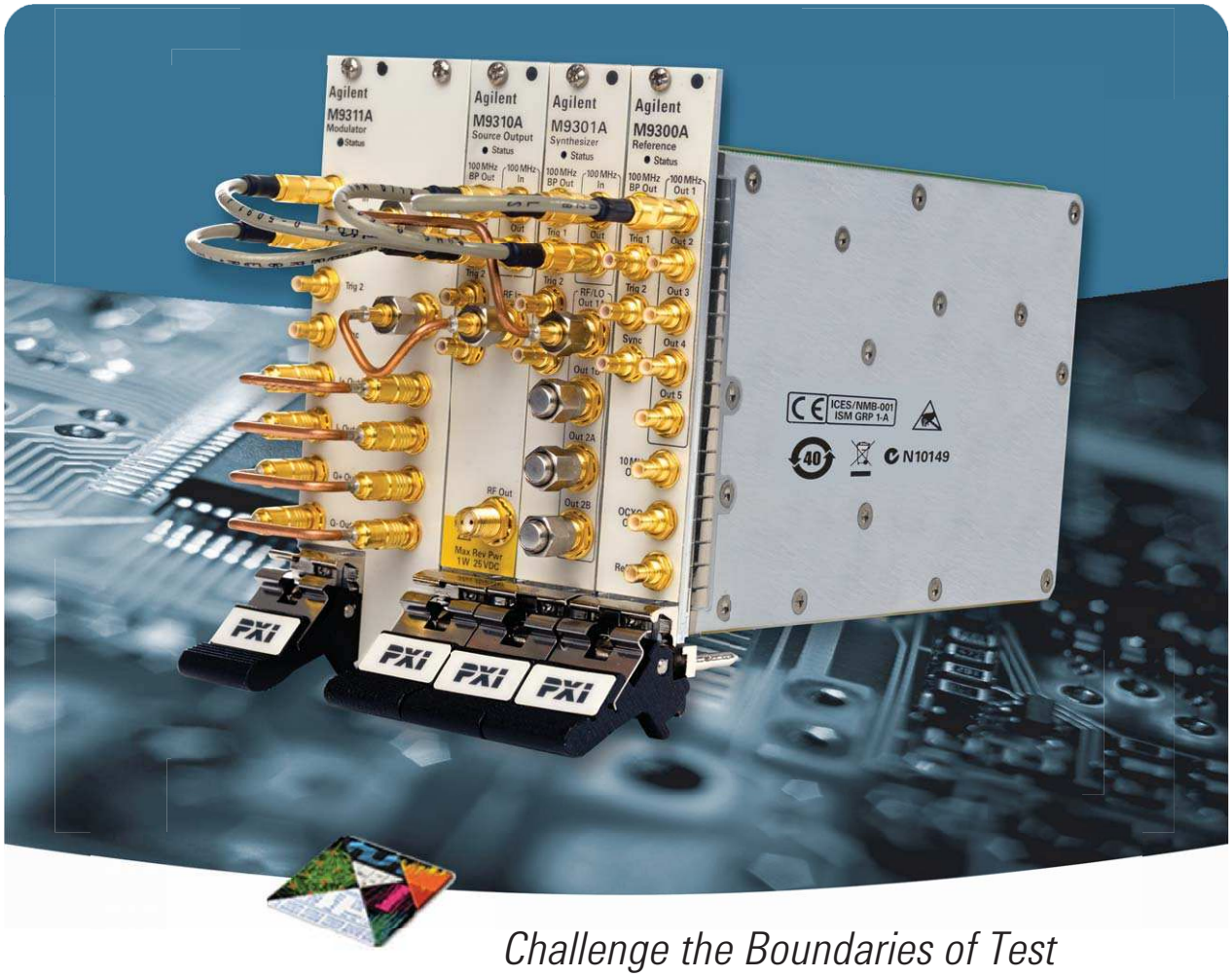
Agilent M9381A PXIe Vector Signal Generator

1 MHz to 3 GHz or 6 GHz

Data Sheet

World's Fastest RF PXIe Source



Challenge the Boundaries of Test
Agilent Modular Products

Anticipate ___Accelerate ___Achieve

Agilent Technologies

OVERVIEW

Break the Speed Barrier

Effective testing of today's complex products requires a balanced mix of time, coverage and cost-per-DUT. Success starts with the right combination of speed and accuracy in your test system. The M9381A is the modular signal generator you've been asking for—one that provides Agilent quality and performance in the PXI form factor. It accelerates throughput by delivering new levels of speed in signal generation—the fastest RF switching, an exclusive baseband tuning technology innovation, versatile list mode and more. Add the M9381A to your system—and break the speed barrier.

Product Description

The M9381A PXIe vector signal generator is a compact modular solution that provides frequency coverage from 1 MHz to 3.0 GHz or 6.0 GHz. A typical M9381A configuration includes four individual PXIe modules—M9311A digital vector modulator, M9310A source output, M9301A synthesizer and the M9300A frequency reference—designed for fast data interfaces and high-speed automated test systems. Instrument control is provided through a soft front panel and programmatic interfaces tuned to your application development environment of choice.

Applications

- Cellular picocell and femtocell test
- Handset component test
- Military component test
- Public safety and homeland security radio test
- Wireless device test
- Wireless transceiver design validation
- WLAN production test

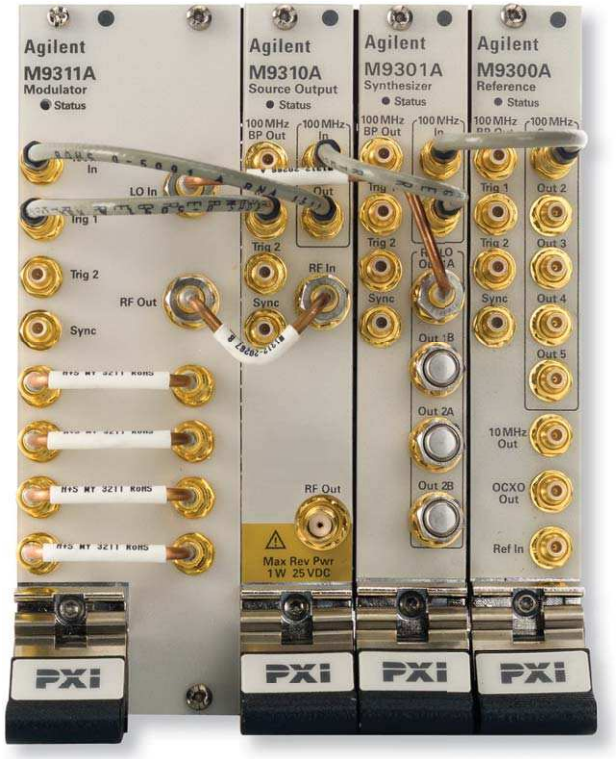


Figure 1. M9381A PXIe vector signal generator with four modules consisting of the M9311A digital vector modulator, M9310A source output, M9301A synthesizer and the M9300A frequency reference.

OVERVIEW

Product Features

- Frequency coverage from 1 MHz to 3.0 GHz or 6.0 GHz.
- 10 µs switching speed with baseband tuning using the modulation interface of the IVI driver.
  - Set the RF frequency to the center of the band being tested and then program the baseband frequency offset to any value within the modulation bandwidth (e.g., ± 80 MHz with 160 MHz bandwidth).
  - Set the RF power level to the maximum required for all tests and then set baseband power offset from 0 to 20 dB below RF level.
- Fast RF switching speed:
  - 220 µs for frequency and amplitude changes.
  - 125 µs for amplitude-only changes.
- Output power of +18 dBm across the frequency range.
- Better than ± 0.4 dB absolute amplitude accuracy.
- RF modulation bandwidth up to 160 MHz, with < ±0.3 dB RF I/Q channel flatness.
- AM, FM, phase, pulse and multitone modulation.
- Arbitrary waveform memory up to 1024 MSa.
- Supported Signal Studio software: W-CDMA/HSPA+, cdma2000/1xEV-DO, GSM/EDGE/Evo, LTE/LTE-Advanced FDD, LTE/LTE-Advanced TDD, TD-SCDMA/HSDPA, WLAN 802.11a/b/g/n/ac, Bluetooth, Broadcast radio, Digital video, Mobile WiMax.
- License key upgrades for all performance options: frequency range, output power, fast switching, generation bandwidth and memory.
- Chassis slot compatibility: PXIe slot.

Uncompromising Values

- Accelerates test throughput with the industry's fastest RF frequency and amplitude switching speeds and 3201 list mode points.
- Reduces test time with the baseband tuning that allows you to switch amplitude and frequency in < 10 µs.
- Ready to test wideband components with optional 160 MHz RF bandwidth.
- Keeps costs manageable—purchase what you need today and easily upgrade later using license-key upgrades without returning your modules to Agilent.
- Reduces development time and simplifies integration into existing test environments with multiple drivers and programmatic interfaces.
- Reduces startup time with Agilent IO libraries for easy configuration, one-step software install, and integrated instrument level VSG soft front panel.
- Fast repair turn-around time with Calibrated Core Exchange strategy.

Figure 2. M9381A baseband power and frequency offset tuning in < 10 µs as shown by the 89600 VSA software.

EASY SETUP

Software Platform

IO libraries

Agilent IO Libraries Suite offers FAST and EASY connection to instruments and the newest version extends that capability to include modular instruments.

The Agilent IO Libraries Suite automatically detects instruments connected to the PC and configures the interface. Included with the IO Libraries is the Agilent Connection Expert (ACE). With ACE, the PXI resource manager will discover and display the chassis and all the PXI, PXIe, and PCIe modules in your system—whether Agilent or other vendor's. From here you can find the right driver, view information about the installed software or launch the module's soft front panel. Agilent is ensuring interoperability in PXI systems making it truly an open standard.

Drivers

Agilent provides instrument drivers that work with your choice of software that saves time and preserves software and hardware investments. Agilent modular instruments come with IVI-COM, IVI-C, LabVIEW and MATLAB software drivers that work in the most popular T&M development environments including, VisualStudio® (VB.NET, C#, C/C++), VEE, LabVIEW, LabWindows/CVI, and MATLAB.

Easy software integration

The M9381A features a one step driver installation that installs all the instrument level driver components, example programs and documentation for each module that is included in the M9381A. This saves significant time during the initial installation and start up and makes it easier to manage the software components.

Included are application code examples for VisualStudio® (VB.NET, C#, C/C++), VEE, LabVIEW, LabWindows/CVI, and MATLAB, which provide set up and basic acquisition functionality. These application code examples are easily modified to quickly integrate the module into your measurement system.

Hardware Platform

The M9381A is PXIe compliant and designed to benefit from fast data interfaces and integrated with other test and automation modules in cPCI(J1), PXI-1, or PXIe Hybrid chassis slots. The PXI format offers high performance in a small, rugged package. It is an ideal deployment platform for many automated test systems. A wide array of complementary PXI products are currently available. From Agilent. Products include multimeters, waveform generators, local oscillators, digitizers, and switch multiplexers.

EASY TEST

Software Applications

Signal studio

Whether you're working on a single radio format or integrating multiple formats into a single device, easy access to the right test signals streamlines validation and helps ensure interoperability.

Signal Studio is a flexible suite of signal-creation tools that reduces the time you spend on signal simulation. Its performance-optimized reference signals—validated by Agilent—enhance the characterization and verification of your devices. With the connectivity license you can playback up to four channels. For high-volume manufacturing, save costs with 5 and 50-pack waveform licenses that enable generation up to 545 Signal Studio I/Q waveform files from any N76xxB Signal Studio software including W-CDMA/HSPA+, cdma2000/1xEV-DO, GSM/EDGE/Evo, LTE/LTE-Advanced FDD, LTE/LTE-Advanced TDD, TD-SCDMA/HSDPA, WLAN 802.11a/b/g/n/ac, Bluetooth, broadcast radio, digital video, and mobile WiMAX.

Figure 3. Agilent Signal Studio Software.

Interfaces

The Agilent soft front panels provide easy to use instrument communications. The M9381A has one soft front panel for controlling the combined modules that make up the vector signal generator. The single graphical user interface guides developers through module setup. Users can quickly configure the instrument parameters. More sophisticated functions are available through the instrument's numerous programmatic interfaces. The modular products support interfaces for VisualStudio, MATLAB, and LabVIEW. The interfaces are implemented using the IVI standard supporting both IVI-COM and IVI-C.

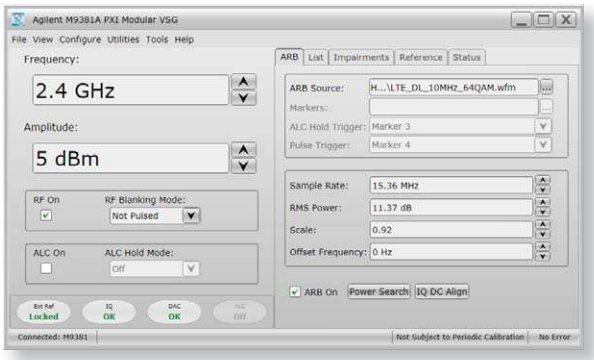


Figure 4. Agilent M9381A vector signal generator soft front panel.

EASY MAINTENANCE

Calibration

The modular products are factory calibrated and shipped with an ISO-9002, NIST-traceable calibration certificate. A one year calibration cycle is recommended.

The M9381A is supported by the Agilent N7800A Calibration Software to perform calibrations that tests all product specifications and is compliant with ISO 17025:2005, ANSI/NCSL Z540.3-2006, and Measurement Uncertainty per ISO Guide to Expression of Measurement Uncertainty, 1995.

The Calibration Status utility helps ensure your M9381A is calibrated by managing the calibration interval and providing messages regarding instrument and module calibration status.

Self Test

A self test utility runs a set of internal tests which verifies the health of the modules and reports their status.

Express Warranty

Reduce downtime with the fastest repair service in the industry. The express warranty upgrades the global warranty to provide:

- 5 day typical turnaround repair service in the US, Japan, China and many EU countries or up to a 10 day improvement in turnaround time in the rest of the world.
- Priority return shipment.

One Day Start Up Assistance

An Agilent Technologies applications engineer will help you get started quickly by installing the modules in a chassis, configuring the controller, loading software and making your first measurements.

Repair

Replacement Core Exchange Assembly allows for fast and easy module repairs while retaining the module's original serial number.

Block Diagram

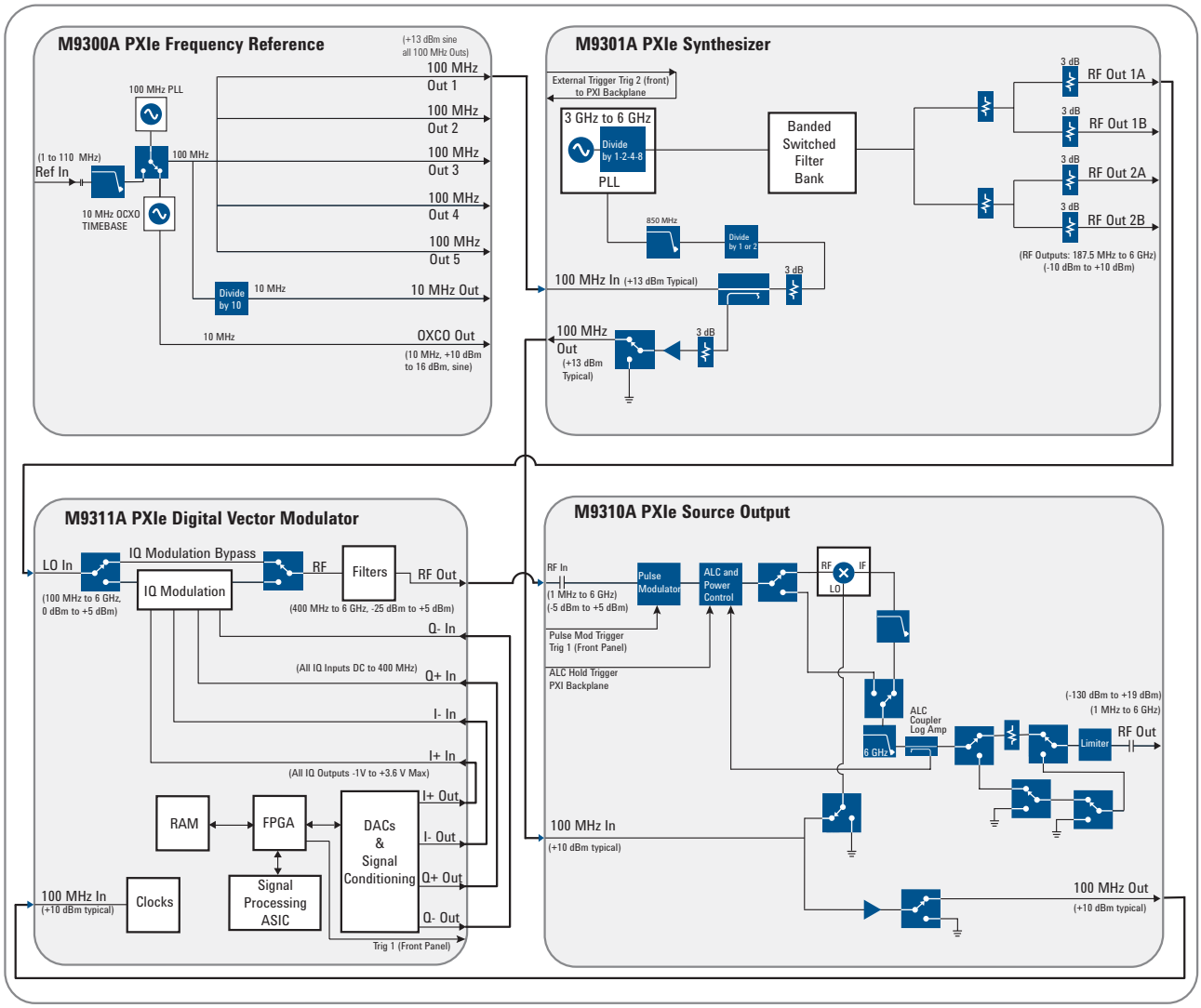


Figure 5. M9381A PXIe vector signal generator block diagram with four modules consisting of the M9301A synthesizer, M9310A source output, M9311A digital vector modulator and the optional M9300A frequency reference.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

Definitions for Specifications

Specifications describe the warranted performance of calibrated instruments that have been stored for a minimum of 2 hours within the operating temperature range of 0 to 55 °C, *(and individual module temperature of ≤ 75 °C)*, unless otherwise stated. Data represented in this document are specifications unless otherwise noted.

Specifications are warranted under the following conditions:

- 30 minute warm-up time
- Calibration cycle maintained
- When used with Agilent M9300A frequency reference

Characteristics *describe product performance that is useful in the application of the product, but that is not covered by the product warranty. Characteristics are often referred to as Typical or Nominal values and are italicized.*

- ***Typical*** *describes characteristic performance, which 80% of instruments will meet when operated over a 20 to 30 °C temperature range.*
- ***Nominal*** *describes representative performance that is useful in the application of the product when operated over a 20 to 30 °C temperature range.*

Note: All graphs contain measured data from one unit and is representative of product performance at room temperature unless otherwise noted.

Recommended Best Practices in Use

- Use slot blockers and EMC filler panels in empty module slots to ensure proper operating temperatures.
- Agilent chassis and slot blockers optimize module temperature performance and reliability of test.
- At ambient temperatures above 45 °C, chassis fan should be set to high.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

FREQUENCY

Frequency Range	
Option F03	1 MHz to 3 GHz
Option F06	1 MHz to 6 GHz
Resolution	0.01 Hz

Frequency Switching Speed			
List mode switching speed [1]	Standard	Option UNZ	*Option UNZ, typical*
Baseband frequency offset change [2]	≤ 5 ms	*≤ 10 µs, nominal*	
ALC off [3, 4]			
Arbitrary frequency change	≤ 5 ms	≤ 220 µs	*≤ 180 µs*
Frequency change < 100 MHz within a band [5]	≤ 5 ms	≤ 125 µs	*≤ 95 µs*
ALC on [3]			
Arbitrary frequency change	≤ 5 ms	≤ 370 µs	*≤ 345 µs*
Frequency change < 100 MHz within a band [5]	≤ 5 ms	≤ 265 µs	*≤ 245 µs*
Non list mode switching speed [6]			
Baseband frequency offset change [2]	≤ 5 *ms, nominal*	*≤ 250 µs, nominal*	
Arbitrary frequency change	≤ 5 *ms, nominal*	*≤ 2 ms, nominal*	

List Mode	
List mode channel parameters	80 parameters including RF frequency, power, modulation arb and baseband, ALC, power search, triggers
Dwell time	0 seconds to 429 seconds
Number of points	1 to 3201
Triggering	Immediate, external, software, timer

Frequency Reference (M9300A PXIe Frequency Reference Module)		
Reference Outputs		
100 MHz Out (Out 1 through Out 5)		
Amplitude	≥ 10 dBm	*13 dBm, typical*
Connectors	5 SMB snap-on	
Impedance	*50 Ω, nominal*	

1. Time from trigger input to frequency and amplitude settled within limits given below with digital modulation on and channel corrections enabled. Specifications are for amplitudes lower than +17 dBm.

2. Baseband offset frequency settled within 100 Hz. Baseband offset can be adjusted ± from carrier frequency within limits determined by RF modulation bandwidth. Synthesizer frequency and amplitude are not changing and ALC off.

3. Carrier frequency settled within 1 ppm or 1 kHz, whichever is greater, and amplitude settled within 0.2 dB (operating ambient temperature range of 20 to 30 °C and individual module temperature of ≤ 55 degrees C) or within 0.5 dB (0 to 55 °C and individual module temperature of ≤ 75 °C). For frequency changes ≥ 1.6 GHz at carriers ≥ 3.2 GHz nominal frequency settling time within ±0.05% of final frequency is 125 us. Simultaneous carrier frequency and amplitude switching.

4. Above 3 GHz, if amplitudes in the list exceed +10 dBm, specification applies for amplitude settled within 0.4 dB (operating ambient temperature range of 20 to 30 °C and individual module temperature of ≤ 55 °C) or within 0.5 dB (0 to 55 °C and individual module temperature of ≤ 75 °C).

5. Frequency bands: One (1 MHz to 400 MHz); Two (> 400 MHz to 750 MHz); Three (> 750 MHz to 1500 MHz); Four (> 1500 MHz to 3000 MHz); Five (> 3000 MHz to 6000 MHz).

6. Mean time from IVI command to carrier frequency settled within 1 PPM or 1 kHz whichever is greater and amplitude settled within 0.2 dB (20 to 30 °C and individual module temperature of ≤ 55 °C) or within 0.5 dB (0 to 55 °C and individual module temperature of ≤ 75 °C). If the ALC is off, the settle limit is 0.4 dB above +10 dBm, (20 to 30 °C and individual module temperature of ≤ 55 °C). Simultaneous carrier frequency and amplitude switching.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

Reference Outputs (continued)	
10 MHz Out	
Amplitude	*9.5 dBm, nominal*
Connectors	1 SMB snap-on
Impedance	*50 Ω, nominal*
OCXO Out	
Amplitude	*11.5 dBm, nominal*
Connectors	1 SMB snap-on
Impedance	*50 Ω, nominal*

Frequency Accuracy
Same as accuracy of internal time base or external reference input

Internal Timebase	
Accuracy	± aging rate ± temperature effects ± gravitational sensitivity
Frequency Stability Aging rate	
Daily	*< ± .5 ppb/day, after 72 hour warm-up*
Yearly	*< ± .10 ppm/year, after 72 hours warm-up*
Total 10 years	*< ± 0.6 ppm/10yrs, after 72 hours warm-up*
Temperature effects	
20 to 30 °C	*< ± 10 ppb at +20 to +30 °C and individual module temperature of ≤ 55 °C (referenced to 25 °C)*
Full temperature range	*< ± 50 ppb (referenced to 25 °C)*
Warm up	
5 minutes over +20 to +30 °C, with respect to 1 hour	*< ± 0.1 ppm*
15 minutes over +20 to +30 °C, with respect to 1 hour	*< ± 0.01 ppm*
Gravitational sensitivity	
In any of the 3 orthogonal axis	*< 5 ppb/g*

External Reference Input	
Frequency	1 MHz to 110 MHz, sine wave
Lock range	*± 1 ppm, nominal*
Amplitude	*0 to 10 dBm, nominal*
Connector	1 SMB snap-on
Impedance	*50 Ω, nominal*

AMPLITUDE

Output Parameters		
Settable range	**Standard**	**Option 1EA**
	+10.7 to -130 dBm	+20 to -130 dBm
Resolution		
ALC On [7]	*0.02 dB, nominal*	
I/Q mode, ALC Off [8]	*0.02 dB, nominal*	
I/Q mode, ALC Off, baseband offset change	*0.001 dB, nominal*	
CW mode, ALC Off	*0.3 dB, nominal*	

Maximum Output Power		
Frequency	**Standard**	**Option 1EA [9]**
1 MHz to 2.5 GHz	+10 dBm	+19 dBm
> 2.5 GHz to 6 GHz	+10 dBm	+18 dBm

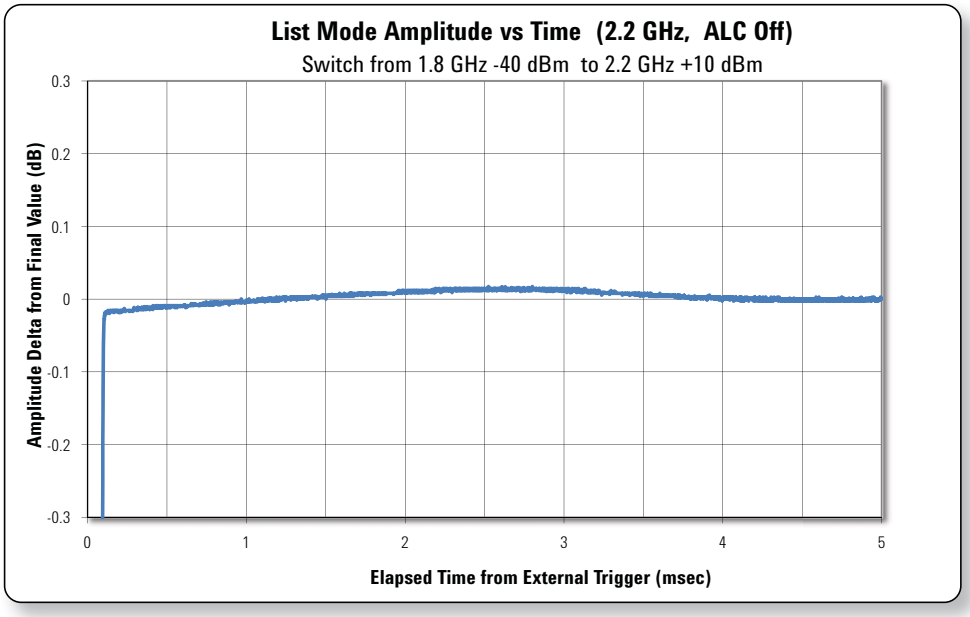


Figure 6. List mode amplitude vs time showing fast settling time to specified level accuracy.

7. Settable to 0.01 dB.
8. After a power search.
9. Specifications apply between 20 ° and 30 °C (and individual module temperature of < 55 °C).

Amplitude Switching Speed			
List mode switching speed [10]	Standard	Option UNZ	*Option UNZ, typical*
Baseband power level change [11]	≤ 5 ms	*≤ 10 µs, nominal*	
ALC off [12]	≤ 5 ms	≤ 125 µs	*≤ 80 µs*
ALC on	≤ 5 ms	≤ 150 µs	*≤ 100 µs*
Non list mode switching speed [13]			
Baseband power level change [11]	≤ 5 *ms, nominal*	*≤ 250 µs, nominal*	
Arbitrary power level change	≤ 5 *ms, nominal*	*≤ 1.5 ms, nominal*	

List Mode
See frequency specification section for more detail

Absolute Level Accuracy in CW Mode [ALC on] [14]					
Frequency	**< +19 to -20 dBm**	**< -20 to -90 dBm**	**< -90 to -100 dBm**	**<-100 to -120 dBm**	**<-120 to -130 dBm**
1 MHz to 400 MHz	±0.5 dB *±0.2 dB, typical*	*±0.55 dB* *±0.2 dB, typical*	±0.62 dB *±0.2 dB, typical*	±0.85 dB *±0.3 dB, typical*	*±0.8 dB, nominal*
> 400 MHz to 3 GHz	±0.4 dB *±0.2 dB, typical*	±0.55 dB *±0.2 dB, typical*	*±0.62 dB* *±0.2 dB, typical*	*±0.85 dB* *±0.3 dB, typical*	*±0.8 dB, nominal*
> 3 GHz to 6 GHz	±0.5 dB *±0.2 dB, typical*	±0.6 dB *±0.2 dB, typical*	*±0.65 dB* *±0.25 dB, typical*	*±1.0 dB* *±0.45 dB, typical*	*±0.8 dB, nominal*

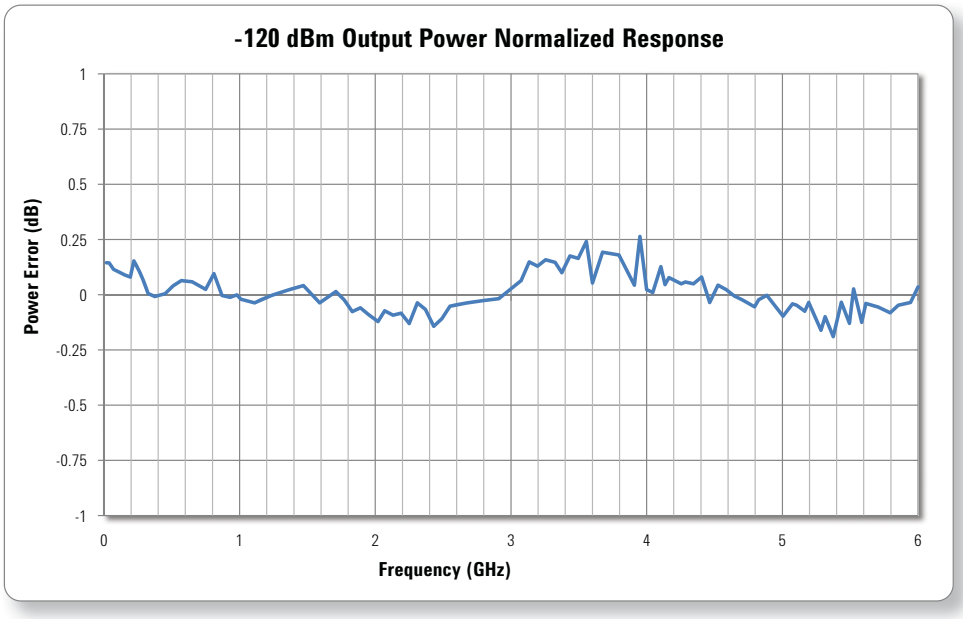


Figure 7. Output power normalized response at –120 dBm.

10. Time from trigger input to amplitude settled within 0.2 dB (operating ambient temperature range of 20 to 30 °C and individual module temperature of ≤ 55 °C) or within 0.5 dB (0 to 55 °C and individual module temperature of ≤ 75 °C). Carrier frequency is not changing.
11. Baseband offset amplitude settled within 0.2 dB. Baseband offset can be adjusted from 0 dB to –20 dB.
12. Above 3 GHz, if amplitudes in the list exceed +10 dBm, specification applies for amplitude settled within 0.4 dB (operating ambient temperature range of 20 to 30 °C and individual module temperature of ≤ 55 °C) or within 0.5 dB (0 to 55 °C and individual module temperature of ≤ 75 °C).
13. Mean time from IVI command to amplitude settled within 0.2 dB operating ambient temperature range of 20 to 30 °C (and individual module temperature of ≤ 55 °C) or within 0.5 dB (0 to 55 °C and individual module temperature of ≤ 75 °C). If the power is above 10 dBm and the ALC is off, the amplitude limit increases to 0.4 dB (20 to 30 °C and individual module temperature of ≤ 55 °C). Carrier frequency is not changing.
14. Specifications apply between operating ambient temperature range of 20 to 30 °C (and individual module temperature of ≤ 55 °C)" For temperatures outside this range, absolute level accuracy degrades by ± 0.02 dB/°C.

Absolute level accuracy (ALC off, relative to ALC on) [15]	
Frequency	
1 MHz to 5 GHz	*±0.25 dB, typical*
> 5 GHz to 6 GHz	*±0.62 dB, typical*
Power search time [16]	
	< 20 ms, nominal
Absolute level accuracy in digital I/Q mode (ALC on, relative to CW) [17]	
< 17 dBm	± 0.5 dB
< 10 dBm	± 0.2 dB
< 0 dBm	± 0.1 dB

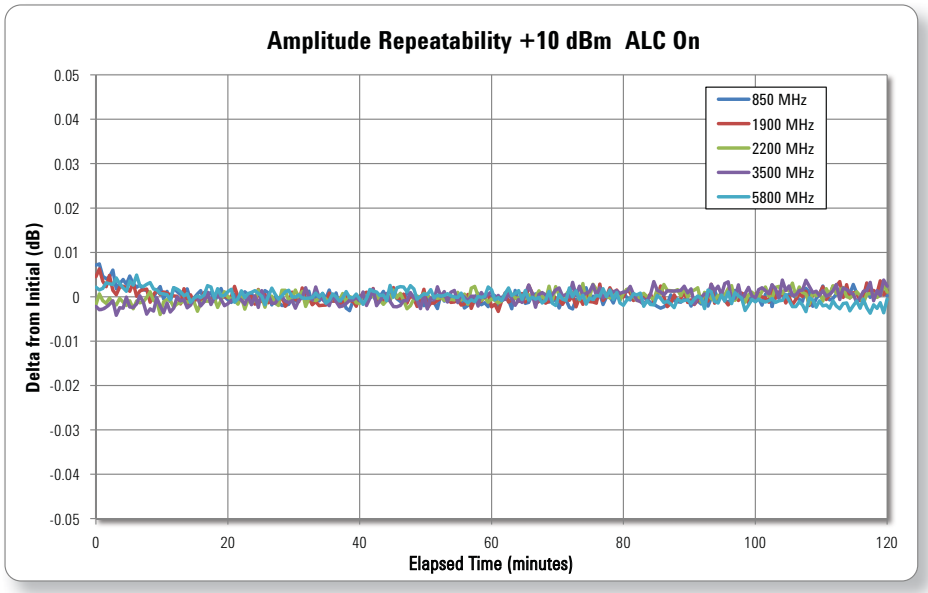


Figure 8. Amplitude repeatability at various carrier frequencies. Repeatability measures the ability of the instrument to return to a given power setting after a random excursion to any other frequency and power setting. It should not be confused with absolute level accuracy.

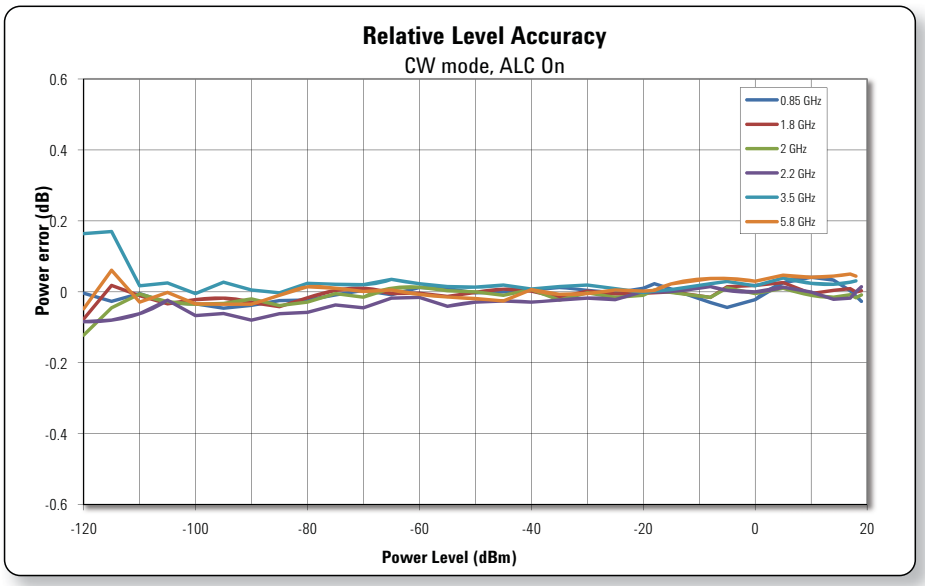


Figure 9. Relative level accuracy at various carrier frequencies.

15. After a power search, with a single side-band signal and with power search blanking on.
16. Power search is an internal alignment routine that improves level accuracy with ALC off.
17. QPSK waveform 4 MS/s symbol rate. Specifications apply between operating ambient temperature range of 20 to 30 °C (and individual module temperature of ≤ 55 °C.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

VSWR	
1 MHz to 6 GHz	*< 1.5:1, nominal*
Maximum Reverse Power	
1 MHz to 6 GHz	*1 W, nominal*
Max DC voltage	*25 VDC, nominal*

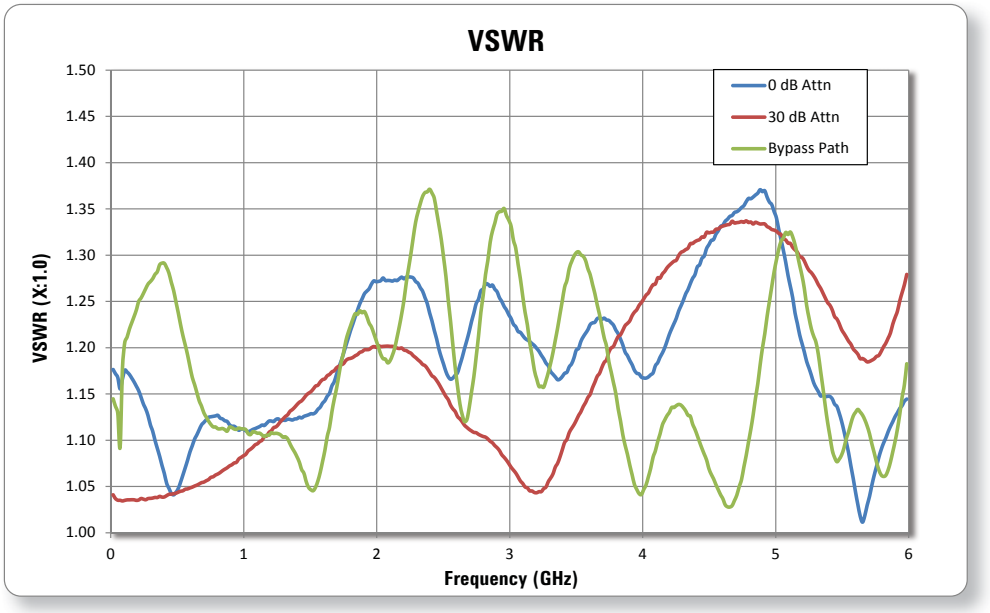


Figure 10. Measured VSWR from 1 MHz to 6 GHz.

SPECTRAL PURITY

Phase Noise at 20 kHz Offset	
1 GHz	*-122 dBc/Hz, typical*
2 GHz	*-117 dBc/Hz, typical*
3 GHz	*-112 dBc/Hz, typical*
6 GHz	*-108 dBc/Hz, typical*

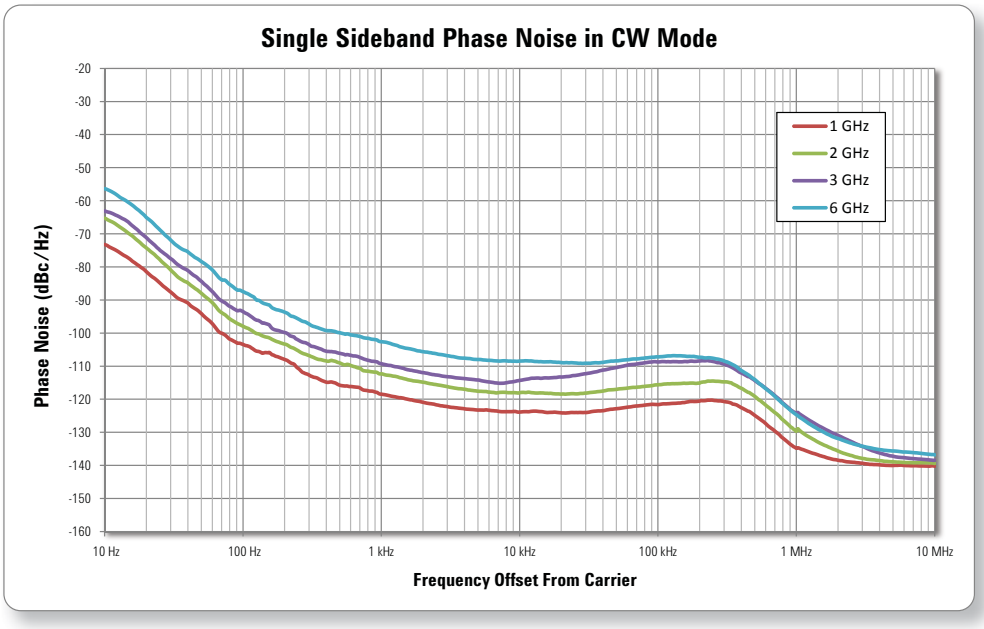


Figure 11. Single sideband phase noise in CW mode from 10 Hz to 10 MHz, offset at 1, 2, 3, and 6 GHz.

Broadband noise floor				
Range				
1 MHz to 6 GHz	*< -140 dBc/Hz, nominal, at +10 dBm output power level*			
Harmonics				
Range	**≤ 0 dBm**	**≤ 0 dBm**	**≤ +10 dBm**	**≤ +10 dBm**
1 MHz to < 1 GHz	< -39 dBc	*-43 dBc, typical*	< -35 dBc	*-37 dBc, typical*
1 GHz to 2.5 GHz	< -34 dBc	*-38 dBc, typical*	< -32 dBc	*-34 dBc, typical*
> 2.5 GHz	< -35 dBc	*-38 dBc, typical*	< -30 dBc	*-32 dBc, typical*
Nonharmonics [18]				
Nonharmonic miscellaneous spurious [19]	*< -70 dBc, nominal*			
Nonharmonic HET band mixing spurs (0 dBm)	*< -67 dBc, nominal*			
Nonharmonic Frac-N	*< -66 dBc, nominal*			
Subharmonics				
1 MHz to 6 GHz	none			

18. Non-harmonics include mixing spurs for frequencies below 400 MHz, synthesizer spurs, and other miscellaneous chassis and power supply products, for offsets >10 kHz.
19. With Agilent M9036A embedded controller.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

ANALOG MODULATION

Pulse Parameters	
Pulse on/off ratio 1 MHz to 400 MHz	*> 85 dB, typical*
Pulse on/off ratio > 400 MHz to 6 GHz	*> 95 dB, typical*
Pulse on/off ratio with I/Q modulation	*> 140 dB, nominal*
Pulse rise/fall time	*< 10 ns, nominal*

Frequency Modulation (Option UNT) [20]	
Maximum deviation	1.25 MHz
Resolution of deviation	0.1 Hz
Maximum rate	5 MHz

Phase Modulation (Option UNT) [20]	
Maximum deviation	10 radians
Resolution of deviation	0.001 radians
Maximum rate	5 MHz

Amplitude Modulation (Option UNT) [20]	
Maximum depth	100%
Resolution of depth	0.001%
Maximum rate	6.25 MHz

Pulse (Option UNT) [20]	
Rate	1 Hz to 1 MHz
Pulse on time	200 ns to 2 ms

Multitone (Option UNT) [20]	
Rate (tone separation)	100 Hz to 1 MHz
Number of tones	2 to 16

20. With arbitrary waveforms. Sine, dual-sine, triangle, ramp and square waveforms supported.

VECTOR MODULATION

Residual Carrier Leakage [21]		
Frequency	**Specifications**	**Typical**
1 MHz to 700 MHz	< -53 dBc	*< -59 dBc*
> 700 MHz to 1 GHz	< -63 dBc	*< -69 dBc*
> 1 GHz to 4 GHz	< -57 dBc	*< -62 dBc*
> 4 GHz to 6 GHz	< -49 dBc	*< -53 dBc*

I/Q Image Suppression [21]		
Frequency	**Specifications**	**Typical**
1 MHz to 700 MHz	< -51 dBc	*< -55 dBc*
> 700 MHz to 1 GHz	< -55 dBc	*< -62 dBc*
> 1 GHz to 4 GHz	< -57 dBc	*< -62 dBc*
> 4 GHz to 6 GHz	< -49 dBc	*< -54 dBc*

I/Q Baseband Feed-Through [21]	
Frequency	**Specifications**
1 MHz to 400 MHz	*< -65 dBc, typical*
> 400 MHz to 3 GHz	*< -80 dBc, typical*
> 3 GHz	*< -90 dBc, typical*

RF Modulation Bandwidth with Internal ARB	
Option B04 (standard)	40 MHz
Option B10	100 MHz
Option B16	160 MHz

RF I/Q Channel Flatness		
Bandwidth	**1 MHz to 5.5 GHz**	**> 5.5 GHz to 6 GHz**
40 MHz BW (Option B04 standard)	*< ±0.1 dB, typical*	*< ±0.2 dB, typical*
100 MHz BW (Option B10)	*< ±0.2 dB, typical*	*< ±0.3 dB, typical*
160 MHz BW (Option B16)	*< ±0.3 dB, typical*	*< ±0.5 dB, typical*

21. Measured with an SSB waveform with an I/Q scale factor of 0.5 for offsets ≤ 50 MHz. Specifications apply at 625 kHz and 50 MHz offsets.

Corrected Phase Error		
Bandwidth	**1 GHz**	**3 GHz**
40 MHz BW (Option B04 standard)	*± 0.25°, nominal*	*± 1.25°, nominal*
100 MHz BW (Option B10)	*± 0.65°, nominal*	*± 2.5°, nominal*
160 MHz BW (Option B16)	*± 0.9°, nominal*	*± 3.0°, nominal*
Arbitrary Waveform Memory Maximum Playback Capacity		
Option M01 (standard)	32 MSa	
Option M05	512 MSa	
Option M10	1024 MSa	

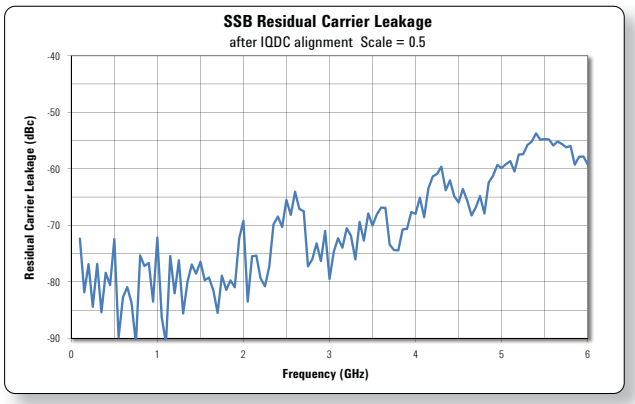


Figure 12. SSB Residual carrier leakage.

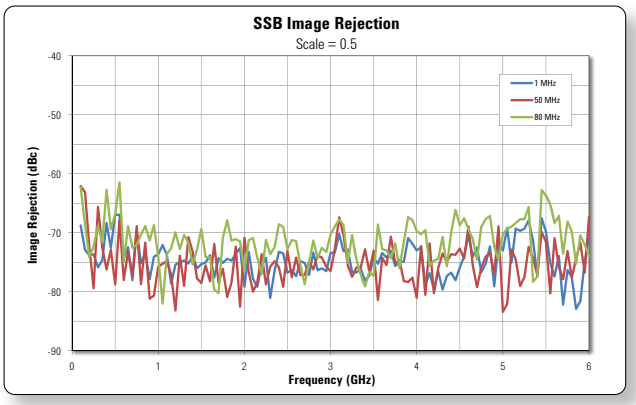


Figure 13. SSB image rejection at 1, 50, and 80 MHz offsets.

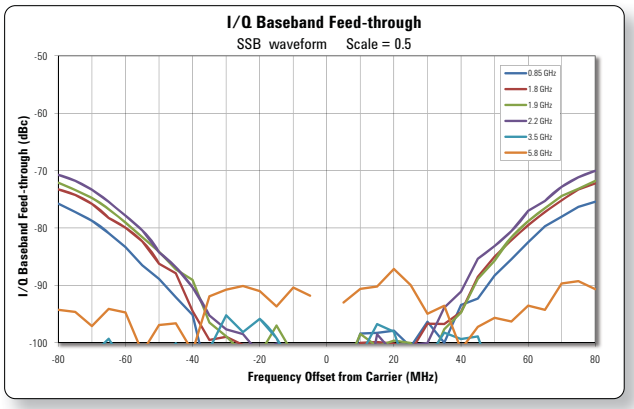


Figure 14. I/Q Baseband feed-through at various carrier frequencies.

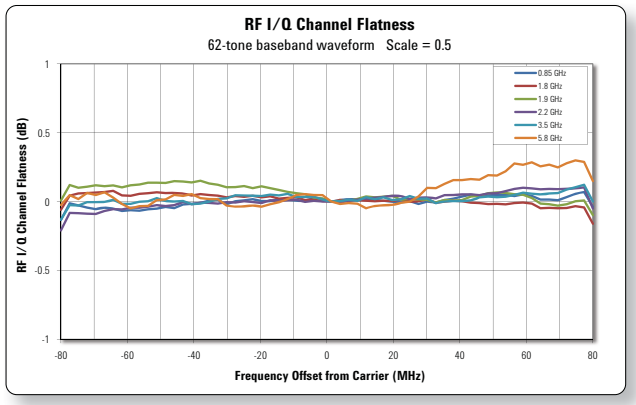


Figure 15. RF I/Q channel flatness at various carrier frequencies.

3GPP W-CDMA Performance Data [22]						
Modulation type	QPSK					
EVM (2 GHz, 1 DPCH, ≤ 5 dBm)	*0.57% rms, typical*					
Channel distortion [23]						
	Power Level		**0 dBm**	**0 dBm**	**5 dBm**	**5 dBm**
Offset	**Configuration**	**Frequency**	**spec (dBc)**	***typical (dBc)***	**spec (dBc)**	***typical (dBc)***
Adjacent 5 MHz	1 DPCH 1 carrier	900 MHz	-70	*-71*	-71	*-72*
Alternate 10 MHz			-71	*-73*	-72	*-74*
Adjacent 5 MHz		1800 to 2200 MHz	-70	*-71*	-70	*-71*
Alternate 10 MHz			-71	*-73*	-72	*-73*
Adjacent 5 MHz	64 DPCH 1 carrier	900 MHz	-69	*-70*	-67	*-69*
Alternate 10 MHz			-71	*-72*	-72	*-73*
Adjacent 5 MHz		1800 to 2200 MHz	-69	*-70*	-67	*-70*
Alternate 10 MHz			-71	*-72*	-72	*-73*

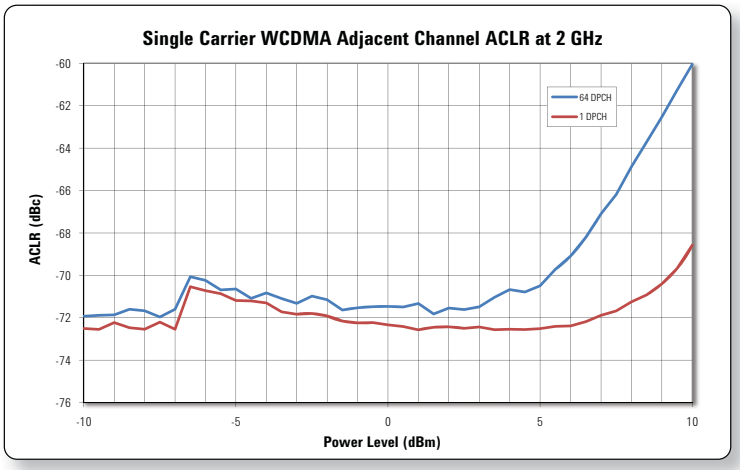


Figure 16. Single carrier W-CDMA adjacent channel ACLR versus power level at 2 GHz.

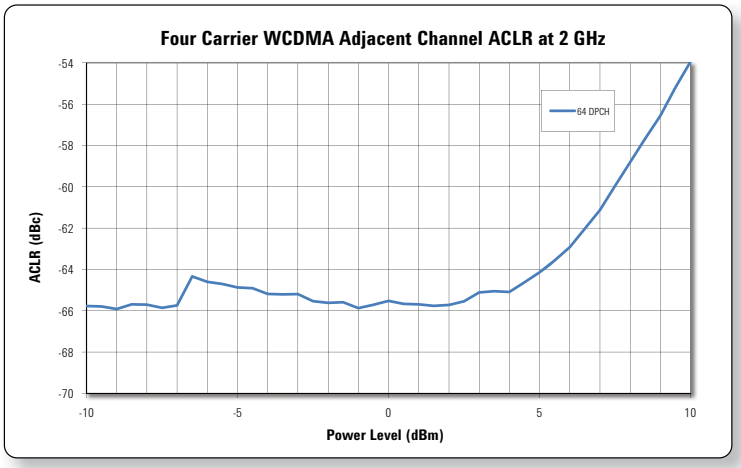


Figure 17. Four carrier W-CDMA adjacent channel ACLR versus power level at 2 GHz.

22. W-CDMA characteristics apply at 900 MHz and between 1.8 to 2.2 GHz, 3.84 Mcps rate, within 5 °C of internal alignment.
23. Specifications apply operating ambient temperature range of 20 to 30 °C (and individual module temperature of ≤ 55 °C) .

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

GSM/EDGE Performance Data [24]		
	GSM	**EDGE**
Modulation Type	GMSK bursted	3pi/8-8PSK bursted
Modulation Rate	270.833 ksps	70.833 ksps
EVM [ALC Off]	*± 0.15 ° rms global phase error, typical*	*0.3%, typical*
EVM [ALC On]	*± 0.15 ° rms, global phase error, typical*	*0.6%, typical*
Output RF spectrum (ORFS)		
Offset	**GSM, *typical***	**EDGE, *typical***
200 kHz	*-36 dBc*	*-39 dBc*
400 kHz	*-64 dBc*	*-64 dBc*
600 kHz	*-68 dBc*	*-68 dBc*
800 kHz	*-75 dBc*	*-75 dBc*
1200 kHz	*-80 dBc*	*-80 dBc*
1800 kHz	*-80 dBc*	*-79 dBc*

802.11 Performance Data					
	Frequency	**2.4 GHz**		**5.8 GHz**	
	Power Level	**5 dBm EVM** *nominal*	**15 dBm EVM** *nominal*	**1 dBm EVM** *nominal*	**11 dBm EVM** *nominal*
802.11a/g, 20 MHz, 64 QAM		*-49.6 dB*	*-39.4 dB*	*-44.0 dB*	*-34.2 dB*
802.11n, 40 MHz, 64 QAM		*-47.8 dB*	*-40.4 dB*	*-43.0 dB*	*-33.3 dB*
802.11ac, 80 MHz, 64 QAM		*-46.8 dB*	*-38.0 dB*	*-42.1 dB*	*-31.7 dB*
802.11ac, 80 MHz, 256 QAM		*-46.1 dB*	*-38.6 dB*	*-42.1 dB*	*-32.3 dB*
802.11ac, 160 MHz, 64 QAM		*-46.0 dB*	*-38.2 dB*	*-40.6 dB*	*-32.1 dB*

LTE FDD Performance Data [25]		
Modulation Type	64 QAM	
EVM		
EVM (900 MHz, ≤ +6 dBm)	*- 52 dB (0.25%), nominal*	
EVM (2 GHz, ≤ +6 dBm)	*- 50 dB (0.32%), nominal*	
ACPR		
Frequency	**Adjacent (< 5 dBm)**	**Alternate (< 5 dBm)**
900 MHz	-68 dBc, nominal	*-70 dBc, nominal*
2 GHz	-67 dBc, nominal	*-70 dBc, nominal*

24. GSM/EDGE characteristics apply 800 MHz to 900 MHz, and 1800 MHz to 1900 MHz, with 1 timeslot channel configuration, within ± 5 °C of internal alignment.

25. LTE FDD E-TM 1.1 and E-TM 3.1, 10 MHz, 64 QAM PDSCH, full resource block. Characteristics apply with ± 5 °C of internal alignment.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

Environmental and physical specifications				
Temperature	Operating Non-Operating (Storage)		0 to 55 °C -40 to +70 °C	
Humidity [26]			Type tested at 95%, +40 °C (non-condensing)	
Altitude			Up to 15,000 feet (4,572 meters)	
Connectors	RF OUT		SMA female	
EMC			Complies with European EMC Directive 2004/108/EC • IEC/EN 61326-2-1 • CISPR Pub 11 Group 1, class A • AS/NZS CISPR 11 • ICES/NMB-001 This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.	
Warm-up time			30 minutes	
Size	M9300A M9301A M9310A M9311A		1 PXIe slot 1 PXIe slot 1 PXIe slot 2 PXIe slots	
Dimensions	**Module**	**Length**	**Width**	**Height**
	M9300A	210 mm	22 mm	130 mm
	M9301A	210 mm	22 mm	130 mm
	M9310A	210 mm	22 mm	130 mm
	M9311A	210 mm	42 mm	130 mm
Weight	M9300A M9301A M9310A M9311A		0.551 kg (1.215 lbs) 0.535 kg (1.179 lbs) 0.551 kg (1.215 lbs) 0.901 kg (1.986 lbs)	
Power drawn from chassis	M9300A M9301A M9310A M9311A		≤ 18 W ≤ 25 W ≤ 28 W ≤ 45 W	

26. Samples of this product have been type tested in accordance with the Agilent 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 MIL-PRF-28800F Class 3.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

System requirements		
Topic	Windows® 7 and Vista Requirements	Windows® XP Requirements
Operating systems	Windows 7 (32-bit and 64-bit) Windows Vista, SP1 and SP2 (32-bit and 64-bit)	Windows XP, Service Pack 3
Processor speed	1 GHz 32-bit (x86), 1 GHz 64-bit (x64) (no support for Itanium 64)	600 MHz or higher required 800 MHz recommended
Available memory	4 GB minimum 8 GB or greater recommended	3 GB minimum
Available disk space [27]	1.5 GB available hard disk space, includes: • 1 GB available for Microsoft .NET Framework 3.5 SP1 [28] • 100 MB for Agilent IO Libraries Suite	1.5 GB available hard disk space, includes: • 1 GB available for Microsoft .NET Framework 3.5 SP1 [28] • 100 MB for Agilent IO Libraries Suite
Video	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)	Super VGA (800 x 600) 256 colors or more
Browser	Microsoft® Internet Explorer 7.0 or greater	Microsoft® Internet Explorer 6.0 or greater

Figure 18. M9381A PXIe vector signal generator with four modules consisting of the M9311A digital vector modulator, M9310A source output, M9301A synthesizer and the M9300A frequency reference placed within the Agilent M9018A PXI chasis with the Agilent M9036A controller.

27. Because of the installation procedure, less memory may be required for operation than is required for installation.
28. NET Framework Runtime Components are installed by default with Windows Vista and Windows 7. Therefore, you may not need this amount of available disk space.

CONFIGURATION AND ORDERING INFORMATION

Ordering Information

Model	Description
M9381A	PXIe Vector Signal Generator: 1 MHz to 3 or 6 GHz Includes: M9301A PXIe Synthesizer M9310A PXIe Source Output M9311A PXIe Digital Vector Modulator One day start up assistance Module interconnect cables Software, example programs and product information on CD Return to Agilent Warranty—3 Years
Base Configuration	
M9381A-F03	Frequency range: 1 MHz to 3 GHz
M9381A-B04	RF Modulation Bandwidth, 40 MHz
M9381A-M01	Memory, 32 MSa
M9381A-300 Required for warranted specifications	PXIe Frequency Reference: 10 MHz and 100 MHz Adds M9300A PXIe Frequency Reference: 10 MHz and 100 MHz (M9300A module can support multiple M9381A modular instruments)

Configurable Options		
Frequency		
	M9381A-F03	Frequency range: 1 MHz to 3 GHz
✓	M9381A-F06	Frequency range: 1 MHz to 6 GHz
Power		
✓	M9381A-1EA	High Output Power
Switching Speed		
✓	M9381A-UNZ	Fast Switching
Modulation Bandwidth		
	M9381A-B04	RF Modulation Bandwidth: 40 MHz
	M9381A-B10	RF Modulation Bandwidth: 100 MHz
✓	M9381A-B16	RF Modulation Bandwidth: 160 MHz
Memory		
	M9381A-M01	Memory, 32 MSa
	M9381A-M05	Memory, 512 MSa
✓	M9381A-M10	Memory, 1024 MSa
Other		
✓	M9381A-UNT	Analog Modulation
	M9381A-UK6	Commercial calibration certificate with test data for M9381A (M9301A, M9310A, M9311A)
	M9300A-UK6	Commercial calibration certificate with test data for M9300A (module only)
Related Products in Recommended Configuration		
✓	M9036A	PXIe Embedded Controller
✓	M9018A	18-Slot PXIe Chassis

✓ *Recommended Configuration*

CONFIGURATION AND ORDERING INFORMATION

Software Information

Supported operating systems	Microsoft Windows® XP (32-bit) Microsoft Windows® 7 (32/64-bit) Windows Vista®, SP1 and SP2 (32-bit and 64-bit)
Standard compliant drivers	IVI-COM, IVI-C, LabVIEW, MATLAB
Supported application development environments (ADE)	VisualStudio® (VB.NET, C#, C/C++), VEE, LabVIEW, LabWindows/CVI, MATLAB
Agilent IO Libraries (version 16.2 or newer)	Includes: VISA Libraries, Agilent Connection Expert, IO Monitor
Signal Studio Software Connectivity: ▪ N76xxB-9TP connects to M9381A, transportable perpetual license. ▪ N76xxB-9FP connects to M9381A, fixed perpetual license. ▪ N7650B-2xx provides 5/50 waveform pack licenses. (Playback on up to four channels per license)	N7600B W-CDMA/HSPA+ N7601B cdma2000/1xEV-DO N7602B GSM/EDGE/Evo N7606B Bluetooth N7611B Broadcast Radio N7612B TD-SCDMA/HSDPA N7615B Mobile WiMAX N7617B WLAN 802.11a/b/g/n/ac N7623B Digital Video N7624B LTE/LTE-Advanced FDD N7625B LTE/LTE-Advanced TDD
Agilent Command Expert	Instrument control for SCPI or IVI-COM drivers

Accessories

Model	Description
Y1212A	Slot Blocker Kit: 5 modules
Y1213A	PXI EMC Filler Panel Kit: 5 slots
Y1214A	Air Inlet Kit: M9018A 18-slot chassis
Y1215A	Rack Mount Kit: M9018A 18-slot chassis

Related Products

Model	Description
M9021A	PCIe Cable Interface
M9045B	PCIe ExpressCard Adaptor for laptop connectivity
Y1200B	PCIe Cable for laptop connectivity
M9048A	PCIe Desktop Adaptor for desktop connectivity
Y1202A	PCIe Cable for desktop connectivity
M9380A	PXIe CW Source

Advantage Services: Calibration and Warranty

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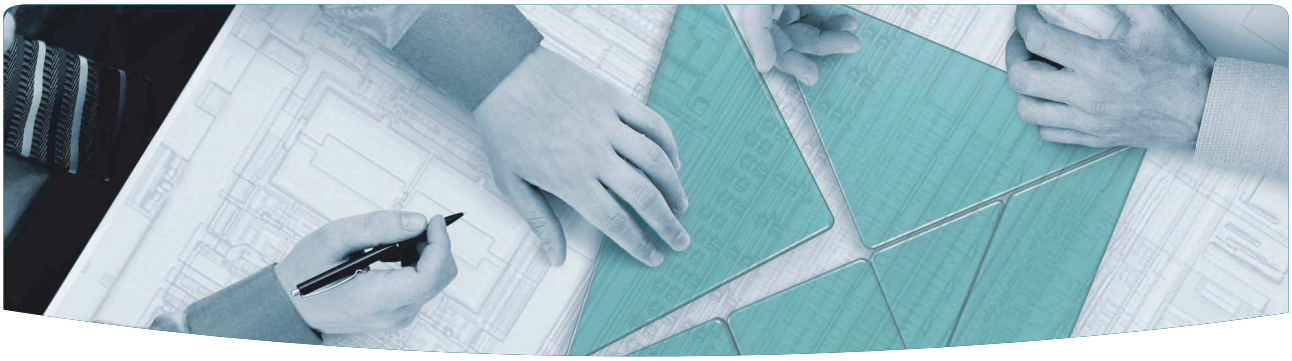
R-51B-001-3C	Return to Agilent Warranty - 3 years
R-51B-001-5C	Return to Agilent Warranty - 5 years



The Modular Tangram

The four-sided geometric symbol that appears throughout this document is called a tangram. This seven-piece puzzle originated in China a few centuries ago. The goal is to create shapes—from simple to complex—that form an identifiable silhouette. As with a tangram, the possibilities may seem infinite as you begin to create a new test system. With a set of clearly defined elements—architecture, hardware, software—Agilent can help you create the system you need, from simple to complex.

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