53100A Phase Noise Analyzer

For Precision Oscillator Characterization

Summary

The 53100A Phase Noise Analyzer measures the amplitude, phase and frequency stability of high-performance RF sources. Carrier frequencies from 1 MHz to 200 MHz are supported. The 53100A tells you everything you need to know about the stability characteristics of your devices, at timescales ranging from femtoseconds to days. From use on a bench-top or embedded into rack-mount ATE systems, the small formfactor and industry-leading measurement speed makes this test set versatile for multiple applications.

Expanding upon the heritage of the 3120A and 51XXA series of instruments, the 53100A makes fast yet accurate single side band (SSB) phase noise and Allan deviation (ADEV) measurements at a fraction of the cost of alternate solutions.

Features

- Now with Internal Reference options (OCXO and atomic clock)
- Independent input and reference frequencies from 1 to 200 MHz
- No phase-locking or measurement calibration required
- Single or dual reference oscillator inputs allow cross-correlation measurements
- Intuitive graphical interface enables a user to quickly start making measurements
- Includes an embedded JavaScript engine that can run automated test scripts
- Use the internal reference options as standalone frequency sources, via the 50Ω RF connectors

Measurements

- Phase noise and AM noise at offsets from 0.001 Hz to 1 MHz and levels typically below -175 dBc/Hz (10 MHz floor)
- Real-time 'strip charts' of phase and frequency differences at subpicosecond precision
- Absolute frequency counts at 13+ digits per second, 17 digits maximum
- Allan deviation (ADEV) typically 5E-15 at t = 1s
- Modified Allan deviation (MDEV), Hadamard deviation (HDEV), time deviation (TDEV) and Maximum Time Interval Error (MTIE)
- RMS-integrated time jitter, residual FM, and SSB carrier/noise ratio

Using a Windows® PC, all of these measurements can be made simultaneously. Results appear as you watch, and you can save, view, compare or print them at any time with the interactive GUI or via remote Telnet operation. Accuracy and stability are inherited from a user-supplied external reference which can run at any frequency within the supported range, with no calibration required by the instrument itself.

Now available with two new internal reference options for true standalone operation, the 53100A makes high-performance noise and stability measurements easier than ever. Simply connect your DUT and start measuring!

Specifications @ 25˚C (ambient), unless noted otherwise

Performance

Frequency Range	1 to 200 MHz
Allan Deviation (t=1s)	7E-15 (5E-15 typical)
Allan Deviation (t=1000s)	2E-16 (1E-16 typical)

Phase Noise Specifications

Offset Frequency Range	0.001 Hz to 1 MHz

System Noise Floor

Offset	5 MHz Carrier	100 MHz carrier
1 Hz	–140 dBc/Hz	–120 dBc/Hz
10 Hz	–152 dBc/Hz	–130 dBc/Hz
100 Hz	–164 dBc/Hz	–145 dBc/Hz
1 kHz	–172 dBc/Hz	–160 dBc/Hz
10 kHz	–175 dBc/Hz	–170 dBc/Hz
>100 kHz	–175 dBc/Hz	–170 dBc/Hz
Spurious (5 to 100 MHz)	–100 dBc	–100 dBc

Electrical Specifications

Input Signal Level	–5 to +15 dBm (front panel)
Input Impedance	50Ω

Mechanical & Environmental Specifications

Size	13.5 × 8.5 × 3.6 inches (344 × 215 × 91 mm)
Power	<40W (90 to 264 VAC)
Operating Temperature	+15°C to 35°C
Storage Temperature	–20°C to +50°C
Unit Weight	3.2 kg (7 lbs)
MTBF	90,000 hours at 25°C (GB)
Compliance	RoHS, CE, FCC

About Internal Reference Options

Options IR and STD equip the instrument with internal reference oscillators for genuine turnkey operation. Eliminate costly reference sources on your production line, or improve the stability of your existing house standard by taking advantage of versatile disciplining capabilities to perform cross-correlated measurements.

Use as a frequency reference. The externally accessible 50Ω reference connections provide maximum flexibility in a variety of applications where high-quality 100 MHz sources are required.

Option IR (-001): Dual independent 100 MHz references support phase noise measurements at levels below -170 dBc/Hz and Allan deviation measurements near 2E-13 @ τ=1s.

Option STD (-002): Adds a miniature atomic standard to units equipped with Option IR, enabling long-term drift and precision frequency measurements with atomic accuracy.

Note: Option STD is factory and user calibrated with 5E-9/year accuracy.

ADEV Measurement Floor with IR option

Allan Deviation (t = 1s)	2E-13 (typical)
Allan Deviation (t = 10s)	5E-13 (typical)
Allan Deviation (t = 100s)	5E-12 (typical)
Allan Deviation (t = 1000s)	5E-12 (typical, Option -002 only)

Phase Noise Measurement floor with IR option

Offset	10 MHz carrier	100 MHz carrier
1 Hz	-120 dBc/Hz	-100 dBc/Hz
>10 kHz	-170 dBc/Hz	-170 dBc/Hz

Product Includes

- USB 2.0 cable, A(m) / B(m)
- Power supply (50/60 Hz, 100V to 240V)
- (Qty = 2) N(m)/BNC(f) coax adapters
- (Qty = 4) SMA(m)/SMA(m) coax jumpers, 1 inch (25.4 mm)

Front Panel

N(f) RF connector	(Qty = 2) DUT and Reference
SMA(f) RF connector	(Qty = 10) Multichannel expansion, IR access
LED	Instrument status indication

Rear Panel

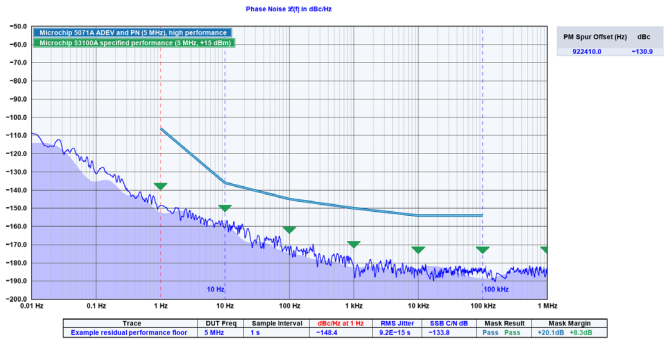
USB-B connector	PC connectivity
SMA(f) RF connectors	(Qty = 1) 1 PPS input
DC input jack (2.1 mm)	For use with 15V external power supply

Ordering Information

Part Number	Description
090-53100-000	53100A Base Model
090-53100-001	53100A with IR option
090-53100-002	53100A with IR plus STD option

Note: IR = Internal Reference, STD = Atomic Standard

Software



53100A phase noise test software is shipped along with the product. It allows a user to set up various measurement configurations/speeds, toggle display settings, import/export data, run scripts, set up mask lines and more.
Visit microchip.com/53100A for more information.