Agilent V2920A RF Vector Signal Generator

10 MHz to 4 or 6 GHz

Technical Overview

Applications

- MIMO derived research
- Commercial OFDM development and verification
- 802.11n WLAN design validation

The Agilent V2920A RF vector signal generator outputs both continuous wave (CW) and modulated signals from 10 MHz to 4 GHz or 6 GHz for R&D and production testing of wireless chipsets, wireless modules, and wireless devices. This no-compromise signal generator combines high speed with outstanding phase noise performance. The V2920A can download waveform files at high speed and offers an arbitrary waveform generator capable of bandwidths as wide as 80 MHz, so it can download large, complex, wide-bandwidth signal files quickly. That helps researchers develop sophisticated new wireless transmission schemes and production test engineers develop test schemes that exercise their devices thoroughly.

Agilent Technologies

Reduce your test times with fast, no-compromise performance

Tune to different frequencies over a device's operating band in 350 µs or less. The V2920A employs a new, patent-pending technique to ensure fast settling of phase-locked loop synthesizers when changing frequencies. You can also test a device over its power handling range by sourcing different amplitude levels in as little as 150 µs in open loop level control operation and 300 µs in closed loop operation. The V2920A provides electronic attenuation along with the fast-tracking, automatic level control loop to stabilize on a new power level quickly. This lets it provide "no-compromise" performance with both fast frequency tuning and amplitude level settling, so you can execute a test plan that maximizes confidence in your product's performance while minimizing the impact on test time.

To maximize operating speed, the V2920A offers a direct link from its DSP processing circuit block to an external PC via a USB 2.0 bus. When the instrument is in this desktop control panel operating mode, an external PC assumes control of the instrument, just as if it were the instrument's on-board processor controller. This speed-optimized mode supports transferring signal files from a PC directly into the V2920A's arbitrary waveform memory at 100 Mb/sec. That simplifies downloading extremely large files to the V2920A, such as streaming video test signal files, signal files modified by channel models, and radar profile files.

Extensive signal generation library and signal creation software to test a wide range of wireless devices

- Analog and digital modulation
- Cellular standards: GSM/EDGE, cdma2000, W-CDMA, HSPA, and HSPA+
- Wireless connectivity: WLAN 802.1 1a, b, g, j, n and WiMAX 802.16eACPR (adjacent channel power ratio bar chart)
- Mobile TV and GPS: DVB-H, DVB-T, and GPS
- Create both ideal and impaired SISO and MIMO signals for the V2920A with V2901A SignalMeister integrated RF signal analysis and generation toolkit

Test WLAN 802.11n, WiMAX 802.16e Wave 2, and HSPA+ MIMO devices with highly-synchronized V2920A RF vector signal generators

- $< \pm 1$ ns alignment offset across multiple V2920A generators
- ≤ 1 ns of arbitrary waveform jitter

No need to compromise signal generation performance to achieve high testing speed

The V2920A combines high quality signal generation with superior speed performance. The instrument's low phase noise means you can test receivers with low distortion signals and still have high confidence that any detection problems the receiver exhibits are attributable to receiver performance rather than generator signal quality.

When creating complex HSPA+, 802.11n WLAN, and 802.16e WiMAX signals, signal purity is essential. To ensure these signals meet your test requirements, the V2920A-UPN ultra low phase noise option provides superior low phase noise levels such as ≤ –135 dBc/Hz at a 300 kHz offset on a 2 GHz carrier. That allows you to generate W-CDMA signals with EVMs < 0.85%. The low phase noise option also permits the V2920A to generate 5.8 GHz, 40 MHz bandwidth WLAN 802.11n signals with a residual relative constellation error as low as –45 dB. Even when using the low phase noise option, the V2920A still provides a no-compromise tuning time as fast as 750 µs.

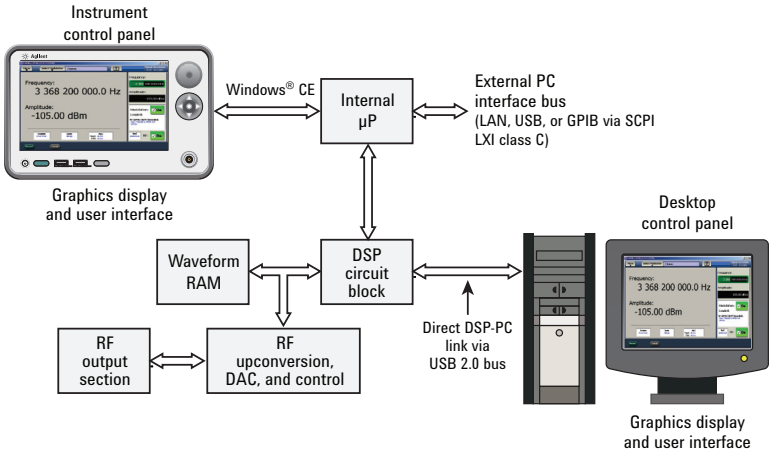


Figure 1. The V2920A gives you the flexibility to operate it in the conventional manner (using the internal microprocessor to control the instrument) or to use the high speed mode, which employs a USB 2.0 bus to provide a direct, high speed link between the internal DSP processing block and an external PC. This direct PC-DSP link supports signal file download rates in excess of 100 MB/s.

Simplify the creation of complex ideal and impaired signals with SignalMeister

V2901A SignalMeister integrated RF signal analysis and generation toolkit software provides an even more extensive set of signal personalities. When used in conjunction with SignalMeister software, the V2920A is not only capable of generating pure signals but can also generate impaired signals for in-depth receiver characterization and testing. The graphical user interface the SignalMeister package provides lets you build complex signals using an easy-to-learn block diagram format. All signal personalities have the same format—once you've become familiar with one personality, you can easily manipulate all the others. A variety of signal generation libraries are available:

- W-CDMA (3GPP) downlink and uplink, including HSPA and HSPA+
- cdma2000 forward and reverse link, including EV-DV
- OFDM-based standards such as:
  – WLAN 802.11a, b, g, j, and n (both SISO and MIMO for 802.11n)
  – WiMAX 802 .16e, WiMAX 802.16e Wave 2, and WiBro
- Mobile TV transmission standards, DVB-H and DVB-T

Refer to the *Agilent V2901A SignalMeister Integrated RF Signal Analysis and Generation Toolkit* technical overview, literature number 5990-5485EN, for additional information.

Custom solutions—WLAN DFS pre-conformance testing

All WLAN access points operating in the 5 GHz band must detect government radar signals and transmit on a non-interfering channel. This operating requirement is known as Dynamic Frequency Selection (DFS). Worldwide standards bodies require that the access points must be capable of detecting specific radar profiles. The V2920A's high-speed download feature along with Agilent applications software enables highly cost-effective, fast WLAN DFS pre-conformance testing.

Scale up your MIMO system to the size you need

Whether you are developing or testing HSPA+, WLAN, WiMAX, or MIMO devices, the V2920A delivers all the performance necessary to operate in both SISO and MIMO test systems. For example, the ability to synchronize the operation of multiple signal generators is essential when creating a MIMO receiver test system. When combined with a V2895A MIMO synchronization unit, multiple V2920As can synchronize the outputs of their individual arbitrary waveform files to within one nanosecond of each other. In addition, RMS phase jitter between multiple V2920As is less than 0.1°. This tight synchronization of multiple generators ensures highly time-synchronized signal streams and gives MIMO researchers and designers confidence that any received signal time delays detected at the receiver are the result of the effects of the channel between the generator and the receiver, problems with the receiver signal processing algorithms, or phase delays among the multiple receivers. The V2920A is designed for uncomplicated integration into MIMO receiver test systems configured with up to eight generators without the need for any options.

SignalMeister software includes tools to let you manage both SISO and MIMO systems easily. It also can be used to control and manage the synchronization of multiple V2920A generators. The simplicity and convenience of this software ensures your MIMO system is up and running quickly.

For additional information on MIMO systems, refer to the MIMO technical overview, literature number 5990-5493EN.

Extensive synchronization for accurate and low latency device test

To ensure accurate characterization and testing, synchronize the V2920A to devices such as femtocells within the generator's wide external frequency lock range of 1 to 60 MHz. For production test, the V2920A can be linked directly to other instrumentation, such as the V2820A RF vector signal analyzer, with trigger input lines and synchronization output lines. Trigger inputs can initiate the generation of an arbitrary waveform file as well as trigger stepping from one file to another. A variety of synchronization modes permit triggering other instruments at the end of a waveform file; at the beginning of a programmed sweep, list, or sequence; at the end of each step in a sweep, list, or sequence; or when a sequence, list, or sweep is complete. The triggering and synchronization capability minimizes wait time latency in setting up instruments for new test conditions.

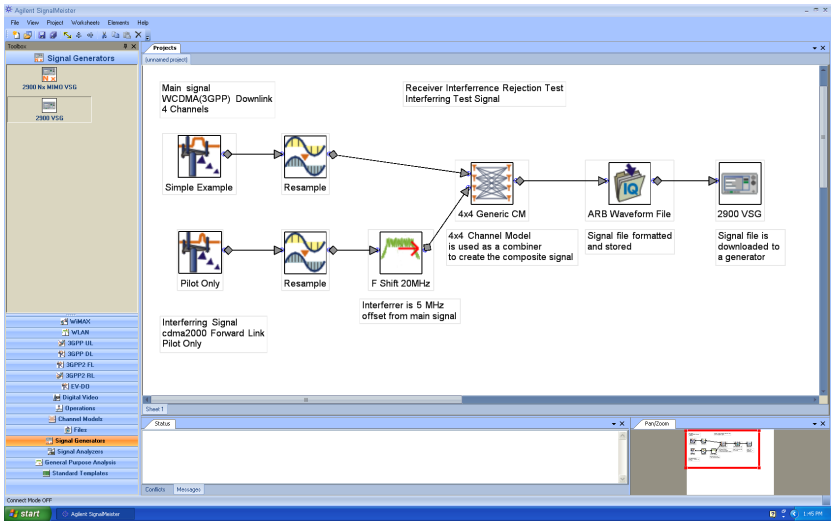


Figure 2. Drag SignalMeister icons into the project area to create block diagrams of ideal or impaired waveforms. The file shown here consists of a W-CDMA transmission combined with an interfering signal; both signals are modified by a channel model to simulate an actual environmental condition. The file is created and downloaded to a V2920A, which will generate a waveform that can be used to test a receiver's interference rejection performance.

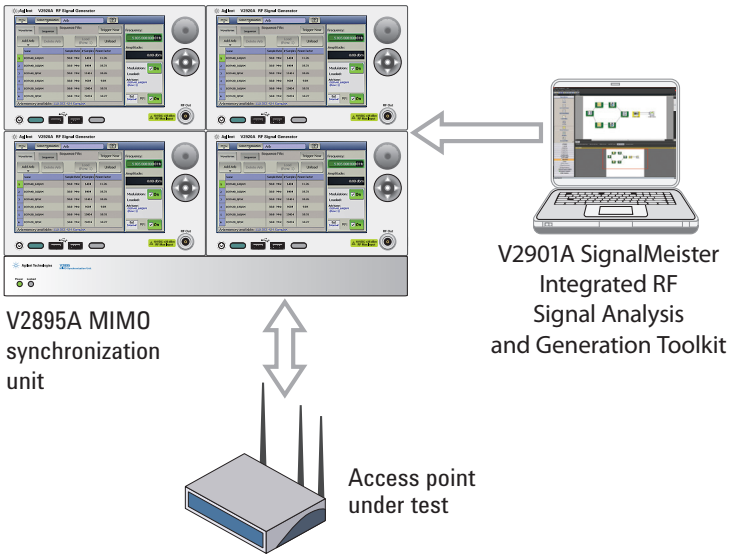


Figure 3. Standard V2920As deliver the configuration flexibility you need to build them into any size MIMO system desired—no special generator modifications are needed. SignalMeister software generates MIMO signal streams and transparently manages the operation and synchronization of the test system's V2920As. You can test receivers with a V2920A-based system or test transmitters using the V2920A-BBA baseband output option to drive the transmitter's baseband inputs.

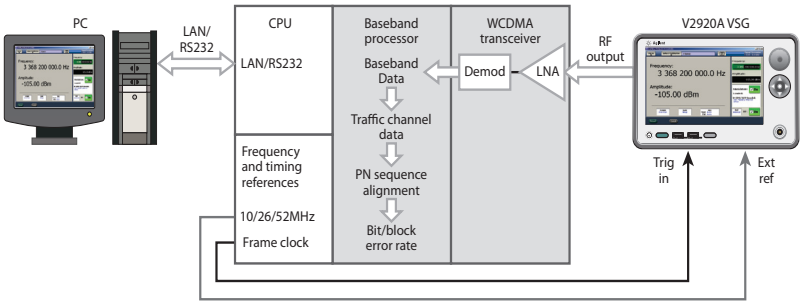


Figure 4. Optimize your testing by using the V2920A's wide external reference frequency range of 1 to 60 MHz and external trigger inputs for synchronizing with a wide range of wireless devices, including femtocells.

Signal Generation Options

Arbitrary waveform generator options

V2920A-B20: Arbitrary waveform generator, 20 MHz bandwidth
V2920A-B40: Arbitrary waveform generator, 40 MHz bandwidth
V2920A-B80: Arbitrary waveform generator, 80 MHz bandwidth

Performance enhancement options

V2920A-UPN: Generator low phase noise option
V2920A-LAR: Low amplitude range, < –110 dBm
V2920A-BBA: Baseband analog IQ inputs and outputs

Signal generation and channel model licenses

Generic modulation

V2900A-101: Flexible analog modulation signal generation personality license
V2900A-102: Flexible digital modulation signal generation personality license

GSM/EDGE

V2900A-103: GSM, GPRS, EDGE signal generation personality license

cdmaOne, cdma2000

V2900A-104: cdma2000 and IS-95A forward link signal generation personality license
V2900A-201: cdma2000 and 1xEV-DV for reverse link signal generation SignalMeister license

W-CDMA

V2900A-105: W-CDMA FDD downlink signal generation personality license
V2900A-202: W-CDMA FDD uplink and downlink signal generation SignalMeister license
V2900A-203: HSPA including HSPA+ signal generation SignalMeister license
V2900A-204: 3GPP channel model signal generation SignalMeister license

WLAN

V2900A-205: 802.11a-b-g-j WLAN signal generation SignalMeister license
V2900A-206: 802.11n WLAN signal generation SignalMeister license
V2900A-207: WLAN channel model signal generation SignalMeister license

WiMAX

V2900A-208: 802.16e-2005 mobile WiMAX and WiBRO signal generation SignalMeister license
V2900A-209: WiMAX channel model signal generation SignalMeister license

Digital video broadcast

V2900A-213: DVB-H and DVB-T signal generation SignalMeister license

Global Positioning System

V2900A-106: GPS signal generation personality license

V2920A Product Specifications

Specification definitions and conditions

Specifications describe the instrument's warranted performance. All units are warranted to meet performance specifications under the following conditions:

• Ambient operating temperature of 18 to 28 °C, unless otherwise noted.

• After specified warm-up time of 30 minutes and self calibration at ambient temperature.
Note: All items are specifications unless otherwise noted.

Typical (mean plus three standard deviations)
"Typical" indicates performance that units will meet under the following conditions:

• Ambient operating temperature of 23 °C, unless otherwise noted.

• After specified warm-up time of 30 minutes and self calibration at ambient temperature.

This performance is not warranted.

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

Basic modes of operation

CW (continuous waveform): signal generator mode: CW signal generator; default mode

Analog and digital signal generator personalities: general-purpose analog and digital modulation

Vector signal generator personalities: Modulation quality source for GSM, GPRS, EDGE, GPS, cdma2000, and W-CDMA mobile phone transmitter signals

Frequency

Frequency range:	V2920A-504: 10 MHz to 4.0 GHz
V2920A-506:	10 MHz to 6.0 GHz[1]
Frequency input units:	Hz, kHz, MHz, GHz
Frequency setting resolution:	0.1 Hz
Frequency accuracy:	Same as frequency reference + synthesizer resolution term[2]
Frequency switching time[3]:	
Via remote command after receipt of end-of-operation indicator (EOI):	≤ 2 ms (nominal); ≤ 1 ms (nominal) using V2920A desktop control panel
List or swept mode[4]:	≤ 350 µs standard (≤ 300 µs typical): ≤ 750 µs V2920A-UPN

1. *Over range operation provided: 10 MHz to 6.9 GHz. Performance above 6.0 GHz is not specified.*
2. *Synthesizer resolution term: ≤ 5 µHz.*
3. *To within 0.1 ppm or 100 Hz of final value, whichever is greater. ALC on or off. Modulation on or off.*
4. *Start and stop frequencies remain in the same frequency band: Band 1 = 10 MHz to 330 MHz, Band 2 = 330 MHz to 3400 MHz, Band 3 = 3400 MHz to 6000 MHz. No change in programmed level.*

Frequency and amplitude switching time

(Standard or V2920A-UPN option)[1]

Frequency band	Mode	From final value (dB)	Standard time (µs)	V2920A-UPN time (µs)
10 MHz ≤ frequency ≤ 6000 MHz	Open loop	0.25	600	750
	Closed loop (fast)	0.25	750	750
	Sample and hold	0.25	900	900
10 MHz ≤ frequency < 330 MHz (Band 1)	Open loop	0.20	450	750
	Closed loop (fast)	0.20	600	750
	Sample and hold	0.25	900	900
330 MHz ≤ frequency < 3400 MHz (Band 2)	Open loop	0.20	450	750
	Closed loop (fast)	0.20	600	750
	Sample and hold	0.25	900	900
3400 MHz ≤ frequency ≤ 6000 MHz (Band 3)	Open loop	0.25	550	750
	Closed loop (fast)	0.25	700	750
	Sample and hold	0.25	900	900

Internal frequency reference

Aging rate: ≤ 1 ppm/year

Temperature stability: ≤ 0.2 ppm[2]

Frequency reference output

Impedance: 50 W (nominal), AC coupled

Ref output signal: 10 MHz, +7 dBm ±3 dB (nominal)

External frequency reference input

Frequency lock range:

- Hardware lock mode[3]: 10 MHz ±10 Hz (1 ppm) input frequency lock range
- Variable input frequency mode: 1 to 60 MHz[4]

Amplitude: lock range: –3 to +15 dBm[5]

Impedance: 50 W (nominal)

List and step sweep modes

Frequency step/sweep: start, stop, number of points, dwell time

Amplitude step/sweep: start, stop, number of points, dwell time

Dwell time min/max: 0 to 999.9999 s

Dwell time resolution: 0.1 ms

Arbitrary list: List of frequency/amplitude/dwell time sets; maximum number of sets = 1000

1. *To within 0.1 ppm of final frequency value. List mode or sweep mode. Start and stop frequencies remain in the same frequency band. If the start and stop frequencies cross frequency bands, use the 10 to 6000 MHz row. Blank on tuning disabled.*
2. *Total variation relative to 0 to 50 °C ambient temperature range.*
3. *Factory preset setting.*
4. *On 10 Hz boundaries, Freq = 1 MHz + n* 10 Hz reference accuracy: ≤ ±1 ppm. Sine or square wave inputs acceptable. Lock time may be up to 30 seconds.*
5. *For optimum phase noise performance, use hardware lock mode. Reference input power 0 to +10 dBm.*

Spectral purity
Standard SSB phase noise, 300 kHz offset:

Carrier frequency (GHz)	Specification	Nominal
1	≤ –118 dBc/Hz	≤ –122 dBc/Hz
2	≤ –112 dBc/Hz	≤ –117 dBc/Hz
3	≤ –109 dBc/Hz	≤ –114 dBc/Hz
4	≤ –106 dBc/Hz	≤ –110 dBc/Hz
5.8	≤ –101 dBc/Hz	≤ –105 dBc/Hz

Harmonics and sub-harmonics[1]:

Fundamental frequency (Ff)	Harmonics specification (typical)	Sub-harmonics specification (typical)
20 MHz ≤ Ff < 60 MHz[2]	≤ –25 dBc	Not applicable
60 MHz ≤ Ff < 4.0 GHz	≤ –30 dBc	≤ –40 dBc
4.0 GHz ≤ Ff ≤ 6.0 GHz	≤ –40 dBc	≤ –40 dBc

Non-harmonic spurious[3]:

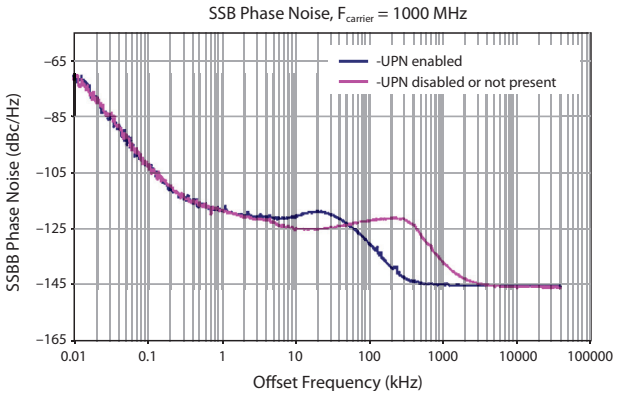
Fundamental frequency (Ff)	Specification	Nominal
10 MHz ≤ Ff < 330 MHz	≤ –55 dBc	≤ –64 dBc
330 MHz ≤ Ff < 1.0 GHz	≤ –55 dBc	≤ –64 dBc
1.0 GHz ≤ Ff < 3.0 GHz	≤ –55 dBc	≤ –60 dBc
3.0 GHz ≤ Ff < 4.0 GHz	≤ –55 dBc	≤ –58 dBc
4.0 GHz ≤ Ff ≤ 6.0 GHz	≤ –50 dBc	≤ –55 dBc

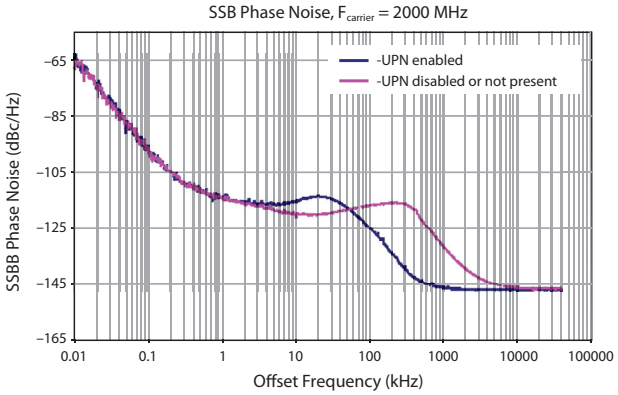
1. *P_{out} ≤ +4 dBm. Specifications apply to harmonic and sub-harmonic responses within the specified operating range of the instrument.*
2. *P_{out} ≤ 0 dBm.*
3. *Valid for responses offset from carrier > 10 kHz, P_{out} = 0 dBm and modulation off, specifications apply to responses within the specified operating range of the instrument.*

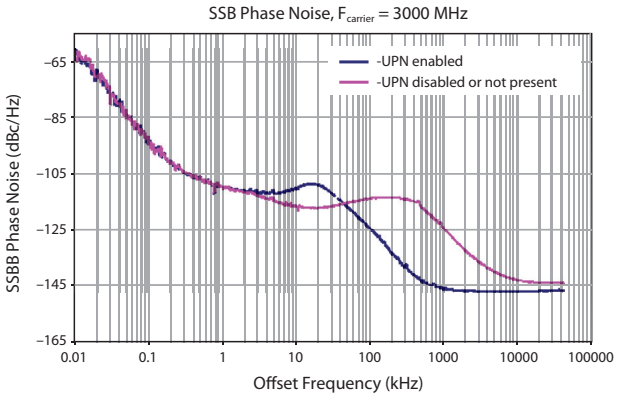
V2920A-UPN ultra low phase noise option

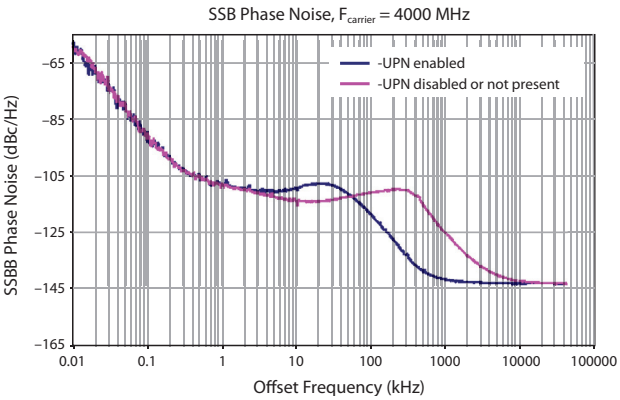
SSB phase noise, dBc/Hz[1]:

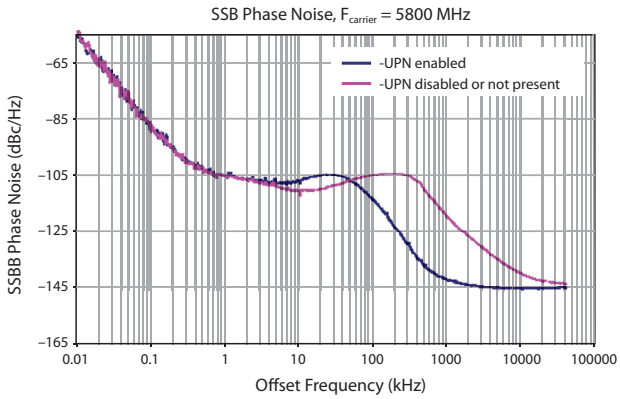
	Specification (nominal) at offset frequency		
Carrier frequency	100 kHz	300 kHz	1 MHz
1.0 GHz	≤ –126 (–131)	≤ –138 (–143)	≤ –141 (–146)
2.0 GHz	≤ –120 (–125)	≤ –135 (–139)	≤ –141 (–146)
3.0 GHz	≤ –117 (–122)	≤ –133 (–137)	≤ –141 (–146)
4.0 GHz	≤ –114 (–119)	≤ –129 (–133)	≤ –137 (–142)
5.8 GHz	≤ –109 (–113)	≤ –125 (–129)	≤ –137 (–142)











1. RF output power set to 0 dBm.

Amplitude[1]

Amplitude level range (CW):

Carrier frequency (GHz)	Standard	V2920A-LAR
10 MHz to < 330 MHz	–110 to +10 dBm	–130 to +10 dBm
330 MHz to < 3.0 GHz	–110 to +13 dBm	–130 to +13 dBm
3.0 GHz to ≤ 6.0 GHz	–110 to +12 dBm	–130 to +12 dBm

Using built in waveforms:

	Standard	V2920A-LAR
Amplitude level range (GSM)	–110 to +6 dBm	–130 to +6 dBm
Amplitude level range (EDGE)	–110 to +6 dBm	–130 to +6 dBm
Amplitude level range (cdma2000)[2]	–110 to +3 dBm	–130 to +3 dBm
Amplitude level range (W-CDMA)[3]	–110 to +4 dBm	–130 to +4 dBm

Amplitude setting resolution: 0.01 dB
Amplitude input units: dBm

Absolute amplitude level accuracy (CW), dB:

Amplitude level setting	Frequency (typical)			
	10 to < 330 MHz	330 MHz to < 3.0 GHz	3.0 to 4.0 GHz	4.0 to 6.0 GHz
Maximum to > –75 dBm	≤ ±0.6 (0.3)	≤ ±0.6 (0.3)	≤ ±0.7 (0.4)	≤ ±0.7 (0.4)
–75 dBm to –110 dBm	≤ ±0.6 (0.3)	≤ ±0.6 (0.3)	≤ ±0.8 (0.4)	≤ ±0.8 (0.4)
V2920A-LAR				
–110 dBm to > –120 dBm	≤ ±0.6 (0.3)	≤ ±1.0 (0.6)	≤ ±1.5 (0.7)	≤ ±1.5 (0.7)
–120 dBm to –125 dBm	≤ ±(0.6)	≤ ±(0.6)	≤ (0.7)	≤ ±(0.7)

User flatness correction max; number of points: 20 (points are amplitude correction and frequency pairs)
Power change over temperature 0 to 50 °C (nominal): 0.02 dB/ °C
Relative amplitude accuracy – linearity[4] (nominal): ≤ ±0.05 dB
Amplitude repeatability[5] (nominal): ≤ ±0.05 dB

Output match – VSWR:

Carrier frequency, Fc	Specification	Typical
10 MHz ≤ Fc ≤ 3.4 GHz	< 1.45:1	< 1.3:1
3.4 GHz < Fc ≤ 6.0 GHz	< 1.60:1	< 1.4:1

Reverse power protection[6]: +35 dBm or 10 VDC
Amplitude switching time: via remote command – after receipt of end of operation indicator (EOI): ≤ 2 ms (nominal);
≤ 1 ms (nominal) using V2920A desktop control panel

1. *Specifications apply when ALC is in auto mode, unless otherwise stated.*
2. *+3 dBm max for Pilot only. +0.5 dBm max for Forward 9 channel.*
3. *+4 dBm max for CPICH only. –1.0 dBm max for Test Model 1 with 16 DPCH.*
4. *Applies for changes in amplitude setting only.*
5. *–110 dBm < P_{out} < P_{max}, CW signal, ALC mode: Auto.*
6. *Up to 50 VDC with optional external DC block, V2999A-DCB.*

V2900A-101 analog modulation signal generation personality license[1]

Frequency modulation:

FM modulation frequency range:	1 Hz to 100 kHz
FM modulation frequency setting resolution:	1 Hz
FM deviation internal sine wave only:	0 Hz to 1 MHz
FM distortion:	< 1.5% (nominal)
Internal modulation waveform types:	sine, ramp up, ramp down, and triangle waves

Amplitude modulation:

AM modulation frequency range:	1 Hz to 100 kHz
AM modulation frequency setting resolution:	1 Hz
AM modulation depth:	0 to 100%
AM distortion[2]:	< 1.5% (nominal)
Internal modulation waveform types:	sine, ramp up, ramp down, and triangle waves

Phase (Φ) modulation:

F modulation frequency range:	1 Hz to 100 kHz
F modulation frequency setting resolution:	1 Hz
F deviation:	0 to 100 radians
F distortion:	< 1.5% (nominal)
Internal modulation waveform type:	sine wave only

Pulse modulation:

PM pulse repetition rate:	1 Hz to 100 kHz	
PM pulse repetition rate setting resolution:	1 Hz	
PM minimum pulse width[3]:	1.2 µs (nominal)	
PM rise/fall time (10 to 90%)[3]:	< 600 ns (nominal)	
PM on-off ratio[4]:	Pulse width	Nominal
	< 5 µs	> 40 dB
	≥ 5 µs	> 100 dB

Two-tone:

Two-tone CW frequency separation settings:	2 Hz to 2 MHz

Noise modulation:

Modulation bandwidth[5]:	1 kHz to 2.5 MHz

V2920A-BBA baseband analog I-Q inputs and outputs option

Baseband analog inputs (nominal)

External IQ input 3 dB bandwidth[6]:

I Channel:	DC to 200 MHz
Q Channel:	DC to 200 MHz
Input impedance (single-ended only):	50 W (nominal), DC coupled, SMB (m) connector
Maximum input V (DC + AC peak)[7]:	±3 V peak damage level

Baseband analog outputs (nominal)

0.2 dB Bandwidth[8]:

I Channel:	DC to 40 MHz
Q Channel:	DC to 40 MHz
Output impedance (single ended only):	50 W (nominal), DC coupled, SMB (m) connector
Full scale output V (DC + AC peak):	±1.0 V peak
Maximum reverse input voltage (damage level):	±1.0 V
IQ offset (DC and quadrature adjustment):	±12.5% of full scale, ±10°
IQ gain:	0 to full scale
Accuracy[9] (typical): carrier suppression:	≤ –60 (–65) dBc
image rejection:	≤ –50 (–55) dBc

1. *Frequency ranges and resolution can be multiplied by up to 40 times with V2920A-BXX license.*
2. *Output power ≤ 0 dBm.*
3. *Can be decreased by up to 40 times with V2920A-BXX license.*
4. *Valid when Pulse Modulation is the only active modulation type. The higher on-off ratio is attained using ARB blanking feature.*
5. *6 dB double sided. Can be increased up to 40 times with V2920A-BXX license.*
6. *23 dB BW. With inputs applied directly to I/Q modulator. User needs to provide correction for I/Q AC and DC amplitude and phase skew and offsets.*
7. *Maximum voltage includes offsets and signal for nominal input of 50 W. Optimal drive voltage is ±0.8 V.*
8. *Into 50 W impedance.*
9. *At the V2920A output ports, 0.5 V peak-to-peak output voltage.*

V2920A-BXX arbitrary waveform generator

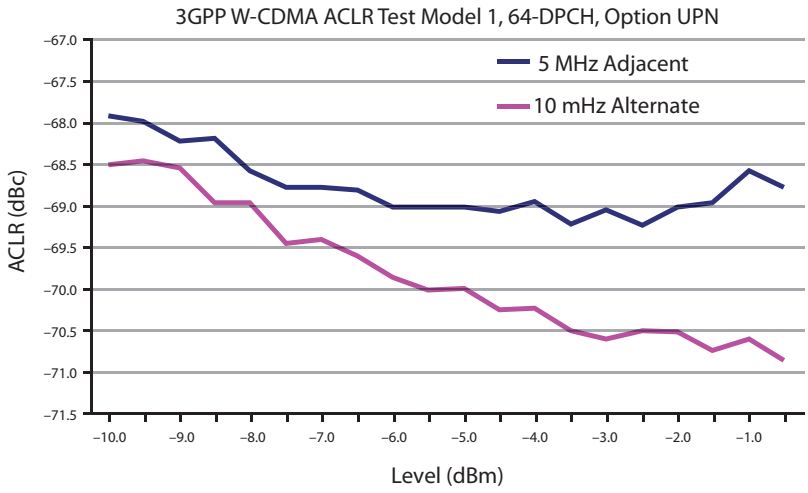
Maximum modulation bandwidth for internal modulation generation:

V2900A-B20:	20 MHz (25 MSa/s)
V2900A-B40:	40 MHz (50 MSa/s)
V2900A-B80:	80 MHz (100 MSa/s)
Waveform memory:	100 megasamples
Minimum segment length:	1000 samples
Maximum segment length:	100 megasamples
Max. number of segments in a sequence:	400 segments
Non-volatile memory:	2 GB

V2900A-105 W-CDMA FDD downlink signal generation personality license

Frequency range:	1800 to 2200 MHz
EVM RMS[1]:	< 0.85% (typical), < 0.75% (nominal)
ACLR[2]:	Adjacent: > 68 dBc (typical), > 70 dBc (nominal)
	Alternate: > 72 dBc (typical), > 73 dBc (nominal)
With V2920A-UPN:	
ACLR[2]:	Adjacent: > 68 dBc (typical), > 70 dBc (nominal)
	Alternate: > 73 dBc (typical), > 73 dBc (nominal)

ACLR versus output power (nominal)[3]



V2900A-104 cdma2000 and IS-95A forward link signal generation personality license

Frequency range:	800 to 900 MHz; 1800 to 1900 MHz
RHO[4]:	> 0.9995 (typical), > 0.9999 (nominal)
ACPR[5]:	Adjacent at 750 kHz: > 70 dBc (typical), > 72 dBc (nominal)
	Adjacent at 885 kHz: > 75 dBc (typical), > 78 dBc (nominal)
	Alternate at 1980 kHz: > 85 dBc (typical), > 90 dBc (nominal)
With V2920A-UPN:	
ACPR[5]:	Adjacent at 750 kHz: > 70 dBc (typical), > 73 dBc (nominal)
	Adjacent at 885 kHz: > 77 dBc (typical), > 83 dBc (nominal)
	Alternate at 1980 kHz: > 87 dBc (typical), > 91 dBc (nominal)

1. *$P_{out} \leq -10$ dBm.*
2. *CPICH only. $P_{out} \leq -1$ dBm. Adjacent spacing 5 MHz offset. Alternate spacing 10 MHz offset.*
3. *Single carrier.*
4. *Pilot only.*
5. *Pilot only. $P_{out} \leq -4$ dBm.*

V2900A-103 GSM, GPRS, EDGE signal generation personality license

Frequency range: 800 to 900 MHz, 1800 to 1900 MHz
EVM for EDGE[1]: < 0.60% RMS (typical), < 0.35% RMS (nominal)
Phase error for GSM[2]: < 0.25 ° RMS (typical), < 0.15 ° RMS (nominal)

ORFS for EDGE (nominal):

	Carrier frequency, Fc	
Frequency offset, kHz	990 MHz P_{out} = +6 dBm	1955 MHz P_{out} = +6 dBm
200	–38 dBc	–38 dBc
400	–69 dBc	–65 dBc
600	–75 dBc	–72 dBc
1200	–82 dBc	–80 dBc
1800	–79 dBc	–79 dBc

ORFS for GSM (nominal):

	Carrier frequency, Fc	
Frequency offset, kHz	990 MHz P_{out} = +6 dBm	1955 MHz P_{out} = +6 dBm
200	–36 dBc	–36 dBc
400	–69 dBc	–65 dBc
600	–77 dBc	–72 dBc
1200	–83 dBc	–81 dBc
1800	–81 dBc	–79 dBc

With V2920A-UPN:
ORFS for EDGE (nominal):

	Carrier frequency, Fc	
Frequency offset, kHz	990 MHz P_{out} = +6 dBm	1955 MHz P_{out} = +6 dBm
200	–38 dBc	–38 dBc
400	–72 dBc	–72 dBc
600	–80 dBc	–80 dBc
1200	–83 dBc	–83 dBc
1800	–80 dBc	–80 dBc

ORFS for GSM (nominal):

	Carrier frequency, Fc	
Frequency offset, kHz	990 MHz P_{out} = +6 dBm	1955 MHz P_{out} = +6 dBm
200	–36 dBc	–36 dBc
400	–71 dBc	–71 dBc
600	–81 dBc	–81 dBc
1200	–85 dBc	–85 dBc
1800	–81 dBc	–81 dBc

1. *Measured at P_{out} = 0 dBm.*
2. *Measured at P_{out} = +4 dBm.*

V2900A-106 GPS signal generation personality license

Carrier frequency: 200 MHz to 2.5 GHz; button provided to set carrier frequency to L1 (1575.42 MHz)
C/A code ID range: 1 through 37; default value = 1
Data pattern:
- Selectable: PN9 (default), PN15, all ones, all zeros, square 1-bit [01] and square 2-bit [0011]
- User defined: pattern from a file, length range of 1 to 37,504 bits
- Default pattern: PN9

Doppler shift range: –10 to +10 kHz; default value = 0 Hz
EVM: 3.5% (nominal)

V2900A-102 flexible digital modulation generation personality license

Common parameters	Common specifications	
Symbol rate	Symbol rate resolution	1 Sps (symbols per second)
	Minimum symbol rate	500 Sps
	Maximum symbol rate	2 MSps for NRZ, Gaussian, and Wideband 25 MSps for RC and RRC
Filters	Filter types	NRZ, RC, RRC, Gaussian, and Wideband
Filter factor	RC, RRC	Ratio is 0.2 to 1.0
	Gaussian	Ratio is 0.2 to 3.0
Symbol format	Differential encoding	on/off
Sequence format	Output inversion	on/off
Data pattern	PRBS	PN5, PN9, PN11, PN15
	Count	Radix
	Alternating 0,1	1–16

Modulation format	Modulation type	Parameter	Specification
ASK	OOK (ASK2), ASK4, SASK2, SASK4	See Common parameters above	See Common specifications above
FSK	FSK2	Frequency separation resolution	1 Hz
		Frequency separation range	0 to 2 × symbol rate in Sps
PSK	BPSK, QPSK, QPSK-p/4, QPSK-3p/4, OQPSK, 8PSK	See Common parameters above	See Common specifications above
QAM	16QAM, 32QAM, 64QAM, 128QAM, 256QAM	See Common parameters above	See Common specifications above

EVM characteristics for V2900A-102[1]

Format	Filter conditions	RMS EVM
QPSK	RRC, a = default (0.35)	≤ 1.5%
16QAM	RRC, a = default (0.35)	≤ 1.5%
FSK	Gaussian BT = 0.7	≤ 1.5%

1. *Characterized at 2.5 GHz and 6.0 GHz. Symbol rates from minimum to maximum. For best results at low symbol rates, use the V2920A external reference hardware lock mode.*

Supplementary nominal values

Signal Generation

		Standard	Signal bandwidth	Frequency band	V2920A
V2900A-202 W-CDMA FDD Uplink & Downlink Signal Generation SignalMeister License V2900A-203 HSPA including HSPA+ Signal Generation SignalMeister License	EVM [1]	W–CDMA downlink		1800–2200 MHz	≤ 0.4%
		W–CDMA uplink		1800–2200 MHz	≤ 0.4%
		HSUPA		1800–2200 MHz	≤ 0.4%
	ACLR [2]	W–CDMA downlink		1800–2200 MHz	Adjacent: < –68 dBc
					Alternate: < –75 dBc
		W–CDMA uplink		1800–2200 MHz	Adjacent: < –66 dBc
					Alternate: < –76 dBc
		HSUPA		1800–2200 MHz	Adjacent: < –64 dBc
					Alternate: < –76 dBc
V2900A-201 cdma2000 & 1xEV-DV for Reverse Link Signal Generation SignalMeister License	RHO [3] (ρ)	cdma2000 forward link		800–2025 MHz	≥ 0.9999
		cdma2000 reverse link		800–2025 MHz	≥ 0.9998
	ACLR [4]	cdma2000 forward link		800–900 MHz	Adjacent: < –78 dBc
					Alternate: <–90 dBc
				1800–1900 MHz	Adjacent: < –74 dBc
					Alternate: < –88 dBc
				1900–2025 MHz	Adjacent: < –73 dBc
					Alternate: < –87 dBc
		cdma2000 reverse link		800–900 MHz	Adjacent: < –80 dBc
					Alternate: < –91 dBc
				1800–1900 MHz	Adjacent: < –76 dBc
					Alternate: < –88 dBc
				1900–2025 MHz	Adjacent: < –75 dBc
					Alternate: < –88 dBc
V2900A-205 802.11a-b-g-j WLAN Signal Generation SignalMeister License	EVM [5,6]	802.11a		5150–5825 MHz	≤ –41 dB
		802.11b		2400–2500 MHz	≤ –38 dB
		802.11g		2400–2500 MHz	≤ –42 dB
		802.11j		4900–5000 MHz	≤ –41 dB
	ACP–Adjacent [5, 6]	802.11a		5150–5825 MHz	≤ –45 dBc
		802.11b		2400–2500 MHz	≤ –36 dBc
		802.11g		2400–2500 MHz	≤ –45 dBc
		802.11j		4900–5000 MHz	≤ –55 dBc
V2900A–206 802.11n WLAN Signal Generation SignalMeister License	EVM [7, 8] (standard phase noise)	802.11n	20 MHz	2400 MHz	< –41 dB
				3500 MHz	< –41 dB
			40 MHz	5800 MHz	< –37 dB
	EVM [7, 8] (V2920A-UPN)		20 MHz	2400 MHz	< –48 dB
				5800 MHz	< –45 dB
			40 MHz	5800 MHz	< –43 dB
V2920A-208 802.16e-2005 mobile WiMAX and WiBro Signal Generation SignalMeister license	Residual RCE [9, 10]	802.16e-2005		2300–2690 MHz	≤ –45 dB
				3400–3800 MHz	≤ –44 dB
				4000–4999 MHz	≤ –44 dB
				5150–5825 MHz	≤ –43 dB

1. *RF Amplitude setting: +3 dB. CPICH only.*
2. *RF Amplitude setting : –3 dBm. CPICH only. Adjacent spacing 5 MHz offset. Alternate spacing 10 MHz offset.*
3. *RF Amplitude setting: +3 dB. Pilot only.*
4. *RF Amplitude setting : –1 dBm. Pilot only. Adjacent spacing 750 kHz offset. Alternate spacing 1.98 MHz offset.*
5. *RF amplitude: –1 dBm (for V2920A EVM and all ACP data).*
6. *Signal characteristics: 802.11b: 11 Mbps, 50% duty cycle, Gaussian filter; 802.11a,g: 54 Mbps, 50% duty cycle, 20 MHz bandwidth, Bartlett filter; 802.11j: 27 Mbps, 90% duty cycle, 10 MHz, Bartlett filter.*
7. *RF amplitude : –1 dBm.*
8. *Signal characteristics: 64 QAM modulation, MCS 7, 95% duty cycle, mixed–mode, Bartlett filter.*
9. *RF amplitude setting : –2 dBm.*
10. *Signal Characteristics: DL subframe, 10 MHz bandwidth, 1024 sub–carrier FFT, ⅛, 30 symbol Guard Period, PN9 data.*

Trigger and synchronization inputs and outputs

Trigger modes:
- Free run
- Trigger sweeps in sweep or list mode
- Trigger a sweep or list
- Trigger start of arb waveform

Arb sequence trigger modes:
- Stepping only
- Start and step

Trigger sources:
- SCPI or rear panel trigger
- Rising edge of external TTL input
- Falling edge of external TTL input

External trigger characteristics:
- Minimum input pulse width required: 50 ns (nominal)
- Trigger repeatability: ±10 ns

Trigger delay: 0 to 1 s

Sync output modes:

Generate a sync pulse:
- Never (off)
- On arb waveform wrap
- At beginning of sweep, list, or sequence
- At end of each step in sweep, list, or sequence
- At end of dwell in sweep, list, or sequence
- At end of sweep, list, or sequence

Sync output polarity select:
- Sync out is on rising edge
- Sync out is on falling edge

Sync output characteristics: 3.3 V CMOS, SMV (m); minimum pulse width 200 ns

Even second clock input: external even second clock. 3.3 V CMOS, SMB (m)

Even second clock output: external even second clock. 3.3 V CMOS, SMB (m)

General specifications

Power: 100 to 240 VAC; 50/60 Hz (automatically detected); 175 VA max
CE EMC compliance: compliant with the European Union EMC Directive
CE safety compliance: compliant with the European Union Low Voltage Directive

Recommended calibration interval: 1 year

Environment (for indoor use only):
- 18 to 28 °C specified operating, unless otherwise noted
- 0 to 50 °C operating survival, non-specified operation
- –25 to 65 °C non-operating (AC power off) storage
- Altitude: maximum 2000 meters above sea level
- Cooling: forced air top, bottom, and side intakes and rear exhaust. For proper cooling in a rack, use rack mount kit V2920A-1CM

Digital inputs/outputs: 4 bits, TTL-compatible

Interfaces:
- IEEE-488.1 compliant; supports IEEE-488.2-common commands and status model topology
- LAN: 10/100BT Ethernet, RJ45, LXI Class C, no auto MDIX
- IVI-COM
- USB: USB full speed
  - B-style connector (“FROM HOST”) is USB 2.0 compliant
  - All A-style connectors are USB 1.1 compliant
- Supports V3500A in pass-through mode via USB
- RF out: Type N connector

Mechanical vibration and shock:
- MIL-PRF-28800F CL3 random vibration, 3 axes
- Sine-sweep test for resonances, 3 axes
- MIL-STD-810F 516.5 paragraph 4.5.7, procedure VI, bench handling

Dimensions, weight:
- Height: 3U (133 mm) (5.25 in.)
- Width: Half-rack (213 mm) (8.4 in.)
- Depth: 464 mm (18.25 in.)
- Weight: 9.3 kg (20.5 lb)

Ordering Information

V2920A RF vector signal generator

V2920A-504 RF vector signal generator 10 MHz to 4 GHz
V2920A-506 RF vector signal generator 10 MHz to 6 GHz

RF connector options

V2920A-FPC front RF input connector
V2920A-RPC rear RF input connector

Performance improvement options

V2920A-UPN generator ultra low phase noise option
V2920A-LAR low amplitude range
V2920A-BBA baseband analog IQ inputs and outputs

Signal generation personality licenses

V2900A-101 flexible analog modulation signal generation personality license
V2900A-102 flexible digital modulation signal generation personality license
V2900A-103 GSM, GPRS, EDGE signal generation personality license
V2900A-104 cdma2000 and IS-95A forward link signal generation personality license
V2900A-105 W-CDMA FDD downlink signal generation personality license
V2900A-106 GPS signal generation personality license
V2900A-107 GSM signal generation license

Signal generation software licenses[1]

V2900A-201 cdma2000 & 1xEV-DV for reverse link signal generation SignalMeister license
V2900A-202 W-CDMA FDD uplink & downlink signal generation SignalMeister license
V2900A-203 HSPA including HSPA+ signal generation SignalMeister license
V2900A-204 3GPP channel model signal generation SignalMeister license
V2900A-205[2] 802.11a-b-g-j WLAN signal generation SignalMeister license
V2900A-206[2] 802.11n WLAN signal generation SignalMeister license
V2900A-207 WLAN channel model signal generation SignalMeister license
V2900A-208[2] 802.16e-2005 mobile WiMAX & WiBro signal generation SignalMeister license
V2900A-209 WiMAX channel model signal generation SignalMeister license
V2900A-213 DVB-H and DVB-T signal generation SignalMeister license

1. *A software license is required in the V2920A RF vector signal generator in order to play SignalMeister waveform files of the applicable signal type.*
2. *The V2900A-205, V2900A-206, and V2900A-208 require the V2920A-B40 or V2920A-B80 arbitrary waveform generator license.*

Accessories supplied

AC power cable
Printed quick start guide
CD-ROM containing V2920A VSG system help, V2920A desktop control panel program, SignalMeister integrated RF signal analysis and generation toolkit, utility programs, and PDF files (also available on-line at **www.agilent.com.find/V2920A**)
on-board, context sensitive help system
Contact your local Agilent sales representative for the latest information on new personalities and software.

Accessories available

V2999A-BTK additional benchtop kit, handle, and front-rear sleeve
V2999A-1CM additional rack mount kit for 1 or 2 instruments
V2999A-ADK RF Cable and adapter accessory kit
V2999A-DCB external RF-DC block module

Services available

R-51B-001-C return to Agilent warranty – 1 year
R-51B-001-3C return to Agilent warranty – 3 years
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R-50C-011-3 Agilent calibration – 3 years

For more information about the V2920A, visit the website at: **www.agilent.com/find/V2920A**

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Published in USA, November 22, 2013
5990-5496EN

Agilent Technologies