Full-featured CW Microwave Counters for Field, Factory or Lab

Product Overview

Agilent 53150A 20 GHz Counter
Agilent 53151A 26.5 GHz Counter
Agilent 53152A 46 GHz Counter

High performance microwave counters: at home, in the field, bench or ATE environment

- Ultrawide range, single input (from 50 MHz up to 46 GHz)
- Simultaneous power and frequency measurement with analog peaking indicator
- GPIB and RS-232 standard
- Lightweight and rugged
- Battery optional

Agilent Technologies

Convenience, portability and outstanding performance

The innovative designs of the Agilent 53150 Series microwave counters offer an uncluttered, feature-laden front panel. These designs present no-compromise performance and quality in a surprisingly small, light, battery operated product.

The convenience of a single microwave input

The Agilent 53150 Series has an advanced sampler that integrates a separate zero bias Schottky diode for the accurate measurement of input power. This allows measurement of both frequency and power with a single connection. No compromise in frequency coverage is required for this capability. The ultrawideband microwave input covers the entire RF and microwave spectrum, from intermediate frequencies IFs) of 50 MHz to millimeter waves.

The power measurement accuracy and repeatability of these counters rivals power meters with diode sensors. Since frequency and power of the input signal are measured simultaneously, adjustment for the diode's frequency response is done automatically. And like the latest in diode sensors, compensation is also made for deviation from square law.

Field tough but ready for benchtop or ATE applications

The Agilent 53150 Series is as comfortable in the field as in the laboratory. The rugged case with an integrated tilting handle can tolerate the vibration and shock expected in field use. The backlit LCD display ensures visibility in all environments, from dark to full sunlight, at distances exceeding 15 feet.

If AC power is unavailable, the internal, replaceable camcorder batteries provide at least 2.5 hours of continuous operation. The unit can also be powered from an external 11-18 VDC source.

For benchtop and ATE applications, the Agilent 53150 Series delivers full functionality and high measurement speed. The fully programmable RS-232 interface and high speed GPIB interface are standard features.

No compromise performance

The Agilent 53150 Series offers exceptional sensitivity by utilizing a single board design with low phase noise PLL circuitry. Despite their simple appearance, these counters retain all the powerful functions one expects in precision instrumentation: measurement averaging, arbitrary as well as nulling offsets for both frequency and power, display of power in either dBm or Watts.

Additional capabilities include full control of resolution, sampling rate, and GPIB address, plus extensive self-diagnostics, fast acquisition times and full programmability. Performance surpasses the industry standard Agilent 5350 Series, in virtually every aspect, in a package less than half the weight and size.

Measurement Specifications and Characteristics

All measurement specifications are over the full signal and temperature ranges unless otherwise noted.

Input characteristics	Agilent 53150A	Agilent 53151A	Agilent 53152A
Frequency range			
Channel 1 (Normal mode)	10 Hz - 125 MHz	10 Hz - 125 MHz	10 Hz - 125 MHz
(Low pass filter enabled)	10 Hz - 50 kHz	10 Hz - 50 kHz	10 Hz - 50 kHz
Channel 2	50 MHz - 20 GHz	50 MHz - 26.5 GHz	50 MHz - 46 GHz
Sensitivity			
Channel 1			
10-30 Hz	40 mVrms	40 mVrms	40 mVrms
30 Hz-125 MHz	25 mVrms	25 mVrms	25 mVrms
Channel 2			
50-300 MHz	–20 dBm	–20 dBm	–20 dBm
0.3-12.4 GHz	–33 dBm	–33 dBm	–33 dBm
12.4-18 GHz	–33 dBm	–33 dBm	–30 dBm
18-20 GHz	–29 dBm	–29 dBm	–27 dBm
20-26.5 GHz	N/A	–25 dBm	–27 dBm
26.5-40 GHz	N/A	N/A	–23 dBm
40-46 GHz	N/A	N/A	–17 dBm
Maximum input			
Channel 1	2 Vrms	2 Vrms	2 Vrms
Channel 2			
50 MHz - 2 GHz	+5 dBm	+5 dBm	+5 dBm
2-46 GHz	+13 dBm	+13 dBm	+13 dBm
Damage level			
Channel 1	120 V (DC + AC pk) linearly derated to 5 Vrms at 125 MHz	120 V (DC + AC pk) linearly derated to 5 Vrms at 125 MHz	120 V (DC + AC pk) linearly derated to 5 Vrms at 125 MHz
Channel 2	+27 dBm	+27 dBm	+27 dBm
Impedance (Nominal)			
Channel 1	1 MΩ/60 pF	1 MΩ/60 pF	1 MΩ/60 pF
Channel 2	50 Ω	50 Ω	50 Ω
Connector			
Channel 1	BNC female	BNC female	BNC female
Channel 2	SMA/APC-3.5 compatible female	SMA/APC-3.5 compatible female	2.92 mm removable, SMA/APC-3.5 compatible female
SWR (Typical)			
Channel 2			
50-300 MHz	1.5:1 typical	1.5:1 typical	1.5:1 typical
0.3-10 GHz	2.0:1 typical	2.0:1 typical	2.0:1 typical
10-20 GHz	3.0:1 typical	3.0:1 typical	3.0:1 typical
20-26.5 GHz	N/A	3.0:1 typical	2.5:1 typical
26.5-46 GHz	N/A	N/A	2.5:1 typical
Coupling			
Channel 1	AC	AC	AC
Channel 2	AC	AC	AC
Emissions (Typical) ("kickback noise")			
Channel 1	N/A	N/A	N/A
Channel 2 (measuring/no input)	–40 dBm/< –70 dBm	–40 dBm/< –70 dBm	–40 dBm/< –70 dBm
Resolution			
Channel 1/Channel 2	1 Hz to 1 MHz	1 Hz to 1 MHz	1 Hz to 1 MHz

Measurement Specifications and Characteristics *Continued...*

Input characteristics	Agilent 53150A	Agilent 53151A	Agilent 53152A
Accuracy			
Channel 1/Channel 2 (LSD = resolution selection)	±1 LSD ± residual stability ±(timebase error x frequency)	±1 LSD ± residual stability ±(timebase error x frequency)	±1 LSD ± residual stability ±(timebase error x frequency)
Residual stability*			
Channel 1 Channel 2 **Counter and source tied to same timebase*	N/A 0.6 LSD rms	N/A 0.8 LSD rms	N/A 1.25 LSD rms
Measurement time (Typical)			
Channel 1	1/Resolution + 20 ms	1/Resolution + 20 ms	1/Resolution + 20 ms
Channel 2	1/Resolution + Acquisition time + 20 ms	1/Resolution + Acquisition time + 20 ms	1/Resolution + Acquisition time + 20 ms
Acquisition time (Typical) (1 MHz FM rate, power measurement off)			
Channel 1 Channel 2 (FM Auto/FM Off)	N/A 125 ms/100 ms	N/A 125 ms/100 ms	N/A 140 ms/115 ms
FM tolerance			
Channel 1 Channel 2 (FM Auto)	N/A 20 MHz p-p max @ 10 MHz rate	N/A 20 MHz p-p max @ 10 MHz rate	N/A 20 MHz p-p max to 26.5 GHz, 12 MHz p-p max above 26.5 GHz @ 10 MHz rate
(FM Off)	1 MHz p-p @ 10 MHz rate	1 MHz p-p @ 10 MHz rate	1 MHz p-p @ 10 MHz rate
AM tolerance			
Channel 1, Channel 2	Any index provided minimum signal level is not less than sensitivity	Any index provided minimum signal level is not less than sensitivity	Any index provided minimum signal level is not less than sensitivity
Amplitude discrimination			
Channel 1 Channel 2 below 300 MHz above 300 MHz	N/A N/A Automatically measures the largest signal present provided signal is > 10 dB(typical) above any signal separated by less than 75 MHz; > 20 dB (typical) above any signal separated by more than 75 MHz	N/A N/A Automatically measures the largest signal present provided signal is > 10 dB(typical) above any signal separated by less than 75 MHz; > 20 dB (typical) above any signal separated by more than 75 MHz	N/A N/A Automatically measures the largest signal present provided signal is > 10 dB(typical) above any signal separated by less than 75 MHz; > 20 dB (typical) above any signal separated by more than 75 MHz
Power measurement			
Channel 1	N/A	N/A	N/A
Channel 2 Range Accuracy at input connector** (0 dBm to –20 dBm) 0.05-12.4 GHz 12.4-20 GHz 20-26.5 GHz 26.5-46 GHz Resolution Display ***see graphs for typical data*	 Counter sensitivity to +7 dBm ±1.5 dB ±1.5 dB N/A N/A 0.01 dB dBm or millwatts/microwatts	 Counter sensitivity to +7 dBm ±1.5 dB ±1.5 dB ±2.0 dB N/A 0.01 dB dBm or millwatts/microwatts	 Counter sensitivity to +7 dBm ±1.0 dB ±1.5 dB ±1.5 dB ±2.0 dB 0.01 dB dBm or millwatts/microwatts

Typical* power measurement uncertainty at 25 °C for various input levels

**Typical means approximately 2/3 of all units will meet these characteristics.*

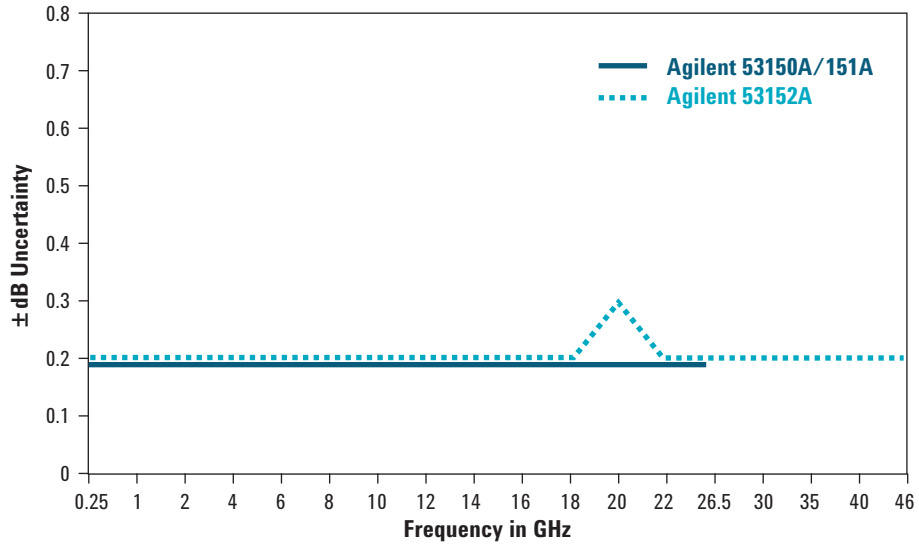

Figure 1. –10 dBm input level at 25 °C

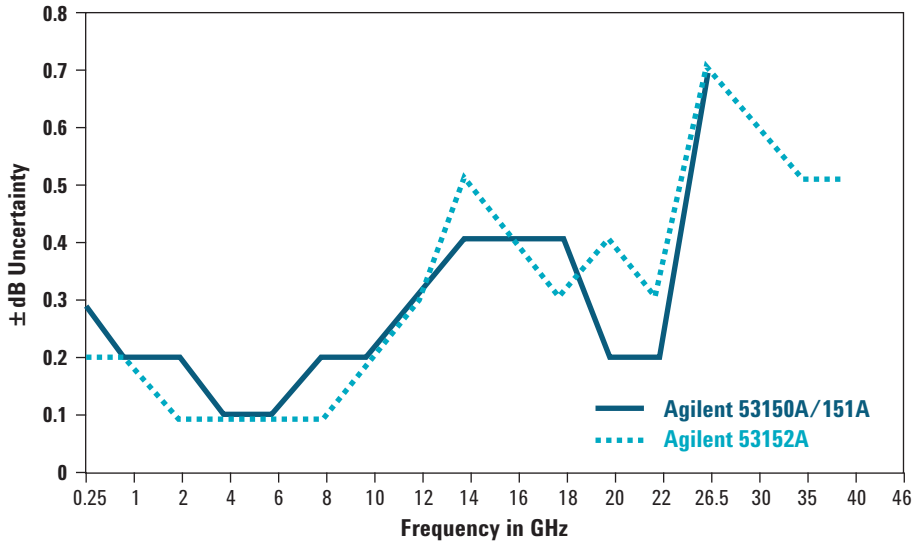

Figure 2. 0 dBm and –20 dBm input level at 25 °C

Typical* power measurement uncertainty at –25 dBm input level

**Typical means approximately 2/3 of all units will meet these characteristics.*

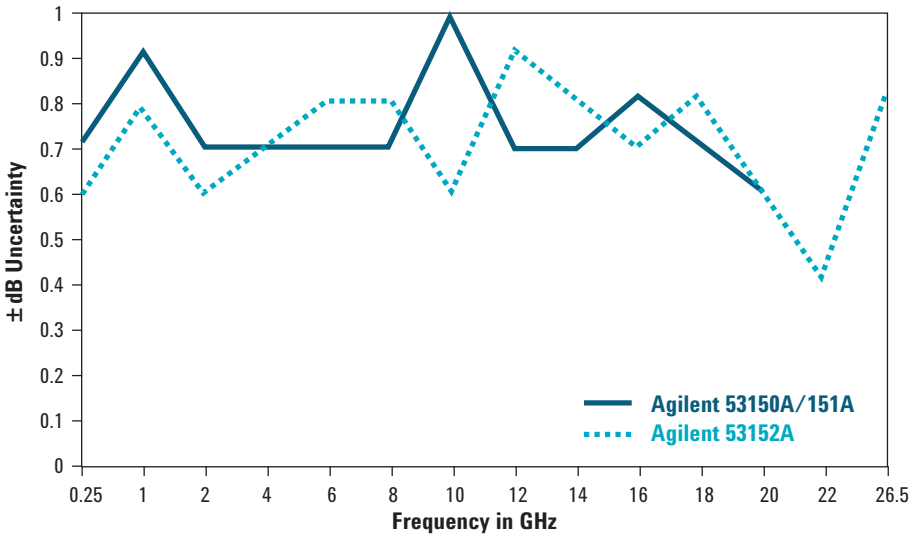

Figure 3. –25 dBm input level at 25 °C

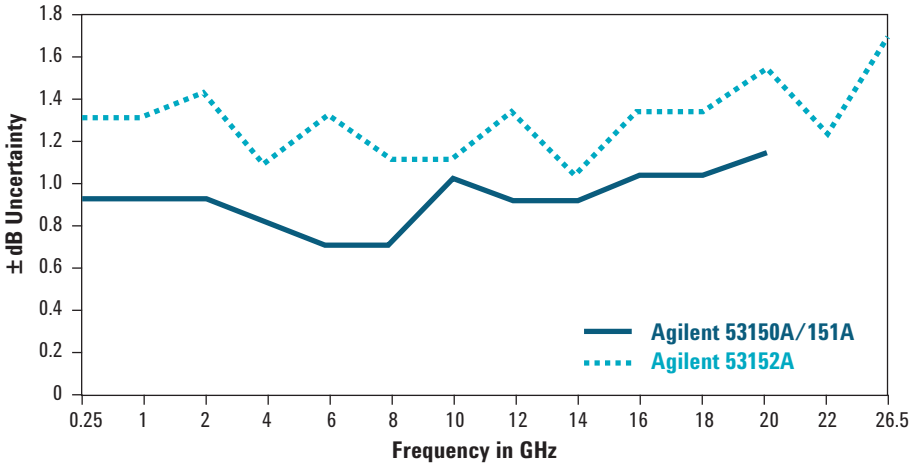

Figure 4. –25 dBm input level from 0 to 55 °C

Timebase

Frequency: 10 MHz

Output: 10 MHz sine wave, 1 Vrms into 50 Ω

External timebase input: 1, 2, 5, 10 MHz; 1 to 5 Vrms into 50 Ω

Connector: BNC female located on rear panel

Internal timebase stability

	TCXO (Standard)	Oven (Option 001)
Aging rate		
Per day	—	$< 5 \times 10^{-10}$
Per month	$< 1 \times 10^{-7}$	$< 1.5 \times 10^{-8}$
Short term (1 s avg. time)	$< 1 \times 10^{-9}$	$< 2 \times 10^{-10}$
Line variation (±10%)	$< 1 \times 10^{-7}$	$< 1 \times 10^{-10}$
Warm-up	—	$< 1 \times 10^{-8}$ within 5 min. after turn-on at 25 °C
Temperature stability (0-55 °C)	$< 1 \times 10^{-6}$	$< 1 \times 10^{-8}$

General information

Save and recall: Up to 9 complete instrument setups may be saved and later recalled. These setups are retained when power is removed.

Sample rate: User-selectable Fast (nominally 20 ms between readings), Medium (nominally 250 ms between readings), Slow (nominally 1 s between readings) and Hold.

Self test: Internal memory and count circuitry automatically tested at startup, via menu selection, or remotely. Error messages displayed to indicate failed tests.

Size: 213 mm W x 88.5 mm H x 300 mm D

Operating temperature: 0-55 °C
With battery option: 0-40 °C

Weight: 4 kg without battery option, 6.4 kg with battery option

Warranty: 1 year

Programming: GPIB (IEEE-488.1-1987, IEEE 488.2-1987) or RS-232C
Language: SCPI-1992.0 (Standard Commands for Programmable Instruments)
RS-232C rates: User-selectable 2400 to 19200 baud

Power supply:
AC: 90-132 Vac; 47.5-66 Hz or 360-440 Hz 216-264 Vac; 47.5-66 Hz line selection: automatic power requirements: 75 VA max. (25 W typ.)
DC: (Option 002 only): 11-18 Vdc; 2A max.
Battery (Option 002):
Type: VHS camcorder, lead acid (2 each)
Charge time: 8 hours in unit
Capacity: 2.5 hours min. at 25 °C

Math functions:
Offset: Last reading and/or entered offset to reading for either power or frequency
Averaging: 1 to 99 measurement running average
Cable loss compensation: Offsets power reading via linear interpolation of user-entered attenuations with up to 9 independent frequency points.

Display: Backlit LCD. Backlight can be turned on or off via front panel control.

Sleep mode (Option 002 only): Automatically activated if no input is present for 5 minutes.

Safety: Designed in compliance with IEC-1010, CAN/CSA 1010.1

EMC: Designed in compliance with IEC-11, EN50082-1, IEC801-2, -3, -4.

Accessories supplied

Operating, programming, and service manuals and AC power cord.

Ordering information

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Agilent 53151A	26.5 GHz counter
Agilent 53152A	46 GHz counter

Options

Option 001	Oven Timebase
Option 002	Battery and DC input
Option 1CM	(53150-67001) Rackmount kit
53153A (Option 007)	Soft carrying case for 5315xA microwave counters
Option A6J	ANSI 7540 Compliant Calibration
Option W30	Three years of Return Repair Service
Option W50	Five years of Return Repair Service

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