The Model 2920 RF Vector Signal Generator is a mid-performance test instrument designed for R&D and production testing of modern RF communications equipment and devices. This next-generation instrument combines state-of-the-art RF and digital signal processing (DSP) technology to generate RF test signals with high accuracy and excellent repeatability. It also switches frequency, amplitude, or modulation type extremely rapidly. Its compact half-rack enclosure and competitive pricing make it a cost-effective solution for many test applications. The Model 2920 simplifies testing mobile phones and other wireless devices economically, by generating signals compatible with an array of RF communications standards. Today’s mobile phones are designed to connect to more types of devices than ever before, so they must integrate with a growing number of wireless standards.

The instrument’s Windows CE® operating system and intuitive graphical user interface allow users their choice of operating it via the touch-screen user interface, the front panel controls, or with a mouse. GPIB, USB, and 100Base-T Ethernet LAN ports offer a variety of options for connecting to a PC; it is LXI Class C compliant, so it’s equally easy to connect to an internal network or the Internet. Tests can be created by developing scripts using SCPI (Standard Commands for Programmable Instrumentation) commands, with IVI-COM or IVI-C drivers, or by assembling LabVIEW® building blocks.
RF Vector Signal Generator
10MHz to 4GHz or 6GHz

Innovative Architecture
The Model 2920’s Software-Defined Radio (SDR) architecture generates virtually any RF signal with up to 80MHz of modulation bandwidth, without the need for a hardware upgrade. This broad bandwidth provides exceptional flexibility in R&D and production testing and reduces capital equipment costs for producing signal types currently used in testing requirements and those that will be needed in the future.

Signal waveforms are downloaded into the Model 2920’s arbitrary waveform generator (ARB) memory, then processed with the high speed DSP. With this approach, the RF signal is defined through software by the I-Q data of the waveform. Multiple waveforms can be stored in the large ARB memory. The DSP can switch rapidly between waveforms for processing.

The Model 2920’s 200MHz fixed-rate dual-DAC (Digital-to-Analog Converter) helps ensure high signal integrity, which is optimized with a fixed-bandwidth, brick-wall, anti-alias filter. The Digital Up/Down Converter (DUC/DDC) compresses and decompresses waveforms to conserve RAM space and eliminates the need to switch in different anti-alias filters, which speeds signal processing. A Field Programmable Gate Array (FPGA) allows for fast triggering and high speed signal routing.

The key components of the Model 2920’s DSP-based software-defined radio architecture are optimized for high accuracy and fast test throughput while reducing instrument cost and rack space requirements.
RF Vector Signal Generator
10MHz to 4GHz or 6GHz

Get the Flexibility of Three Powerful Operating Modes

Keithley’s Series 2900 RF Vector Signal Generators and Series 2800 RF Vector Signal Analyzers are engineered for operating versatility. Use built-in applications or download I-Q waveform data from a connected PC and upload signal waveforms.

1. Multi-Purpose – The Model 2920 can generate continuous wave (CW) signals and sweep the frequency and amplitude of RF signals. Choose the Model 2900-ALG Flexible Analog Modulation personality option to create traditional signals such as AM, FM, PM, pulsed RF, AWG noise, and even two-tone signals. The Model 2900-DIG Flexible Digital Modulation option generates signals with ASK, FSK, PSK, and QAM symbol types.

2. Embedded Radio-Specific Capability – The Model 2920 offers software measurement options for testing cellular standards such as GSM, EDGE, W-CDMA FDD, cdmaOne, and cdma2000. The Model 2900-GPS option simulates the coded L1 signal of a Global Positioning System satellite with a variety of data types, including an external user file with up to 37,504 bits (12.5 minutes) of navigation data.

SERVICES AVAILABLE
2920-3Y-EW 1-year factory warranty extended to 3 years from date of shipment
C/2920-3Y-DATA 3 (Z540-1 compliant) calibrations within 3 years of purchase*

* Not available in all countries
Use the Model 2900-GSM option’s waveform edit menu to select the channel type and data type for each time slot.

3. User-Defined Capability – The Model 2920-ARB option provides ARB (arbitrary waveform generator) options with up to 80MHz bandwidth. The ARB includes a 100-megasample memory to hold large waveforms or many waveforms, which the instrument can switch between quickly and easily. Custom I-Q data files can be downloaded into the signal generator’s ARB memory through GPIB, USB, or LAN interfaces. Waveform creation of virtually any signal is possible with PC-based software such as MATLAB and LabVIEW.

The Model 2900-ARB-xx Arbitrary Waveform Generator option provides 100 megasamples (100MS) of memory for storage of large waveforms or multiple waveforms with up to 80MHz signal bandwidth.

**SignalMeister™ Waveform Creation Software**

The Model 290101 SignalMeister Waveform Creation Software is a PC-based software tool for creating ARB files designed to run flawlessly on any of Keithley’s RF vector signal generators. An intuitive graphical user interface allows you to define signal parameter values and provides a common tool set for adding signal impairments to waveforms, such as Gaussian white noise. A common user interface is designed to be used with multiple signal formats as they become available. The software is included on the documentation CD provided with the instrument or can be downloaded from Keithley’s website at www.keithley.com.

Create waveform files off-line on a PC with Keithley’s free SignalMeister waveform creation software, then download them to the ARB memory of any Keithley Series 2900 RF Vector Signal Generator.

**Superior Signal Generation Accuracy and Repeatability**

The Model 2920’s RF output circuitry is designed to combine simplicity with high performance. High measurement accuracy and repeatability provide confidence in product quality. It allows minimizing measurement guard bands in production test applications, which helps increase product yields. Significant signal generation performance specifications include:

- Absolute amplitude accuracy of ±0.6dB (typically ±0.3dB) from -110dBm to +13dBm up to 3GHz
- ±0.05dB relative amplitude accuracy (linearity)
- ±0.05dB (typically ±0.01dB) amplitude repeatability
- 0.015dB/°C temperature stability
RF Vector Signal Generator
10MHz to 4GHz or 6GHz

Ultra-fast Signal Generation
The Model 2920 generates virtually any signal types up to 80MHz bandwidth at high speed without compromising their accuracy, whether switching between these signals, changing signal frequency, or changing signal amplitude. The built-in high speed DSP controls the instrument hardware and runs measurement programs such as List mode, Sweep mode, and ARB sequencing. Flexible trigger and synchronization choices further enhance the Model 2920’s speed.

The Model 2920’s trigger input and sync output connections simplify synchronizing its operation with other test instruments, such as Keithley Series 2800 RF Signal Analyzers, in high speed measurement applications.

Switching from one waveform stored in the Model 2920’s ARB memory to another takes just 3ms under GPIB control or is instantaneous in the ARB Sequence mode. In this example, the waveform sampler moves from the last point of an ARB waveform to the first point of the next waveform within a single clock cycle. The ARB waveforms can be “played” in any order or pattern desired, providing added flexibility for measurement speed enhancement.

The Model 2920’s RF circuitry, like its measurement circuitry, was optimized for speed without accuracy compromises. The RF Output section employs a patent-pending DDS (Direct Digital Synthesis) synthesizer design to switch frequencies in 1.3ms using List or Sweep modes and in 3ms using a remote SCPI command via GPIB.

When using the List or Sweep modes, the instrument’s amplitude switching time is 1.6ms, which overlaps the frequency tune time when both are changed. Fast-tracking ALC (Automatic Level Control) circuitry and an electronic attenuator make this fast amplitude switching possible. This hardware approach has the added benefit of superior measurement repeatability over millions of cycles in production environments, unlike relatively slow mechanical attenuators, which gradually degrade after a few thousand cycles.

Optimized for High Speed Production Test
Our instruments can be configured into sophisticated test systems that dramatically reduce device test times and lower capital costs compared to traditional rack-and-stack test systems. They are designed for demanding system applications requiring ultra-fast test times and accurate, repeatable measurements. Test script control and intra-instrument triggering work in cooperation to minimize bus traffic from the PC controller. Keithley’s RF test systems have reduced test times by up to 70% in RFIC production applications. Using smart instruments instead of test modules also reduces the engineering time for system test integration. This lowers schedule risk and has greater flexibility to reconfigure the system quickly to transition new devices and equipment into production.

MIMO Test Systems
The Model 2920 is MIMO-ready to meet the requirements of the next-generation 802.11n WiFi and 802.16e WiMAX technologies. With the addition of a Model 2895 MIMO Synchronization Unit, multiple Model 2920s can be configured into ×2, ×3, or ×4 multi-output test systems. The synchronization unit distributes a common LO (local oscillator), common clock, and precise trigger to all the signal generators in the system, creating a MIMO test system with precise synchronization and low jitter between each of the signal generator outputs of the RF carrier and ARB waveform sampler.
Through the use of test script control and intra-instrument triggering, this Model 2920-based RF power amplifier test system can reduce test times by up to 70%.

This 4×4 MIMO test system ensures precise synchronization and low jitter when testing WiFi, WiMAX, and other MIMO devices and equipment.
2920 RF Vector Signal Generator
10MHz to 4GHz or 6GHz
Modes of Operation

**STANDARD MODE**: CW Signal Generator.

**OPTIONAL MODES**: Analog modulation, Digital modulation.

- GSM-GPRS-EDGE, cdmaOne-cdma2000 reverse link, W-CDMA downlink, GPS (all require ARB option).
- Arbitrary Waveform modulation (ARB).

Note: All items are Specifications unless otherwise noted.

### Frequency

**FREQUENCY RANGE**: 2920-004: 10MHz to 4.0GHz
2920-006: 10MHz to 6.0GHz

**FREQUENCY INPUT UNITS**: Hz, kHz, MHz, GHz.

**FREQUENCY SETTING RESOLUTION**: 0.1Hz.

**FREQUENCY ACCURACY**: Same as frequency reference + synthesizer resolution term.

**FREQUENCY SWITCHING TIME**: ≤1.6ms (modulation off), ≤1.8ms (modulation on), ≤3.0ms (characteristic).

**INTERNAL FREQUENCY REFERENCE**

**AGING RATE**: ≤1ppm per year.

**TEMPERATURE STABILITY**: ≤0.2ppm.

**FREQUENCY REFERENCE OUTPUT**

**IMPEDANCE**: 50Ω (characteristic), AC coupled.

**REF OUTPUT SIGNAL**: 10MHz, +5dBm ±3dB (characteristic).

**EXTERNAL FREQUENCY REFERENCE INPUT**

**FREQUENCY LOCK RANGE**: Hardware Lock Mode: 10MHz ±10Hz (1 ppm).

**AMPLITUDE LOCK RANGE**: +5 to +15dBm.

**IMPEDANCE**: 50Ω (characteristic).

**SPECTRAL PURITY**

**SSB PHASE NOISE, dBc/Hz**: 20kHz OFFSET

<table>
<thead>
<tr>
<th>Carrier Frequency, GHz</th>
<th>Specification (characteristic) at Offset Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>≤ –127 (+130) ≤ –125 (+128) ≤ –125 (+129) ≤ –125 (+134) ≤ –125 (+144) ≤ –125 (+145)</td>
</tr>
<tr>
<td>1.0</td>
<td>≤ –121 (+125) ≤ –119 (+122) ≤ –129 (+134) ≤ –133 (+146) ≤ –136 (+147) ≤ –136 (+148)</td>
</tr>
<tr>
<td>2.0</td>
<td>≤ –115 (+118) ≤ –113 (+116) ≤ –125 (+128) ≤ –144 (+147)</td>
</tr>
<tr>
<td>3.0</td>
<td>≤ –112 (+116) ≤ –110 (+114) ≤ –121 (+124) ≤ –145 (+148)</td>
</tr>
<tr>
<td>4.0</td>
<td>≤ –109 (+113) ≤ –107 (+110) ≤ –117 (+122) ≤ –159 (+144)</td>
</tr>
<tr>
<td>6.0</td>
<td>≤ –106 (+110) ≤ –104 (+108) ≤ –115 (+118) ≤ –136 (+140)</td>
</tr>
</tbody>
</table>

**HARMONICS AND SUB-HARMONICS**

<table>
<thead>
<tr>
<th>Fundamental Frequency</th>
<th>Harmonics (typical)</th>
<th>Sub-Harmonics (typical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to &lt;20 MHz</td>
<td>≤ –25 dBc</td>
<td>Not applicable</td>
</tr>
<tr>
<td>20 MHz to &lt;40 GHz</td>
<td>≤ –30 dBc</td>
<td>≤ –40 dBc</td>
</tr>
<tr>
<td>4.0 GHz to 6.0 GHz</td>
<td>≤ –40 dBc</td>
<td>≤ –60 dBc</td>
</tr>
</tbody>
</table>

**NON-HARMONIC SPURIOUS**

<table>
<thead>
<tr>
<th>Fundamental Frequency</th>
<th>Specification (characteristic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to &lt;400 MHz</td>
<td>≤ –55 dBc</td>
</tr>
<tr>
<td>400 MHz to &lt;2.5 GHz</td>
<td>≤ –55 dBc</td>
</tr>
<tr>
<td>2.5 GHz to 6.0 GHz</td>
<td>≤ –55 dBc</td>
</tr>
</tbody>
</table>

### FREQUENCY NOTES

1. Over-range operation is provided from 0.5MHz to 10MHz. Performance below 10MHz is not specified.
2. Over-range operation is provided from 0.5MHz to 10MHz and 6.0GHz to 6.9GHz. Performance below 10MHz and above 6.0GHz is not specified.
3. synthesizer resolution term: ≤5µHz.
4. To within 0.1ppm of final value. List mode or swept mode. Free run or hardware trigger. ALC Off. Modulation On or Off.
5. To within 0.1ppm of final value. Via remote command after receipt of end-of-operation indicator (EOI). ALC Off. Modulation On or Off.
6. Total variation from 0º to 50ºC ambient temperature range.
7. Factory preset setting.
8. On 10Hz boundaries Freq = 1MHz + n · 10Hz. Reference accuracy: ≤±1ppm. Sine or square wave inputs acceptable. Lock time may be up to 30 seconds.
9. For optimum phase noise performance use hardware lock mode and 0dBm < P < +10dBm.
10. Specifications apply to harmonic and sub-harmonic responses within the specified operating range of the instrument.
11. Measured at 0dBm.
12. Offset from carrier >10kHz, P = 0dBm and Modulation off. Specifications apply to harmonic responses within the specified operating range of the instrument.

**2920-LPN Low Phase Noise Option**

**SSB PHASE NOISE, dBc/Hz**

<table>
<thead>
<tr>
<th>Carrier Frequency, GHz</th>
<th>Specification (characteristic) at Offset Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>≤ –127 (+130) ≤ –125 (+128) ≤ –125 (+129) ≤ –125 (+134) ≤ –125 (+144) ≤ –125 (+145)</td>
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<td>≤ –106 (+110) ≤ –104 (+108) ≤ –115 (+118) ≤ –135 (+140)</td>
</tr>
</tbody>
</table>

**Spectral Purity Plot**

- Offset Frequency (kHz)
- SSB Phase Noise (dBc/Hz)

**2920 Data Sheet**

**Model 2920 specifications**

**RF/MICROWAVE**

**www.keithley.com**

**A GREATER MEASURE OF CONFIDENCE**
10MHz to 4GHz or 6GHz

**List and Step Sweep Modes**

- **FREQUENCY SWEEP**: Start Freq., Stop Freq., Number of Steps and Dwell Time.
- **AMPLITUDE SWEEP**: Start Power, Stop Power, Number of Steps and Dwell Time.
- **Dwell Time Range**: 0 to 1 second.
- **Power Change over Temperature**: 
  - 0 to 50°C: 0.015dB/°C. 
  - -110 to +6dBm: ≤ ±0.6(0.3)

**2920-BBIQ-A**

**Baseband Analog I-Q Inputs and Outputs Option**

- **BASEBAND ANALOG INPUTS**
  - External I-Q Input: 3dB bandwidth: 1 channel: (200MHz). Q channel: (200MHz).
  - Input Impedance (single ended only): 50Ω (characteristic), DC coupled, SMB (m) connector.
  - Maximum Input (DC + AC peak): ±1V peak.
- **BASEBAND ANALOG OUTPUTS**
  - 0.2dB Bandwidth: 1 channel: (40MHz), Q channel: (40MHz).
  - Output Impedance (single ended only): 50Ω (characteristic), DC coupled, SMB (m) connector.
  - Maximum Output (DC+AC) Peak: ±1.0V peak.
  - IQ Offset (DC+Phase): ±12.5% of full scale, ±10°.
  - IQ Gain: 0 to full scale.

**NOTES**

1. 3dB bandwidth. Inputs applied directly to I-Q modulator. Optimal drive voltage is ±0.8V.
2. ±12.5%±10°.
3. Arbitrary waveform Generator.

**2900-ARB-xx: Arbitrary Waveform Generator**

- **Maximum Modulation Bandwidth Internal Modulation Generation**
  - (<1dB flatness):
    - 2900-ARB-20: 20MHz.
    - 2900-ARB-40: 40MHz.
    - 2900-ARB-80: 80MHz.
- **Waveform Memory**: 100 Samples in 400 MB of memory.
- **Minimum Segment Length**: 100 samples.
- **Maximum Segment Length**: 1000 Samples.
- **Maximum Number of Segments**: 1,000.
- **Maximum Number of Segments in a Sequence**: 400.

**NOTES**

- For sampling rates (Fs) ≤ 100Ms/s, 1000 samples minimum for Fs > 100Ms/s.

**AMPLITUDE NOTES**

1. Specifications apply when in auto-coupled mode unless otherwise stated.
2. +3dBm max. for Pilot channel. +1 dBm max. for Forward 9 channel.
3. +4dBm max. for CPICH only. +10 dBm max. for Test Model 1 with 16 DPCCH.
4. –110dBm < Pout < +2dBm, modulation Off.
5. –110dBm < Pout < +2dBm, ALC mode = fast, modulation Off.
6. To within ±0.05dB for power changes that cross Pmax = 11dB.
7. Free run or hardware trigger, ALC Off.
8. ALC Off, modulation On or Off.
9. ALC mode = auto (Sample and hold mode for Modulation On. Fast mode modulation Off.)
10. Up to 50VDC with optional external DC block Keithley part number 2910-DCBLOCK.

**RF/MICROWAVE**

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RF Vector Signal Generator
10MHz to 4GHz or 6GHz

2900-GPS: GPS Signal Generation Personality

CARRIER FREQUENCY: 200MHz to 2.5GHz. Button provided to set carrier frequency to L1 (1575.42MHz).
CA 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] and
User Defined: Pattern from a file, length range of 1 to 57,504 bits. Default Pattern = PN9.
DOPPLER SHIFT RANGE: –10kHz to +10kHz, default value = 0Hz.
EVM: 3.5% (characteristic).

2900-ALG: Flexible Analog Modulation Personality¹

AMPLITUDE MODULATION
MODULATION FREQUENCY RANGE: 1Hz to 100kHz.
MODULATION FREQUENCY RESOLUTION: 1Hz.
MODULATION DEPTH RANGE: 0 to 100%.
MODULATION WAVEFORM: Internal sine wave, triangle wave, or up/down ramp.
AM DISTORTION: <1.0% (characteristic).

FREQUENCY MODULATION
MODULATION FREQUENCY RANGE: 1Hz to 100kHz.
MODULATION FREQUENCY RESOLUTION: 1Hz.
MODULATION DEVIATION RANGE: 0Hz to 1MHz.
MODULATION WAVEFORM: Internal sine wave, triangle wave, or up/down ramp.
FM DISTORTION: <1.5% (characteristic).

PHASE MODULATION
MODULATION FREQUENCY RANGE: 1Hz to 100kHz.
MODULATION FREQUENCY RESOLUTION: 1Hz.
MODULATION DEVIATION RANGE: 0 to 100 radians.
MODULATION WAVEFORM: Internal sine wave.
ΦM DISTORTION: <1.5% (characteristic).

PULSE MODULATION
PULSE REPEITION RATE RANGE: 1Hz to 100kHz.
PULSE REPEITION RATE RESOLUTION: 1Hz.
MINIMUM PULSE WIDTH: 1.2µs.
ON-OFF RATIO: >50dB (characteristic), pulse width <50µs.
>100dB (characteristic), pulse width ≥50µs.
RISE/FALL TIME (10% to 90%): <600ns (characteristic), pulse width <5µs.
<2µs (characteristic), pulse width ≥50µs

TWO-TONE
TWO-TONE CW FREQUENCY SEPARATION RANGE: 2Hz to 80MHz.
TWO-TONE CW 3rd ORDER INTERMODULATION: <–6dBc (characteristic).
TWO-TONE CW CARRIER FEED-THROUGH: <–6dBc (characteristic).

NOISE MODULATION
NOISE BANDWIDTH RANGE: 1kHz to 2.5MHz.

NOTES
1. All 2900-ALG analog modulation frequency ranges and pulse repetition rates can be increased
   up to 20 times by storing the waveforms and up-sampling if option 2900-ARB-xx is installed.
2. Valid when Pulse Modulation is the only active modulation type.
3. Relative to power of fundamental tones at Pout = 0dBm.
4. 6dB double-side-d.

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2900-WCDMA: W-CDMA FDD Downlink Signal Generation Personality

FREQUENCY RANGE: 1.8 to 2GHz.
EVM: <0.8% RMS (typical).
ACP : Adjacent: <-6dBc (typical), <-6dBc (characteristic).
Alternate: <-7dBc (typical), <-7dBc (characteristic).

NOTES
1. CPICH only. Adjacent spacing 5MHz offset. Alternate spacing 10MHz offset.

2900-GSM: GSM-GPRS-EDGE Signal Generation Personality

FREQUENCY RANGE: 800 to 900MHz and 1800 to 1900MHz.
PHASE ERROR FOR GSM: <0.2° RMS (typical), <0.15° RMS (characteristic).
EVM FOR EDGE: <0.35% RMS (typical), <0.20% RMS (characteristic).
ORFS FOR GSM (characteristic): ¹

<table>
<thead>
<tr>
<th>Frequency Offset, kHz</th>
<th>1GHz Pout = 0dBm</th>
<th>400MHz to 2.5GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>&lt; –36 dBc</td>
<td>&lt; –35 dBc</td>
</tr>
<tr>
<td>400</td>
<td>&lt; –36 dBc</td>
<td>&lt; –35 dBc</td>
</tr>
<tr>
<td>600</td>
<td>&lt; –75 dBc</td>
<td>&lt; –76 dBc</td>
</tr>
</tbody>
</table>

ORFS FOR EDGE (characteristic): ¹

<table>
<thead>
<tr>
<th>Frequency Offset, kHz</th>
<th>1GHz Pout = 0dBm</th>
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</tr>
<tr>
<td>400</td>
<td>&lt; –36 dBc</td>
<td>&lt; –35 dBc</td>
</tr>
<tr>
<td>600</td>
<td>&lt; –75 dBc</td>
<td>&lt; –76 dBc</td>
</tr>
</tbody>
</table>

2900-TDSCDMA-PC: SignalMeister™ License for TD-SCDMA

FREQUENCY RANGE: 800 to 900MHz and 1850 to 2025MHz.
CHANNELS:
Physical: DwPCH, UpPCH, P-CPCH, S-CCPCH, FPACH, PICH, PRACH, PUSCH, PDSCH, DPCH, DPDCH.
Transport: BCH, DCH, RACH.
MODULATION ACCURACY: EVM: <0.3%. ACP: <–6dBc.
**2900-DIG: Flexible Digital Modulation Signal Generation Personality**

**FORMATS:** 8-PSK, 128QAM, 256QAM.

**SYMBOL RATE:**
- Symbol Rate Resolution: 1sp (Symbols per second).
- Minimum Symbol Rate: 500sp.
- Maximum Symbol Rate: 2MSps for NRZ, Gaussian, and Wideband, 12.5MSps for RC and RBC.

**FILTERS:** Filter Types: NRZ, RC, RBC, Gaussian and Wideband.

**FILTER FACTOR:**
- RC, RBC: 0.2 to 1.0. Gaussian: 0.1 to 2.0.

**SYMBOL FORMAT:**
- Differential Encoding, On/Off.

**SEQUENCE FORMAT:** Output Inversion, On/Off.

**DATA PATTERN:** PRBS: PN5, PN9, PN11, PN15 Count: Radix. Alternating 0: 1–16.

**EVM:**
- QPSK, QAM Filter, α = 0.35: <1.5% RMS (characteristic).
- 16 QAM, RQAM Filter, α = 0.35: <1.5% RMS (characteristic).
- FSK, Gaussian Filter, BT = 0.7: <1.7% RMS (characteristic).

<table>
<thead>
<tr>
<th>Modulation Format</th>
<th>Modulation Type</th>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK</td>
<td>OOK (ASK2), ASK4, SASK2, SASK4</td>
<td>See Common</td>
<td>See Common Specifications</td>
</tr>
<tr>
<td>FSK</td>
<td>FSK2</td>
<td>Frequency Separation</td>
<td>Resolution 1 Hz</td>
</tr>
<tr>
<td>PSK</td>
<td>BPSK, QPSK, QPSK-N/4, QPSK-3N/4, QOQPSK, RBSK</td>
<td>See Common Parameters</td>
<td>See Common Specifications</td>
</tr>
<tr>
<td>QAM</td>
<td>QAM 16, QAM 32, QAM 64, QAM 128, QAM 256</td>
<td>See Common Parameters</td>
<td>See Common Specifications</td>
</tr>
</tbody>
</table>

**Supplementary Characteristics**

EVM (802.11n WLAN, 20MHz and 40MHz Bandwidth, 64QAM Signal): 2.4 and 5.8GHz: <=-11dB. 58GHz: <=-7dB.

**Trigger and Synchronization Inputs and Outputs**

**TRIGGER MODES:** Free Run
- Trigger steps in Sweep or List mode
- Trigger a sweep or list
- Trigger start of ARB waveform
- Bus
- BUS arm using external trigger

**TRIGGER DELAY RANGE:** 0 to 1 second.

**TRIGGER SOURCE:** SCI, front panel trigger
- Rising edge of external TTL input
- Falling edge of external TTL input
- 50ns minimum input pulse width (characteristic)
- Trigger repeatability ≤1ns (characteristic)

**SYNC OUTPUT MODES:** Generate a sync pulse: Off (never)
- On ARB waveform wrap
- At end of each step in List or Sweep mode
- At beginning of each sweep or list
- At end of each sweep or list

**SYNC OUTPUT POLARITY SELECT:** Rising or falling edge

**SYNC OUTPUT:** TTL level, 3.3V CMOS, SMB(m): 200ns minimum pulse width (characteristic).

**EVEN SECOND CLOCK INPUT:** External even second clock (TTL), 3.3V CMOS, SMB(m).

**EVEN SECOND CLOCK OUTPUT:** External even second clock (TTL), 3.3V CMOS, SMB(m).

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**2920**

**RF Vector Signal Generator**

10MHz to 4GHz or 6GHz

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**GENERAL SPECIFICATIONS**

**POWER:** 100VAC to 240VAC, 50-60Hz (automatically detected), 175VA max.

**CE EMC COMPLIANCE:** EU Directive 89/336/EEC, EN 61326-1.


**CALIBRATION:** 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: 2000 meters above sea level maximum specified operating.
- Cooling: Forced air top, bottom, and side intakes and rear exhaust. For proper cooling in a rack, use Keithley Instruments 2890-RK Rack Mount Kit.

**DIGITAL INPUTS/OUTPUTS:** 4 bits, TTL-compatible.

**INTERFACES:**
- LAN: 10/100BT Ethernet, RJ45, LXI Class C, no auto MDIX.
- iVi-COM USB: USB full speed.
- Supports Keithley Model 3500 in pass-through mode via USB.
- RF Out: Type N connector.

**MECHANICAL VIBRATION AND SHOCK:**
- MIL-PRF-2880 CL3 random vibration, 3 axes.
- Sine-Sweep test for resonances, 3 axes.
- MIL-STD-810F §16.5 paragraph 4.5.7 procedure VI bench drop.

**GENERAL MECHANICAL CHARACTERISTICS:**
- Height: 153mm (5.25 in.), Width: 213mm (8.4 in.), Half-rack.
- Weight: 9.35kg (20.5 lbs.).

**WARRANTY:** 1 year.

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**SPECIFICATION NOTES**

Specifications describe the instrument’s warranted performance. Typical and characteristic values are not warranted, but provide additional information regarding performance of the Model 2920 and are provided to assist in application of the Model 2920.

**SPECIFICATIONS (warranted performance):**
- Specification values are performance that is warranted. All units are warranted to meet these performance specifications under the following conditions:
  - Ambient operating temperature of 18°C to 28°C, unless otherwise noted.
  - After a warm-up time of 30 minutes and self calibration at ambient temperature.

**TYPICAL (mean + 3 standard deviations):**
- Typical values are performance that units will meet under the following conditions:
  - Ambient operating temperature of 23°C, unless otherwise noted.
  - After a warm-up time of 30 minutes and self calibration at ambient temperature.

This performance is not warranted.

**CHARACTERISTIC (mean or expected value):**
- Characteristic values are nominal performance that units are expected to have under the following conditions:
  - Ambient operating temperature of 25°C, unless otherwise noted.
  - After a warm-up time of 30 minutes and self calibration at ambient temperature.

This performance is not warranted.
RF Vector Signal Generator
10MHz to 4GHz or 6GHz

Specifications are subject to change without notice.
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A GREATER MEASURE OF CONFIDENCE


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