



E4421A Analog RF Signal Generator, 250 kHz to 3000 MHz (Discontinued - Support Information Only)

Data Sheet

Frequency Specifications

Frequency Range Agilent ESG-3000A: 250 kHz to 3000 MHz

Resolution: 0.01 Hz

Switching Speed Modulation On: <45 ms, typical Modulation Off: <35 ms, typical

Accuracy: Same as timebase Sweep Modes

Operating modes Step: frequency & power, and arbitrary list

Dwell Time: 2 ms to 60 sec

Number of Points: 2 to 401 Internal Reference Oscillator

Stability Standard (typical) High Stability (Opt 1E5) Aging Rate $\leq \pm 2$ ppm/yr $\leq \pm 0.1$ ppm/yr or $\leq \pm 0.0005$ ppm/day after 45 days

Temperature $\leq \pm 1$ ppm $\leq \pm 0.05$ ppm, typical (0° to 55° C)

Line Voltage $\leq \pm 0.1$ ppm $\leq \pm 0.002$ ppm, typical (+5%, -10%) (+5%, -10%)

Timebase Reference Output Frequency: 10 MHz Amplitude: $>0.35 V_{rms}$ into 50 ohm load

External Reference Input Frequency: 1, 2, 5, 10 MHz \pm typ. 10 ppm Option 1E5: 1 ppm, typical Amplitude: $>0.15 V_{rms}$ Input Impedance: 50 ohm Output

Range 250 kHz to 1000 MHz: +13 to -136 dBm >1000 MHz to 3000 MHz: +10 to -136 dBm

Resolution 0.02dB

Level Accuracy¹ (at $23 \pm 5^\circ$ C) +7 to -127 dBm < -127 dBm 250 kHz to 2 GHz: ± 0.5 dB ± 1.5 dB

2 GHz to 3 GHz: ± 0.9 dB ± 2.5 dB

Attenuator Hold Level Range: >17 dB

Switching Speed: <25 ms typical With Power Search Mode: <210 ms typical

Reverse Power Protection: 250 kHz to 2000 MHz: 50 Watts >2000 MHz to 3000 MHz: 25 Watts Max DC Voltage: 50 V

SWR (typical) 250 kHz to 2000 MHz: $<1.4:1$ >2000 to 3000 MHz: $<1.9:1$

Output Impedance: 50 ohms ¹Accuracy degrades by 0.02 dB/ $^\circ$ C over full temperature range and by 0.3 dB above +7 dBm.

Frequency Bands

Band Frequency Range N# 1 250 kHz to ≤ 249.999 MHz 1 2 >249.999 to ≤ 500 MHz 0.5 3 >500 MHz to ≤ 1 GHz 1 4 >1 to ≤ 2 GHz 2 5 >2 to 3 GHz 4

Spectral Purity

SSB Phase Noise (typical, at 20 kHz offset) at 500 MHz: <-120 dBc/Hz at 1000 MHz: <-116 dBc/Hz at 2000 MHz: <-110 dBc/Hz at 3000 MHz: <-104 dBc/Hz

Residual FM (CWmode, 0.3-3 kHz BW, CCITT, rms): Phase Noise Mode 1: $<N \times 2$ Hz Phase Noise Mode 2: $<N \times 4$ Hz

Harmonics $\leq +4$ dBm output level: <-30 dBc



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Nonharmonics (>3 kHz offset, <+7dBm output level) 250 kHz to 1000 MHz: <-65 dBc >1000 MHz to 2000 MHz: <-59 dBc >2000 MHz: <-53 dBc
Subharmonics <=1000 MHz: None >1000 MHz: <-40 dBc

Frequency Modulation

Maximum Deviation: $N \times 10$ MHz

Resolution: 0.1% of deviation or 1 Hz, whichever is greater

Deviation Accuracy (1 kHz rate, dev. < $N \times 100$ kHz): $\pm(3.5\%$ of FM deviation + 20 Hz)

Modulation Frequency Response(deviation = 100 kHz)

Path Rates 1 dB Bandwidth 3 dB Bandwidth, typical FM1 dc/20 Hz to 100kHz dc/5 Hz to 10 MHz

FM2 dc/20Hz to 100 kHz dc/5 Hz to 1 MHz

Distortion (1 kHz rate, THD, dev. = $N \times 100$ kHz): <1%

Phase Modulation

Maximum Deviation: $N \times 90$ radians

Resolution: 0.1% of set deviation

Deviation Accuracy (1 kHz rate): $\pm(5\%$ of deviation + 0.01 radians)

Modulation Frequency Response

PM Mode Maximum Rates (3 dB BW) Deviation PM1 PM2 Normal BW $N \times 90$ rad dc to 100 kHz dc to 100 kHz

High BW $N \times 2$ pi rad dc to 1.5 MHz (typ) dc to 1 MHz (typ) $N \times$ pi/2 rad dc to 4 MHz (typ) dc to 0.9 MHz (typ)

Distortion (1 kHz rate, THD, dev < $N \times 90$ rad): <1% Amplitude Modulation fc>500 kHz

Range (envelope peak <=max specified power): 0 to 100%

Resolution: 0.1%

Rates (3 dB Bandwidth): dc/10 Hz to 10 kHz

Distortion(1 kHz rate, THD) 30% AM: <1.5% 90% AM: <4%

Accuracy(1 kHz rate): $\pm(5\%$ of setting + 1%)

Pulse Modulation

On/Off Ratio <=3 GHz: >80 dB

Rise/Fall Times: 150 ns, typical

Minimum Width (typical) ALC On: 2 μ s ALC Off: 0.4 μ s

Pulse Repetition Frequency (typical) ALC On: 10 Hz to 250 kHz ALC Off: DC to 1.0 MHz

Level Accuracy (relative to CW): ± 0.5 dB, typical

Internal Pulse Generator (Squarewave only) Squarewave Rate: 0.1 Hz to 50 kHz Pulse Period: 16 μ s to 30 seconds

Width: 8 μ s to 30 seconds Resolution: 4 μ s Internal Modulation Source Provides FM, PM, and AM Modulation Signals and LF Out **Waveforms:** sine, square, ramp, triangle, pulse, noise

Rate Range Sine: 0.1 Hz to 50 kHz Square, Ramp, Triangle: 0.1 Hz to 10 kHz

Resolution: 0.1 Hz

Frequency Accuracy: 0.005%

Swept Sine Mode(Frequency, Phase Continuous):

Operating Modes: Triggered or Continuous Sweeps

Frequency Range: 0.1 Hz to 50 kHz

Sweep Time: 1 ms to 65 seconds

Resolution: 1 ms

Dual Sinewave Mode Frequency Range: 0.1 Hz to 50 kHz

Amplitude Ratio: 0 to 100%

Amplitude Resolution: 0.1% LF Out (Internal Modulation Source)

Amplitude: 0 to 3 V_{peak} into 50 ohms

Output Impedance: <1 ohm External Modulation Inputs

Modulation Types: Ext1: FM, PM, AM, and Burst Envelope Ext2: FM, PM, AM, and Pulse

Simultaneous Modulation All modulation types may be simultaneously enabled, except: FM with PM, AM with Burst envelope. AM, FM, and PM can sum simultaneous inputs from any two sources (INT, EXT1, and EXT2.) Any given source (INT, EXT1, or EXT2) may only be routed to one activated modulation type. Remote Programming

Interface: HP-IB (IEEE-488.2-1987) with Listen and Talk, RS-232

Control Languages: SCPI version 1992.0, also compatible with Agilent 8656B & 8657A/B/D/J mnemonics

Functions Controlled: All front panel functions except power switch and knobs

IEEE-488 Functions: SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT0, C0, E2



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General Specifications

Power Requirements: 90 to 254 V; 50,60, or 400 Hz; 200 W maximum

Operating Temperature Range: 0 to 55° C

Leakage: Conducted and radiated interference meets MIL-STD-461B RE02 Part 2 and CISPR 11

Storage Registers: Up to 100 storage registers, up to 10 sequences available

Weight: <12.7 kg (28lb) net, <21 kg (46 lb.) shipping

Dimensions: 133 mm H x 426 mm W x 432 mm D (5.25 in H x 16.8 in W x 17 in D)



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