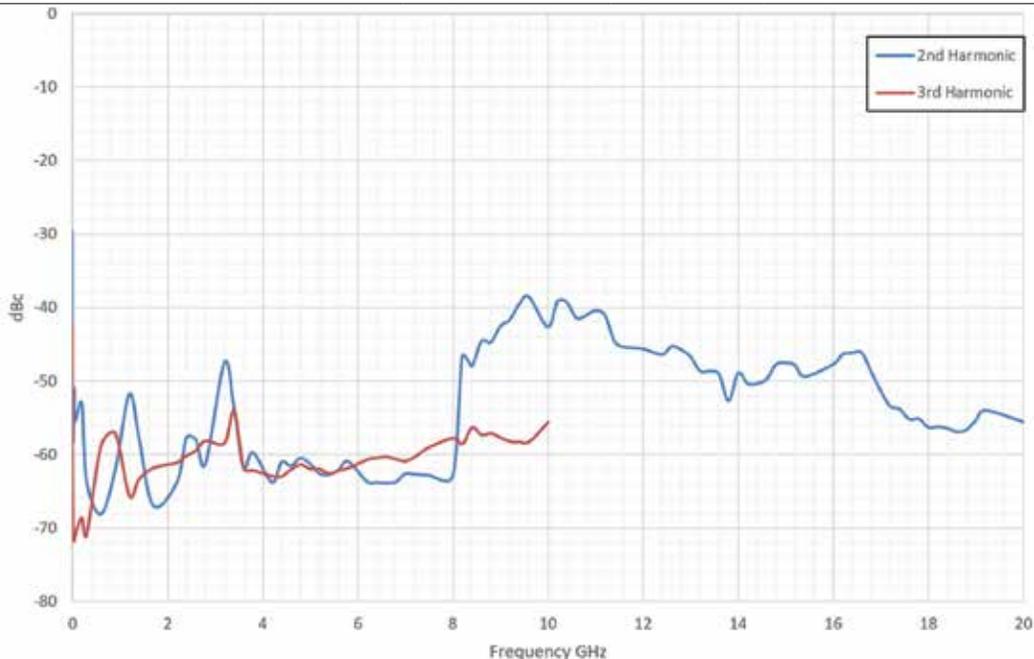


Figure 4: Harmonics at 5 dBm

Spectral Purity (continued)

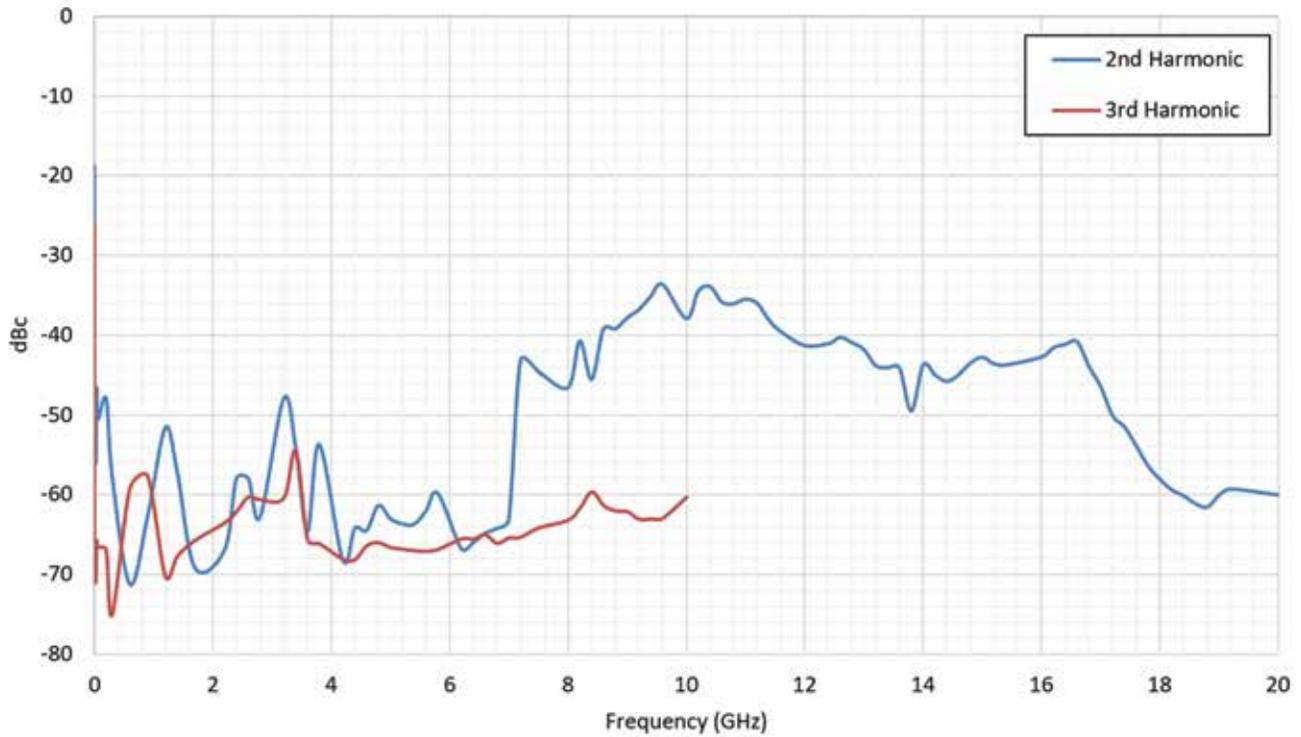


Figure 4: Harmonics at 5 dBm

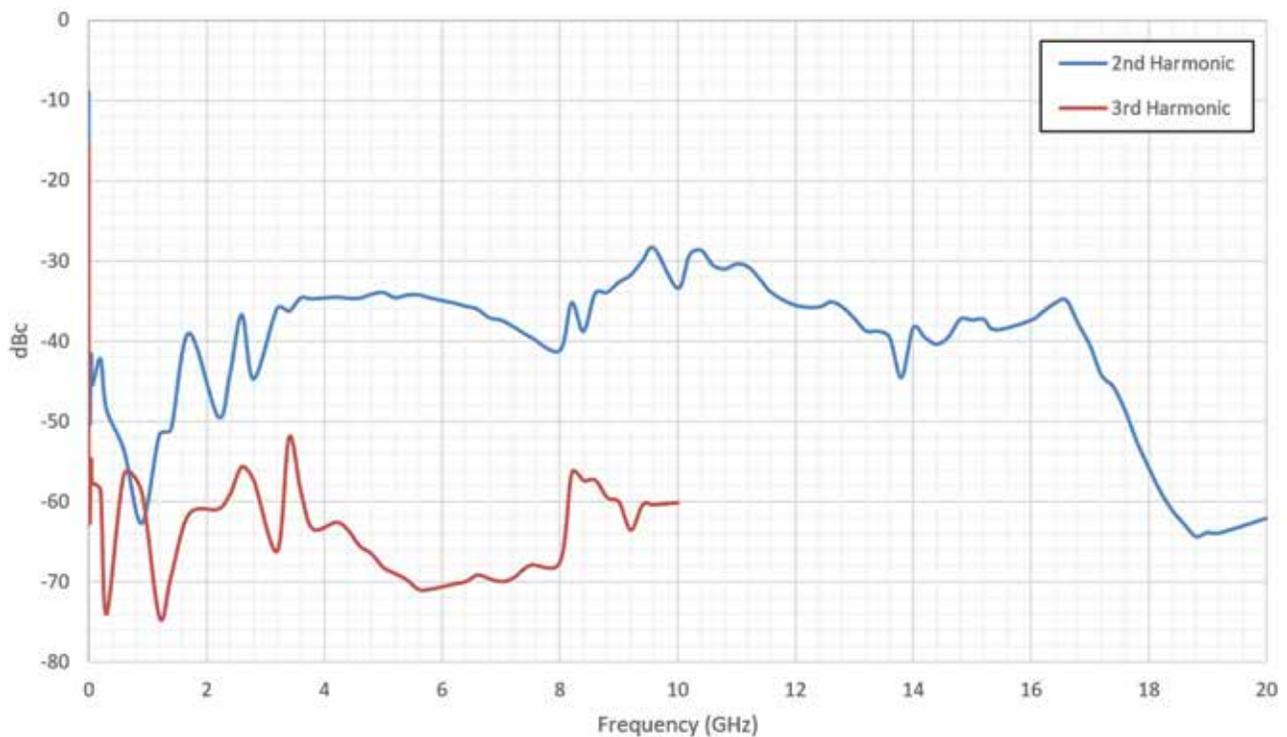


Figure 5: Harmonics at 10 dBm

Level Performance

| Parameter | Min | Typical | Max | Note |
|---------------------------|---------|---------|---------|------|
| Output Power Level | | | | |
| Settable | -80 dBm | | +20 dBm | |
| Calibrated | -70 dBm | | +15 dBm | |
| Power Resolution | | 0.01 dB | | |
| Power Mute | | -100 dB | -70 dB | |

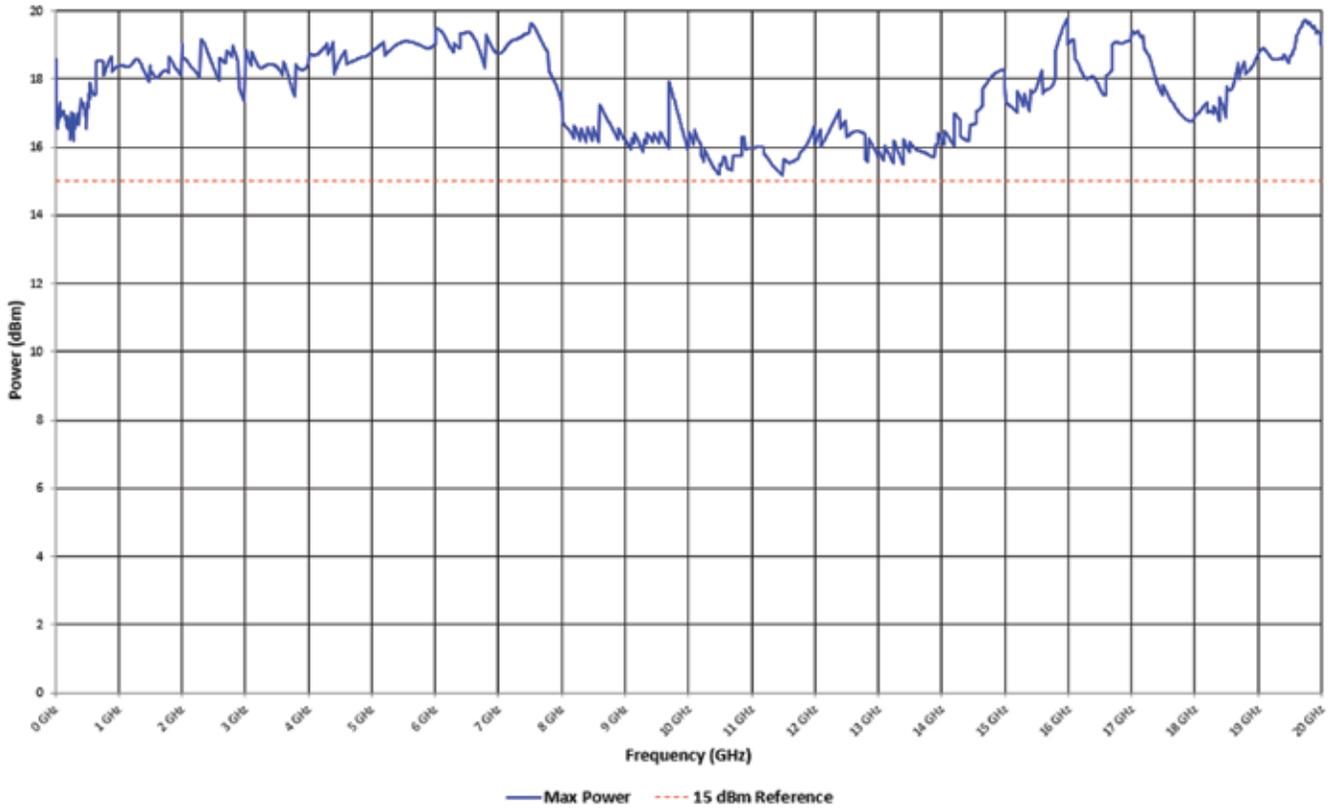


Figure 6: Max Power vs. Frequency up to 20 GHz

Level Accuracy

| Parameter | -5 dBm | 0 dBm | 5 dBm | 10 dBm |
|------------------------|------------------|------------------|------------------|------------------|
| Frequency Range | | | | |
| 0.0–1.5 GHz | 0.6 dB (<0.1 dB) | 0.5 dB (<0.1 dB) | 0.5 dB (<0.1 dB) | 0.7 dB (<0.2 dB) |
| 1.5–8.0 GHz | 0.8 dB (<0.1 dB) | 0.6 dB (<0.1 dB) | 0.8 dB (<0.1 dB) | 0.5 dB (<0.2 dB) |
| 8.0–16.0 GHz | 1.0 dB (<0.2 dB) | 1.0 dB (<0.1 dB) | 1.1 dB (<0.5 dB) | 1.1 dB (<0.4 dB) |
| 16.0–20.0 GHz | 1.3 dB (<0.3 dB) | 1.0 dB (<0.2 dB) | 1.2 dB (<0.4 dB) | 1.1 dB (<0.4 dB) |

Output Return Loss

| Parameter | Min | Typical | Max | Note |
|--------------------|-----|---------|-----|------|
| Output Return Loss | | -10 dBm | | |

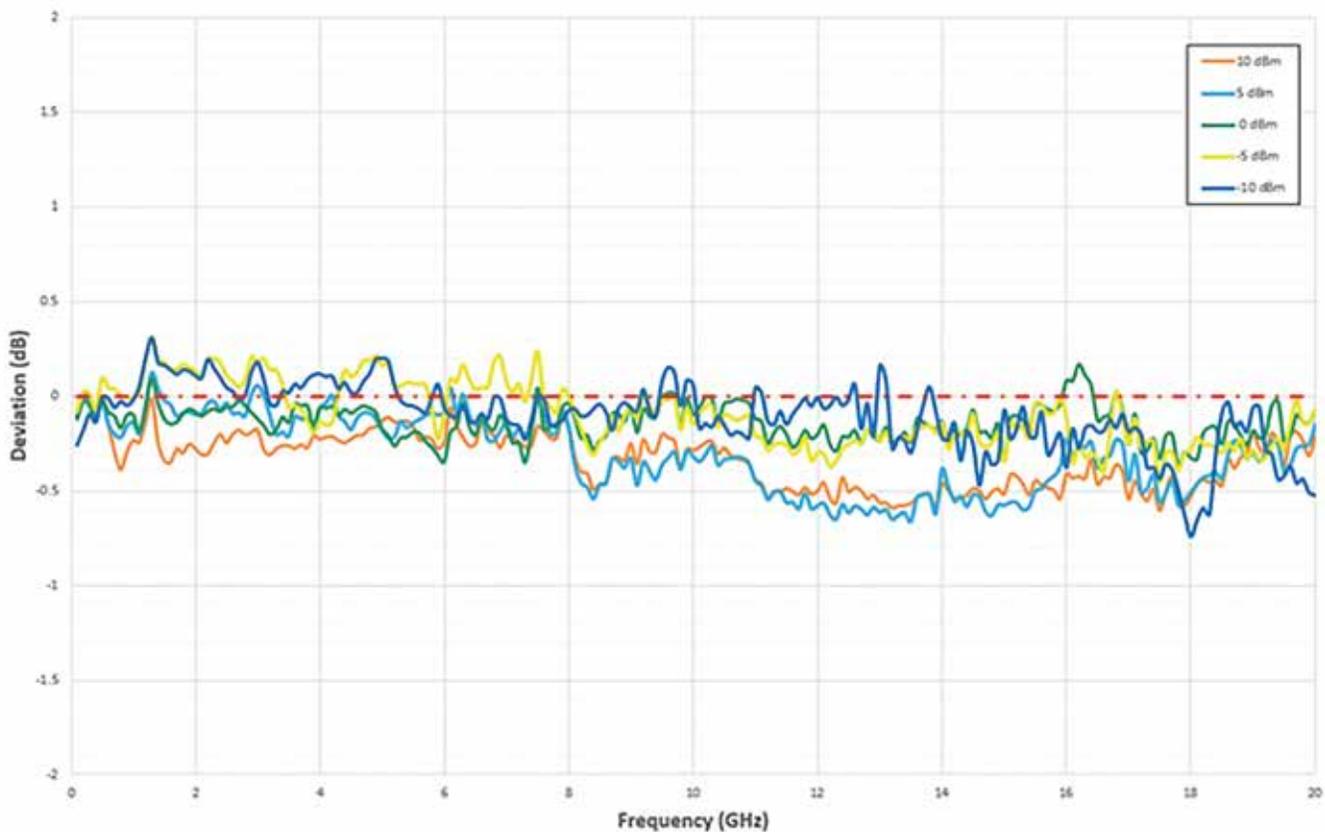


Figure 7: Level Accuracy over Frequency

Power Linearity

| Parameter | Min | Typical | Max | Note |
|------------------------|-----|------------------|-----|-------------------|
| Frequency Range | | | | -20.0 to -8.3 dBm |
| 100 MHz to 5.1 GHz | | 0.5 dB (<0.2 dB) | | |
| 5.1 GHz to 10 GHz | | 1.2 dB (<0.4 dB) | | |
| 10 GHz to 15 GHz | | 1 dB (<0.6 dB) | | |
| 15 GHz to 20 GHz | | 1 dB (<0.7 dB) | | |

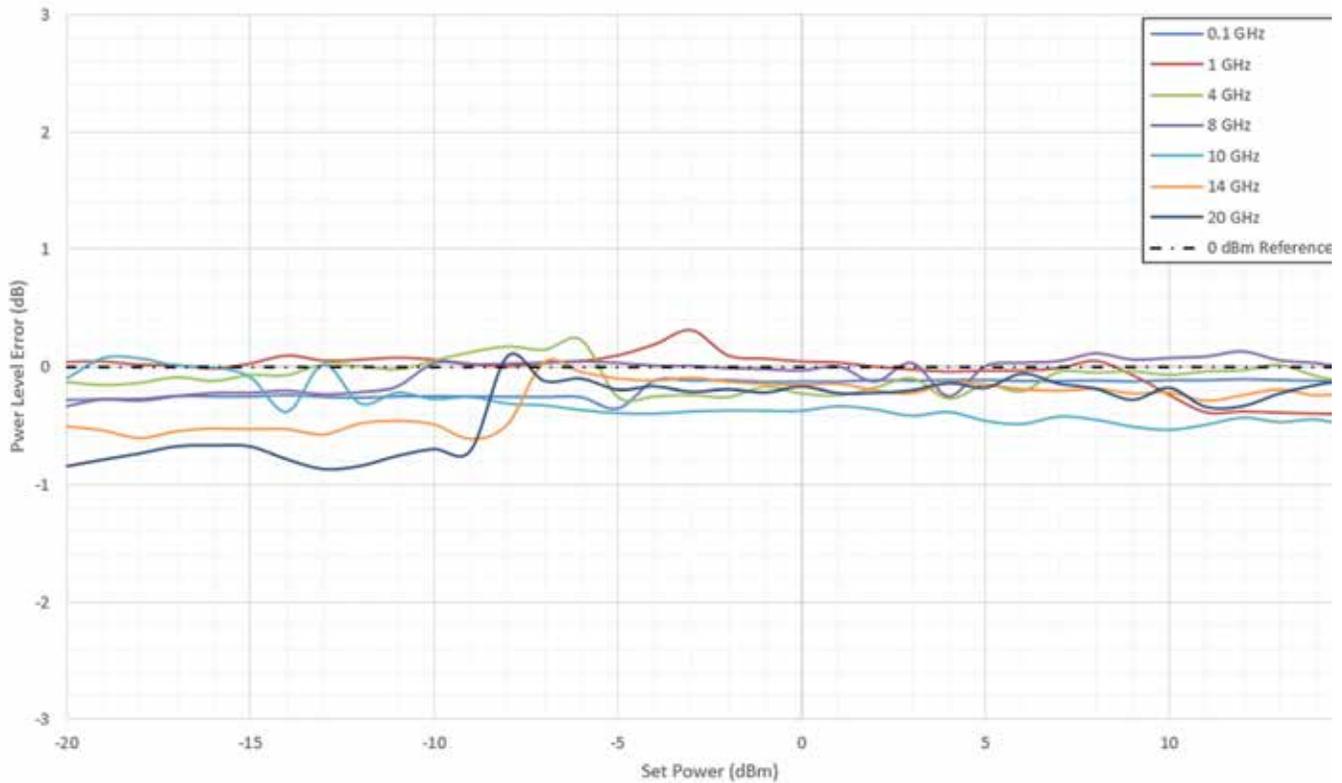


Figure 8: Power Linearity over Frequencies up to 20 GHz

Modulation

Pulse Modulation

| Parameter | Min | Typical | Max | Note |
|---------------------------------|-------|---------|---------|---------------------|
| Pulse Modulation | | | | Opt PLS |
| Modulation Source | | | | Internal / external |
| External Input Amplitude | | TTL | | 50 Ohm |
| On / off ratio | | 70 dB | | |
| Pulse rise / fall time | | | 15 ns | 10%-90% |
| Resolution | | 10 ns | | |
| Width | 32 ns | | 100 ms | |
| Repetition Frequency | DC | | 10MHz | |
| Internal Pulse Generator | | | | Opt PAT |
| Number of Steps | 1 | | 2048 | |
| Step Repetition | 1 | | 65535 | |
| On/Off Time | 32 | | 20 days | |

Amplitude Modulation

| Parameter | Min | Typical | Max | Note |
|----------------------|-----|---------------|---------|---------------------|
| Modulation Source | | | | Internal / External |
| Type | | | | Linear |
| Depth | 0% | | 100% | |
| Deviation Resolution | | 0.1% of depth | | |
| Modulation Rate | DC | | 100 kHz | |
| Modulation Waveforms | | | | Sine |

Frequency Modulation

| Parameter | Min | Typical | Max | Note |
|----------------------|------|-------------|--------|---------------------|
| Modulation Source | | | | Internal / External |
| Deviation | 1 Hz | | 10 MHz | |
| Resolution | | 0.1% or 1Hz | | The greater |
| Modulation Rate | 1 Hz | | 1MHz | Internal |
| Modulation Waveforms | | | | Sine |

Modulation - continued

Phase Modulation

| Parameter | Min | Typical | Max | Note |
|----------------------|-------|---------|---------|---------------------|
| Modulation Source | | | | Internal / External |
| Peak Deviation | 0 deg | | 360 deg | |
| Modulation Rate | DC | | 100 kHz | |
| Modulation Waveforms | | | | Sine |

Sweep

| Parameter | Min | Typical | Max | Note |
|------------------|------------|---|-----------|------------------------------------|
| Range | | | | Same as the device frequency range |
| Modes | | Frequency step, Amplitude step, List | | |
| Type | | Linear | | |
| Dwell Time | 10 μ s | | 562,499 s | |
| Resolution | | 1 μ s | | |
| Number of Points | 2 | | 4096 | |
| Trigger | | Free run, External, Bus, Timer | | |

Modulation - continued

Frequency Reference

| Parameter | Min | Typical | Max | Note |
|------------------------------|-----|--------------|-----|----------------------|
| Internal reference frequency | | 10 MHz | | |
| Temperature stability | | ±10 ppb max. | | Over range 0 to 50°C |
| Aging 1st year | | ± 0.3 ppm | | |
| Aging 10 years | | 1.5 ppm | | |
| Warm up Time | | 30 min | | |
| Frequency Accuracy | | ±0.5ppm | | |

Reference Input

| | | | | |
|---------------------|--|-------------------|--|--|
| Connector Type | | SMA | | |
| Input Impedance | | 50 Ω | | |
| Waveform | | Sine or Square | | |
| Frequency | | 10/100 MHz | | |
| Power | | -3 dBm to +10 dBm | | |
| Absolute Max. Level | | +15 dBm | | |

Connectors

| RF Out | |
|------------------------------|---------------------------|
| Parameters | Typical Value |
| Impedance | 50 Ω |
| Connector Type | |
| LSX8081xy | 2.92 mm |
| LSX149xy | 2.92 mm |
| LSX209xy | 2.92 mm |
| LSX409xy | 2.92 mm |
| VSWR | |
| | 1:2.1 |
| Reverse Power | |
| | 0.2 W, 16 VDC |
| Reference Out | |
| Impedance | 50 Ω |
| Connector Type | SMA |
| Frequency | 10 MHz or 100 MHz |
| Shape | Sine |
| Power | 3 to 7 dBm |
| Modulation Input | |
| Connector Type | SMP |
| Input Impedance | 50 Ω |
| Max. Input Voltage | ± 1 V |
| Input Damage Level | ± 3.5 V |
| Pulse / Trigger Input | |
| Connector Type | SMP |
| Input Impedance | 50 Ω |
| Input Voltage | TTL, CMOS compatible |
| Threshold | 1.5 V |
| Damage Level | -0.42 V min or 5.42 V max |
| Reference Input | |
| Connector Type | SMA |
| Input Impedance | 50 Ω |
| Waveform | Sine or Square |
| Frequency | 10/100 MHz |
| Power | -3 dBm to +10 dBm |
| Absolute Max. Level | +15 dBm |

General

Common

| | |
|---------------------|----------------------------|
| Temperature | |
| Operating | 0°C to +40°C |
| Storage | -40°C to +70°C |
| Warm up Time | 15 minutes |
| Humidity | 85% RH, non-condensing |
| Safety | CE Marked, IEC61010-1:2010 |
| EMC | IEC 61326-1:2013 |
| Calibration | 2 years |
| Warranty | 3 years |

Desktop

| | |
|--------------------------|--|
| Power Supply | Input: 100 – 240 V AC, 1.5 A, 47-63 Hz. Output 12.0 V DC, 8.34 A, 100.0 W |
| Power Consumption | |
| LSX8081D | 25 W typ., 35 W max. |
| LSX1491D | 30 W typ., 45 W max. |
| LSX2091D | 30 W typ., 45 W max. |
| LSX4091D | 35 W typ., 55 W max. |
| Interface | USB TYPE C, SPI |
| Dimensions | 145 x 95 x 30 mm (5.71 x 3.74 x 1.18 inches) |
| Weight | |
| Without Package | 1.0 kg |
| Shipping Weight | 1.5 kg |

Portable

| | |
|---------------------------|--|
| Power Supply | Input: 100 – 240 V AC, 1.5 A, 47-63 Hz. Output 12.0 V DC, 8.34 A, 100.0 W |
| Power Consumption | 60 W max. |
| LSX8081P | 25 W typ., 35 W max. |
| LSX1491P | 30 W typ., 45 W max. |
| LSX2091P | 30 W typ., 45 W max. |
| Display Type | 10.1", 1280x800 TFT capacitive touch screen |
| Battery | |
| Type | 4-cell, replaceable |
| Standby | Up to 2 hours |
| Maximum Load | Up to 1 hour |
| Interface | USB TYPE C, SPI |
| Host | 2 x USB type A |
| Device | 1 x USB type B, 1 x micro-USB for LAN adapter |
| Storage | 16 GB removable SD card |
| Dimensions (WxHxD) | 280 x 225 x 65 mm (11.0 x 8.86 x 2.56 inches) |
| Weight | |
| Without Package | 3.0 kg |
| Shipping Weight | 4.5 kg |

General ~ continued

PXIe

| | |
|----------------------------|----------------------|
| Voltage | +12.0 to +12.6 VDC |
| Power Consumption | |
| LSX8081X | 25 W typ., 35 W max. |
| LSX1491X | 30 W typ., 45 W max. |
| LSX2091X | 30 W typ., 45 W max. |
| LSX4091X | 35 W typ., 55 W max. |
| Current Consumption | |
| +3.3 V | 0.5 A max. |
| +12 V | 5.5 A max. |
| Interface | PXIe Gen3 x8 Lanes |
| Dimensions | 8HP PXIe (2 Slots) |
| Weight | |
| Without Package | 1.0 kg |
| Shipping Weight | 1.5 kg |

Rackmount

| | |
|---------------------------|---|
| Voltage Range | 90 VAC to 264 VAC |
| Frequency Range | 47 Hz to 63 Hz |
| Power Consumption | |
| LSX8081R | 25 W typ., 35 W max. |
| LSX8082R | 50 W typ., 70 W max. |
| LSX8084R | 100 W typ., 140 W max. |
| LSX1491R | 30 W typ., 45 W max. |
| LSX1492R | 60 W typ., 90 W max. |
| LSX1494R | 120 W typ., 180 W max. |
| LSX2091R | 30 W typ., 45 W max. |
| LSX2092R | 60 W typ., 90 W max. |
| LSX2094R | 120 W typ., 180 W max. |
| LSX4091R | 35 W typ., 55 W max. |
| LSX4092R | 70 W typ., 110 W max. |
| LSX4094R | 140 W typ., 220 W max. |
| Interface | |
| Host | 2 x front panel USB type A 1 x rear panel USB type A |
| Device | 1 x rear panel USB type B |
| LAN | 1 x rear panel 1000/100/10 BASE-T |
| Storage | 16 GB removable SD card |
| Dimensions (WxHxD) | 450 x 43 x 500 mm (17.7 x 1.7 x 19.7 inches) |
| Weight | |
| Without Package | 6 kg |
| Shipping Weight | 7 kg |

General ~ continued

Benchtop

| | |
|---------------------------|---|
| Voltage Range | 90 VAC to 264 VAC |
| Frequency Range | 47 Hz to 63 Hz |
| Power Consumption | |
| LSX8081B | 25 W typ., 35 W max. |
| LSX8082B | 50 W typ., 70 W max. |
| LSX8084B | 100 W typ., 140 W max. |
| LSX1491B | 30 W typ., 45 W max. |
| LSX1492B | 60 W typ., 90 W max. |
| LSX1494B | 120 W typ., 180 W max. |
| LSX2091B | 30 W typ., 45 W max. |
| LSX2092B | 60 W typ., 90 W max. |
| LSX2094B | 120 W typ., 180 W max. |
| LSX4091B | 35 W typ., 55 W max. |
| LSX4092B | 70 W typ., 110 W max. |
| LSX4094B | 140 W typ., 220 W max. |
| Display Type | 5", TFT capacitive touch screen |
| Interface | |
| Host | 2 x front panel USB type A 1 x rear panel USB type A |
| Device | 1 x rear panel USB type B |
| LAN | 1 x rear panel 1000/100/10 BASE-T RJ45 |
| Storage | 32 GB removable SD card |
| Dimensions (WxHxD) | |
| With Feet | 315 X 102 x 425 mm (12.40 x 4.02 x 16.73 inches) |
| Without Feet | 315 X 88 x 425 mm (12.40 x 3.46 x 16.73 inches) |
| Weight | |
| Without Package | 6 kg |
| Shipping Weight | 6.5 kg |

Ordering Information & Options

Desktop

| Model | Description |
|----------|---|
| LSX8081D | 8 GHz, 1 channel, desktop analog RF signal generator |
| LSX1491D | 14 GHz, 1 channel, desktop analog RF signal generator |
| LSX2091D | 20 GHz, 1 channel, desktop analog RF signal generator |
| LSX4091D | 40 GHz, 1 channel, desktop analog RF signal generator |

PXIe

| Model | Description |
|----------|--|
| LSX8081X | 8 GHz, 1 channel, PXIe analog RF signal generator |
| LSX1491X | 14 GHz, 1 channel, PXIe analog RF signal generator |
| LSX2091X | 20 GHz, 1 channel, PXIe analog RF signal generator |
| LSX4091X | 40 GHz, 1 channel, PXIe analog RF signal generator |

Rackmount

| Model | Description |
|----------|--|
| LSX8081R | 8 GHz, 1 channel, rackmount analog RF signal generator |
| LSX8082R | 8 GHz, 2 channels, rackmount analog RF signal generator |
| LSX8084R | 8 GHz, 4 channels, rackmount analog RF signal generator |
| LSX1491R | 14 GHz, 1 channel, rackmount analog RF signal generator |
| LSX1492R | 14 GHz, 2 channels, rackmount analog RF signal generator |
| LSX1494R | 14 GHz, 4 channels, rackmount analog RF signal generator |
| LSX2091R | 20 GHz, 1 channel, rackmount analog RF signal generator |
| LSX2092R | 20 GHz, 2 channels, rackmount analog RF signal generator |
| LSX2094R | 20 GHz, 4 channels, rackmount analog RF signal generator |
| LSX4091R | 40 GHz, 1 channel, rackmount analog RF signal generator |
| LSX4092R | 40 GHz, 2 channels, rackmount analog RF signal generator |
| LSX4094R | 40 GHz, 4 channels, rackmount analog RF signal generator |

Benchtop

| Model | Description |
|----------|---|
| LSX8081B | 8 GHz, 1 channel, benchtop analog RF signal generator |
| LSX8082B | 8 GHz, 2 channels, benchtop analog RF signal generator |
| LSX8084B | 8 GHz, 4 channels, benchtop analog RF signal generator |
| LSX1491B | 14 GHz, 1 channel, benchtop analog RF signal generator |
| LSX1492B | 14 GHz, 2 channels, benchtop analog RF signal generator |
| LSX1494B | 14 GHz, 4 channels, benchtop analog RF signal generator |
| LSX2091B | 20 GHz, 1 channel, benchtop analog RF signal generator |
| LSX2092B | 20 GHz, 2 channels, benchtop analog RF signal generator |
| LSX2094B | 20 GHz, 4 channels, benchtop analog RF signal generator |
| LSX4091B | 40 GHz, 1 channel, benchtop analog RF signal generator |
| LSX4092B | 40 GHz, 2 channels, benchtop analog RF signal generator |
| LSX4094B | 40 GHz, 4 channels, benchtop analog RF signal generator |

Ordering Information & Options ~ continued

Portable

| Model | Description |
|----------|--|
| LSX8081P | 8 GHz, 1 channel, portable analog RF signal generator |
| LSX1491P | 14 GHz, 1 channel, portable analog RF signal generator |
| LSX2091P | 20 GHz, 1 channel, portable analog RF signal generator |

Options

| Options | Description | Models ⁽¹⁾ |
|---------|---|-----------------------|
| MOD | Modulation package (AM, FM, PM) | X/R/D/P |
| PLS | Pulse modulation | X/R/B/D/P |
| PAT | Pattern modulation | X/R/B/D/P |
| FS | Fast switching 100 μ s | X/R/B/D |
| UFS | Ultra-fast switching 10 μ s | R/B |
| BAT | 4-cell, replaceable extra battery 39 Wh | P |
| BAT2 | 4-cell, replaceable extra battery 98 Wh | P |
| CHA | External charger | P |
| LAN | USB Ethernet adapter | P |
| W-Rack | Rack-mount kit | B/R |
| WE | 1 year warranty extension (standard warranty 3 years) | X/R/B/D/P |

Accessories

| | | |
|----------|----------------------|---|
| PXE21100 | 21 slot PXIe chassis | X |
|----------|----------------------|---|

(1) X/R/B/D/P=PXIe/Rackmount/Benchtop/Desktop/Portable.



LUCID SERIES
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