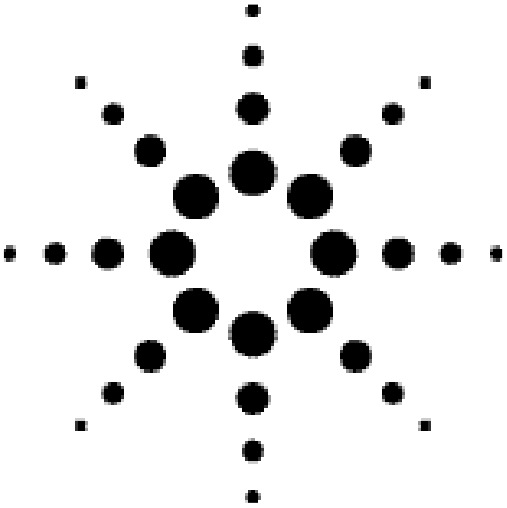

8780A Vector Signal Generator, 10 MHz to 3 GHz (Discontinued - Support Information Only)

Data Sheet

Product Specifications

Frequency Specifications
Range: 10 MHz to 3 GHz

Resolution: 1 Hz

Accuracy and Stability: Same as reference oscillator

Internal Reference Oscillator
Aging Rate: Less than 5 x 10^{-10}/day after 10 day warm-up for internal reference

Frequency Switching Time: <220 ms, <100 ms in fast mode (typical)
Note: in the fast mode, output level accuracy is not specified.

Temperature Effects: <1 x 10^{-10}/°C (typical)

Line Voltage Effects: <5 x 10^{-10}/(+5%-10%) (typical)

RF Output Level Specifications

Level Range: +10 to -100 dBm <2.5 GHz,
+4 to -100 dBm >= 2.5 GHz
(+12 to -100 dBm with Opt 064)

Accuracy: ±2.5 dB for levels >=-30 dBm,
±3.5 dB for levels <-30 dBm and >-100 dBm

Flatness: <±1 dB

Resolution: 0.1 dB

Residual Output with RF Switch Off:
More than 60 dB below the selected level (for levels >-40 dBm)

Output SWR: <1.3:1 (typically)

Output Impedance: 50 ohms nominal

Coherent Carrier Output Specifications

Agilent Technologies

The coherent carrier provides a reference signal for demodulating the Agilent 8780A output. It is an unmodulated (except for FM) and undeveloped version of the front panel RF output.

Frequency Range: 10 MHz to 3 GHz

Output Level, Standard: >-20 dBm (typical)

Output Level, Option 002: >+9 dBm
>+10 dBm (typical)

Output Impedance: 50 ohms, nominal

Spectral Purity Specifications

Residual SSB Phase Noise in a 1 Hz BW:

Offset from Carrier	CW (typical) at 1 GHz (dBc)	DCFM (typical) to 3 GHz (dBc)	ACFM (typical) to 3 GHz (dBc)	Specified 10 MHz Carrier (dBc)
10 Hz	-65	-74	~~~~~~~	~~~~~~~
100 Hz	-84	-93	-74	~~~~~~~
1 kHz	-100	-107	-103	-55
10 kHz	-110	-115	-115	-82
100 kHz	-110	-115	-115	-106
1 MHz	-114	-117	-117	-117
10 MHz	-130	-130[1]	-130[1]	-130[1] (+7 dBm)

Note: Digital, vector, and scalar residual phase noise is the same as CW.
[1]Typical phase noise for 10 MHz offsets is only applicable between 50 MHz and 3 GHz.

Residual FM for CW, Digital, Vector or Scalar Modulated Signals
(300 Hz to 3 kHz post-detection BW at 50 MHz carrier): <4 Hz rms.

Spurious Signals
Harmonics: <-35 dBc for output levels <= +7 dBm to 2.5 GHz and <=+1 dBm to 3 GHz
Non-Harmonically Related Spurious Signals for CW, Digital, Vector, and Scalar Modulated Signals with Output Level >-40 dBm:

Offset from Non-Harmonically Related Carrier (MHz)	Specified Spurious Level (dBc)
10 MHz to 3 GHz	>20 <-60
10 MHz to 3 GHz	<20 <-55
<10 MHz	~~~~~ <-55
>3 GHz to 18 GHz	~~~~~ <-55

Modulation Specifications

Simultaneous Modulation
The Agilent 8780A Vector Signal Generator supports four basic methods of modulation: Digital (including Pulse/Burst), Scalar, FM and Vector. These modulations can be combined simultaneously as shown in the chart below. For detailed specifications, see each of the individual modulation specification sections.

	Digital	Scalar	FM	Vector
Digital	~~~~~	Yes	Yes	No
Scalar	Yes	~~~~~	Yes	No

FM Yes Yes ~~~~~ Yes
Vector No No Yes ~~~~~

AC Coupled Frequency Modulation
FM 3 dB Bandwidth: 20 Hz to 12 MHz for deviations < 30 MHz peak-to-peak, and carrier frequency > 50 MHz
Deviation Ranges: 50 kHz to 50 MHz peak-to-peak with 3 digits of resolution. (Typically up to > 250 MHz p-p deviation range is possible by overdriving the FM input.)
Note: FM 3 dB and deviation bandwidths decrease at carrier frequencies below 50 MHz
Sensitivity: 1V peak-to-peak for displayed deviation
Sensitivity Accuracy: < 7.5% for rates 50 Hz to 6 MHz and deviations < 30 MHz peak-to-peak
Residual FM for 300 Hz to 3 kHz Post-Detection BW and 50 kHz Deviation Range: < 200 Hz rms. (Not applicable with 400 Hz line operation)

DC Coupled Frequency Modulation
FM 3 dB Bandwidth: 10 kHz for deviations to 10 kHz peak-to-peak
Deviation Ranges: 150 Hz to 150 kHz peak-to-peak with 3 digits of resolution
Sensitivity: 1V peak-to-peak for displayed deviation
Sensitivity Accuracy: < 10% for rates to 1 kHz and deviations 150 kHz peak-to-peak
FM Distortion at 1 kHz Rate and 150 kHz Peak-to-Peak Deviation: < 5%
Residual FM for 300 Hz to 3 kHz BW and 150 kHz Deviation Range: < 5 Hz rms.

Digital Modulation
Modulation Types: BPSK, QPSK, 8PSK, 16QAM
(64QAM with Opt 064), Arbitrary 2-state
Simultaneous Digital Modulations
I < Q: Available with all digital modulations
Burst: Available with 2-state, BPSK, QPSK, or 8 PSK (Burst with 8PSK or 2-State are not available with Opt 064)
Burst dc On/Off Ratio: > 50 dB at 140 MHz carrier (Typically the same 10 MHz to 3 GHz)
Clock Input Modes: Single, separate I and Q (except with Opt 064), or asynchronous Data Input
Parallel Data Rates: 0 to 150 MHz clocked (except 64QAM), 0 to 100 MHz clocked 64QAM (with Opt 64)
0 to 50 MHz asynchronous (all digital modulations)
Serial Date Rates only with Opt 064): 0 to 150 MHz clock and data lines for 0 to 25 MHz 64 QAM symbol rate
Thresholds: ECL (-2V termination), ground or variable -2.5V to +2.5V in 100 mV resolution (0V termination)
Timing Requirements--Set up time: > 3 ns
Hold time: < 3 ns
Impedance: 50 ohms nominal
Thresholds: ECL (-2V termination, ground or auto -2.5V to +2.5V (0V termination)
Data and Clock Drive Requirements: 0.3 to 3.0V peak-to-peak. The digital data is clocked on the leading (positive) edge of the pulse.
State dc Accuracy at 140 MHz carrier and <= +7 dBm levels (typically the same over 10 MHz to 3 GHz):
±1% of full scale I and Q values for BPSK, QPSK; ±2% of full scale I and Q values for 16QAM, 2-State, alternate level, I < Q
Spectrum Filter: Four internal baseband filters to limit spectrum are automatically selected depending upon carrier frequency. Provision is made for user-supplied baseband filters.

Carrier Frequency Nominal Filter
(MHz) 3 dB Point (MHz)
Up to 138.999999 42
139 to 278.999999 87
279 to 558.999999 180
559 and above 255
Full range with no internal > 350 baseband filtering

Pulse Modulation (Burst)
Pulse Rates: 0 to 75 MHz
Pulse dc On/Off Ratio: > 50 dB at 140 MHz carrier (typically the same over 10 MHz to 3 GHz)

Pulse Data Input Level: ECL (-2V termination), ground, or variable -2.5V to +2.5V in 100 mV resolution

Pulse Data Drive Requirement: 0.3V to 3.0V peak-to-peak

Pulse Data Input Impedance: 50 ohms nominal

Typical Pulse Rise/Fall Times (10% to 90%): <= 1 ns with no internal baseband filtering

Typical Minimum Pulse Width: < 7 nc

AM/Scalar Modulation
Traditional amplitude modulation (with nominal levels 6 dB below the selected output level, and depths from 0% to 99%) can be generated when a 0.5V dc offset is added to the scalar input. 0V to 1V on the scalar input scales the vector signal generator output from off to full scale.

Sensitivity: 0 to +1V for 0 to full scale envelope modulation

Scalar dc Accuracy: < 2% of full scale input at 140 MHz carrier and for +7 dBm levels (typically < 2% from 10 MHz to 3 GHz)

Scalar dc Residual (Residual I and Q Output for 0 Volts Input): < 1% of full scale I and Q at 140 MHz carrier and <= +7 dBm levels (typically the same over 10 MHz to 3 GHz)

Frequency Response: dc to 500 kHz (-3 dB) at 1 GHz carrier frequency

Input Impedance: 10 k ohms nominal

Vector Modulation (Using Analog I/Q Inputs)
Frequency Response: dc to 350 MHz (-3 dB) at 1 GHz carrier frequency (typically > 350 MHz from 400 MHz to 3 GHz)

Vector dc Accuracy: <1.5% of full scale vector inputs at 140 MHz carrier and <= +7 dBm levels and Ie2 + Qe2^1/2 <= 0.5V (typically the same over 10 MHz to 3 GHz)

Vector dc Residual (Residual Output for 0V I and Q Input): < 1% of full scale vector inputs at 140 MHz carrier (typically < 1% from 10 MHz to 3 GHz)

Sensitivity: ±0.5V into 50 ohms with 50 ohms source impedance for ±100% of full scale magnitude

Input Impedance: 50 ohms nominal

SWR: <1.5:1, dc to 350 MHz (typical)

Typical Accuracy versus Modulation Frequency for Selected Carriers:

Carrier Modulating Amplitude Crosstalk Frequency Flatness Between I and Q
70 MHz 1-20 MHz < 0.1 dB <2%
140 MHz 1-40 MHz < 0.15 dB <2%
500 MHz 1-40 MHz < 0.15 dB < 2%
1.5 GHz 1-100 MHz < 0.3 dB < 4%
2.5 GHz 1-100 MHz < 0.3 dB < 6%

Remote Programming Specifications
All functions are HP-IB programmable except the line switch. The Agilent 8780A can output over the interface, frequency and output level settings, error/malfuntion codes, and operational status codes.

Interface Functions: SH1, AH1, T6, TE0, L3, LE0, SR1, RL1, PP1, DC1, DT0, C0

General Specifications
Operating Temperature Range: 0°C to +55°C

Environmental: Exceeds MIL-T-28800C Class V requirements for operating and non-operating temperature, humidity, shock, and vibration

EMI: Conducted and radiated interference is within the requirements of CE03, CS01, CS02, CS06, RE02, RS01 and RS03 of MIL-STD-461B. It is also within the requirements of VDE 0871/1978, Level B and CISPR publication 11 (1975)

Warm-Up: To achieve specified performance the instrument should be recalibrated from the front panel after a 1 hour warm-up and after every 4 hours of operation or after a 5°C temperature change

Power Requirements
48 to 66 Hz: 100, 120, 220, 240 Vac (+5%, -10%)
360 to 440 Hz: 100 or 120 Vac (+5%, -10%)
500 VA max.

Weight: Net, 31.5 kg (70 lb)
Shipping, 35.5 kg (78 lb)

Size: 177 mm H x 425 mm W x 637 mm D
(7.0 in x 16.7 in x 25.1 in)