



S3503 Series Signal/Spectrum Analyzer Datasheet



Saluki Technology Inc.

The document applies to the signal/spectrum analyzers of the following models:

- S3503A signal/spectrum analyzer (3Hz-4GHz).
- S3503B signal/spectrum analyzer (3Hz-9GHz).
- S3503C signal/spectrum analyzer (3Hz-13.2GHz).
- S3503D signal/spectrum analyzer (3Hz-18GHz).
- S3503E signal/spectrum analyzer (3Hz-26.5GHz).
- S3503F signal/spectrum analyzer (3Hz-40GHz).
- S3503G signal/spectrum analyzer (3Hz-45GHz).
- S3503H signal/spectrum analyzer (3Hz-50GHz).

Options of the S3503 series signal/spectrum analyzer in addition to standard accessories:

- S3503-H01, rear panel RF input: postposition the RF signal input interface.
- S3503-H02, HF/IF output: output the second IF signal with output frequency range of 275MHz-475MHz and step resolution of 1Hz.
- S3503-H03, IF output: output the third IF signal with output frequency range of 10MHz-160MHz and step resolution of 1Hz.
- S3503-H04A, reconstructed IF/video signal output: realize any IF, AM/FM or I/Q signal output through digital reconstruction with bandwidth limit of 40MHz.
- S3503-H04B, broadband reconstructed IF/video signal output: realize any IF, AM/FM or I/Q signal output through digital reconstruction with bandwidth limit of 50MHz-100MHz.
- S3503-H08, broadband logarithmic detector output: output the logarithmic detector signal reflecting the input signal level characteristics.
- S3503-H12A, 40MHz bandwidth digital interface: output real-time signal data through optical fiber and support the signal data output up to 40MHz bandwidth.
- S3503-H12B, 200MHz bandwidth digital interface: output real-time bandwidth data through optical fiber and support the signal data output up to 200MHz bandwidth.
- S3503-H15, +24V DC power supply: +24V DC power supply.
- S3503-H22A, SAV4711 data recorder: configure a SSD data recorder with same interface characteristics for a real-time and huge-capacity logging of signal data.
- S3503-H22B, SAV4712 data recorder: configure a HDD data recorder with same interface characteristics for a real-time and huge-capacity logging of signal data.
- S3503-H33, electronic attenuator: frequency range: 3Hz-4GHz, attenuation range: 30dB, step: 1dB.
- S3503-H34-04/S3503-H34-09/S3503-H34-13/S3503-H34-18/S3503-H34-26/S3503-H34-40/S3503-H34-45/S3503-H34-50, low-noise preamplifier:
- S3503-H36, preselector bypass: bypass the tracking preselector in the reception channel. (Necessary option for H38A and H38B)
- S3503-H38A, 40MHz analysis bandwidth: support 10Hz-40MHz analysis bandwidth.

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- S3503-H38B, 200MHz analysis bandwidth: support 10Hz-40MHz analysis bandwidth.
 - S3503-H39, audio analysis: realize audio signal parameter test, distortion measurement and waveform analysis.
 - S3503-H40, external frequency extension: be capable of extending frequency test range through external mixing. In this option, LO output, IF input and signal identification are provided.
 - S3503-S04, phase noise measurement: provide SSB phase noise curve and single point phase noise measurement.
 - S3503-S09, analog demodulation analysis: provide modulation characteristic and distortion characteristic analysis of AM, FM and PM signals.
 - S3503-S10, transient analysis: test and analyze transient parameter spectrums, frequency spectrums and time-variant characteristics of signals and support logging data playback.
 - S3503-S13, pulse signal analysis: realize automatic measurement for time, level and modulation parameters of pulse waveform and statistic analysis of pulse sequences.
 - S3503-H98, English suite: English panel, English instructions, English operating interface and English operation system. Power supply: AC 100/115V: 50/60/400Hz; AC 220/240V: 50/60Hz.
 - S3503-H99, aluminum alloy case: high-strength and portable aluminum alloy case with a handle and rolling wheels, which are convenient for transportation.

Preface

Thank you for choosing S3503 Signal/Spectrum Analyzer produced by Saluki Technology Inc.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with "superior quality and considerate service", and are committed to offering satisfactory products and service for our clients.

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Document Authorization

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Product Quality Assurance

The warranty period of the product is 36 months from the date of delivery. The instrument manufacturer will repair or replace damaged parts according to the actual situation within the warranty period.

Product Quality Certificate

The product meets the indicator requirements of the document at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Settings Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

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1 Overview

S3503 Series Signal Analyzer, featured with excellent dynamic range, phase noise, amplitude precision and testing speed, has multiple analysis functions including high-sensitivity spectrum analysis, spectrum power analysis, IQ analysis, multi-domain correlation analysis, pulse parameter analysis, audio analysis, analogue demodulation analysis and phase noise test, providing you reliable excellent testing service.

S3503 has a variety of optional components. These components can improve the performance, provide more interfaces and even new functions. The analyzer also provides digit and analogue output interfaces, which can be easily used to build a measurement system. With such a good performance and flexible optional components, S3503 is perfectly suitable for signal and equipment test of fields including Aviation, aerospace, radar detection, communications, electromagnetic countermeasure, and navigation.

1. 1. Definitions

Specification (Spec.)

Specifications describe the performance of parameters within the warranty of the instrument. Product specifications applies under the following conditions:

- 1) Two hours storage at ambient temperature(0-40°C) followed by 30 minutes warm-up operation
- 2) Specified environmental conditions met
- 3) Instrument is within its calibration cycle.
- 4) The specification listed in the datasheet includes measurement uncertainties.

Data in this document are Spec. unless otherwise noted.

Typical (typ.)

Typical data is not guaranteed by instrument warranty. It describes additional product performance information that 80 percent of the units exhibit. Typical data only valid at 25°C. Typical performance does not include measurement uncertainty.

Nominal(nom.)

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

2. Specifications

2. 1. Frequency & Sweep

2. 1. 1. Frequency Range

Model	Frequency Range (AC Coupled)	Frequency Range (DC Coupled)
S3503A	3Hz - 4GHz	10MHz - 4GHz
S3503B	3Hz - 9GHz	10MHz - 9GHz
S3503C	3Hz - 13.2GHz	10MHz - 13.2GHz
S3503D	3Hz - 18GHz	10MHz - 18GHz
S3503E	3Hz - 26.5GHz	10MHz - 26.5GHz
S3503F	3Hz - 40GHz	10MHz - 40GHz
S3503G	3Hz - 45GHz	10MHz - 45GHz
S3503H	3Hz - 50GHz	10MHz - 50GHz

2. 1. 2. Band Division (Nom.)

Band	LO Multiple (N)	Frequency Range
0	1	3Hz - 4.1GHz
1	1	3.9GHz - 9GHz
2	2	8.7GHz - 18.3GHz
3	4	17.7GHz - 27GHz
4	4	26.6GHz - 40.4GHz
5	8	39.6GHz - 50GHz

2. 1. 3. Frequency Reference

Frequency Resolution	0.01Hz	
10MHz Reference	Frequency Accuracy	$\pm(\text{Days from last calibration} \times \text{Aging Rate} + \text{Temp Stability} + \text{Calibration Accuracy})$
	Aging Rate	$\pm 1 \times 10^{-7}/\text{Year}$
	Temp Stability	$\pm 1 \times 10^{-8}(20^{\circ}\text{C} - 30^{\circ}\text{C}), \pm 5 \times 10^{-8}(0^{\circ}\text{C} - 55^{\circ}\text{C})$
	Calibration Accuracy	$\pm 4 \times 10^{-8}/\text{Year}$
Residual FM (CF=1GHz, RBW = 10Hz, VBW = 10Hz)	$< (0.25\text{Hz} \times \text{N})\text{p-p, (Nom. In 20ms)}$ N (LO multiple)	

2. 1. 4. Frequency Readout Accuracy

Frequency Readout Accuracy	$\pm (\text{Frequency Readout} \times \text{frequency reference accuracy} + 0.1\% \text{Frequency Bandwidth} + 5\% \text{RWB} + 2\text{Hz} + 0.5 \times \text{Horizontal resolution})$	
	Horizontal resolution = bandwidth / (scan points - 1)	
Frequency Counter Accuracy	$\pm (\text{Frequency Readout} \times \text{Frequency reference accuracy} + 0.1\text{Hz})$	
	Counter Resolution	0.001Hz

2. 1. 5. Span

Range	0Hz (Zero Span)
	10Hz - Max. Frequency
Resolution	2Hz
Accuracy	$\pm (0.1\% \times \text{Span} + \text{Span} / (\text{Sweep point} - 1))$

2. 1. 6. Sweep & Triggering

Sweep Time	Span \geq 10Hz	1ms - 4000s
	Span=0Hz	1us - 6000s Uncertainty: $\pm 0.01\%$
Sweep Point	101 - 30001	
Trigger	Mode	Free, power, video, external level (front panel) external level (rear), burst signal, timer
	Trigger Delay	0 - 500ms
	Trigger Delay Resolution	0.1 us

2. 1. 7. RBW & VBW

Range:	1Hz - 3MHz (step by 1, 2, 3, 5), 4, 5, 6, 8, 10MHz
Selectivity (-60dB/-3dB)	5 : 1 (Nom)
Video Bandwidth	1Hz - 3MHz (step by 1, 2, 3, 5), 4, 5, 6, 8, 10MHz

2. 1. 8. Analysis Bandwidth

Standard	10Hz - 10MHz
Option H38A	10Hz - 40MHz
Option H38B	10Hz - 200MHz
Memory Capacity	250M Samples (64 Bit)

2. 2. Amplitude

2. 2. 1. Amplitude Range

Measurement Range	DANL to +30dBm
Attenuator Range	0 - 70dB in 2dB step

2. 2. 2. Maximum Input Level

Maximum Safe Input Level	+30dBm (1W)
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2. 2. 3. Display Range

Display Type	Linear, logarithm
Scale	0.1 - 20dB/div
Unit	dBm, dBmV, dBuV, dBmA, dBuA, V, W, A, uV, mV, uA, mA, pW, nW

2. 2. 4. Frequency Response

- Settings: 10dB Attenuator, 20°C - 30°C
- Pre-amplifier off

3Hz - 20MHz	< ±0.7dB
20MHz - 2GHz	< ±0.5dB
2GHz - 3.6GHz	< ±0.7dB
3.6Hz - 4GHz	< ±1dB
4GHz - 9GHz	< ±1.5dB
9GHz - 18GHz	< ±2.0dB
18GHz - 26.5GHz	< ±2.5dB
26.5GHz - 40GHz	< ±3.0dB
40GHz - 50GHz	< ±3.0dB

- Pre-amplifier On (H34)

3Hz - 20MHz	< ±1.5dB
20MHz - 2GHz	< ±1.5dB
2GHz - 3.6GHz	< ±1.5dB
3.6Hz - 4GHz	< ±1.8dB
4GHz - 9GHz	< ±2.5dB
9GHz - 18GHz	< ±3.0dB
18GHz - 26.5GHz	< ±3.5dB

26.5GHz - 40GHz	±4.0dB
40GHz - 50GHz	±4.0dB

2. 2. 5. Absolute Amplitude Accuracy

- Settings: 10 dB attenuation, 20 - 30 °C, 1 Hz < RBW < 1 MHz, input signal: -10 ~ -50dBm
- Pre-amplifier Off

500MHz	±0.24dB
All Frequency	± (0.24dB + Frequency Response)

- Pre-amplifier On (H34)

All Frequency	± (0.36dB + Frequency Response)
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2. 2. 6. VSWR

- Settings: 10 dB attenuation

50MHz - 4GHz	<1.4
4GHz - 9GHz	<1.5
9GHz - 18GHz	<1.8
18GHz - 26.5GHz	<1.7
26.5GHz - 40GHz	<1.8
40GHz - 50GHz	<1.9

2. 2. 7. Display Scale Switching Uncertainty

RBW Range	Specification
1Hz - 2MHz	±0.3dB
3,4,5,6,8,10MHz	±0.3dB

2. 2. 8. Reference Level

Range	Log Scale: -170 - +30dBm, step by 0.01dB
Linear Scale	707pV - 7.07V, 0.01dB resolution
Accuracy	0.2dB

2. 2. 9. Display Scale Fidelity

Between -10 dBm and -80 dBm input mixer level	±0.2dB
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2. 2. 10. Trace Detector

Trace Detector	Normal, positive peak, negative peak, sample, average, RMS
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2. 3. Dynamic Range Specifications

2. 3. 1. 1dB Gain Compression

- Settings: 2 tones, RBW=5kHz, 3MHz tone spacing, 20°C - 30°C
- Pre-amplifier Off:

Frequency Range	Specification	Typical
20MHz - 40MHz	-3dBm	0dBm (typ.)
40MHz - 200MHz	1dBm	+2.5dBm(typ.)
200MHz - 4GHz	+3dBm	+5dBm(typ.)
4GHz - 9GHz	-1dBm	+5dBm(typ.)
9GHz - 50GHz	1dBm	+3dBm(typ.)

- Pre-amplifier On(Option H34)(Nom.):

Frequency	Nominal
20MHz - 40MHz	-29dBm
40MHz - 200MHz	-28dBm
200MHz - 4GHz	-34dBm
4GHz - 9GHz	-31dBm
9GHz - 50GHz	-28dBm

2. 3. 2. DANL

- Settings: 50ohm load, noise marker on, 0dB attenuation, 1Hz RBW, 20°C - 30°C
- Pre-amplifier off:

Frequency Range	DANL
3Hz - 9kHz	< -115dBm/Hz (typ.)
9kHz - 100kHz	<-145dBm/Hz(typ.)
100kHz - 1MHz	<-147dBm/Hz(typ.)
1MHz - 10MHz	<-154dBm/Hz(typ.)
10MHz - 1GHz	<-153dBm/Hz
1GHz - 2GHz	<-151dBm/Hz
2GHz - 3GHz	<-150dBm/Hz

Frequency Range	DANL
3GHz - 3.6GHz	<-148dBm/Hz
3.6GHz - 4GHz	<-145dBm/Hz
4GHz - 4.4GHz	<-148dBm/Hz
4.4GHz - 9GHz	<-150dBm/Hz
9GHz - 18GHz	<-148dBm/Hz
18GHz - 26.5GHz	<-143dBm/Hz
26.5GHz - 40GHz	<-140dBm/Hz
40GHz - 50GHz	<-133dBm/Hz

- Pre-amplifier On (Option H34)

Frequency Range	DANL
10MHz - 1GHz	<-162dBm/Hz
1GHz - 3GHz	<-162dBm/Hz
2GHz - 3GHz	<-160dBm/Hz
3GHz - 3.6GHz	<-156dBm/Hz
3.6GHz - 4GHz	<-155dBm/Hz
4GHz - 4.4GHz	<-155dBm/Hz
4.4GHz - 9GHz	<-155dBm/Hz
9GHz - 18GHz	<-154dBm/Hz
18GHz - 26.5GHz	<-154dBm/Hz
26.5GHz - 40GHz	<-150dBm/Hz
40GHz - 50GHz	<-145dBm/Hz

2. 4. Residues, SHI, TOI, Phase Noise

2. 4. 1. Residual Response

- Settings: Input terminated and 0 dB attenuation

200kHz - 9GHz	-100dBm
Other Frequency	-100dBm (Nom.)

2. 4. 2. Image Response

- Settings: -10dBm Mixer Level

Turned Frequency (f)	Excitation Frequency	Response
10MHz-1.1GHz	f + 150MHz	≤-80dBc
1.1GHz - 4GHz	f - 150MHz	≤-76dBc
4GHz - 26.5GHz	f - 150MHz	≤-80dBc
26.5GHz - 40GHz	f + 150MHz	≤-80dBc
40GHz - 50GHz	f - 150MHz	≤-76dBc
10MHz-1.1GHz	f - 850MHz	≤-80dBc
10MHz - 18GHz	f + 850MHz	≤-80dBc
18GHz - 26.5GHz	f + 850MHz	≤-70dBc
26.5GHz - 40GHz	f - 850MHz	≤-70dBc
40GHz - 50GHz	f + 850MHz	≤-60dBc
10MHz - 1.1GHz	f + 3950MHz	≤-80dBc
1.1GHz - 4GHz	f + 10450MHz	≤-80dBc

2. 4. 3. Second Harmonic Distortion(SHI)

Frequency Range	Mixer Level	Distortion	SHI
10MHz - 0.55GHz	-15dBm	-54dBc	+39dBm
0.55GHz - 2GHz	-15dBm	-54dBc	+39dBm
2GHz - 4.5GHz	-15dBm	-72dBc	+57dBm
4.5GHz - 9GHz	-15dBm	-70dBc	+55dBm
9GHz - 25GHz	-15dBm	-65dBc	+50dBm

2. 4. 4. Third Order Intermodulation Distortion

- Settings: two tones, 50kHz tone spacing, 20°C - 30°C Nom.
- Pre-amplifier Off:

Frequency Range	TOI (Nom.)
10MHz - 200MHz	≥13dBm
200MHz - 4GHz	≥13dBm
4GHz - 9GHz	≥11dBm
9GHz - 18GHz	≥13dBm
18GHz - 50GHz	≥13dBm

- Pre-amplifier On:

Frequency Range	TOI (Nom.)
10MHz - 200MHz	≥-16dBm
200MHz - 4GHz	≥-20dBm
4GHz - 9GHz	≥-20dBm
9GHz - 18GHz	≥-17dBm
18GHz - 50GHz	≥-16dBm

2. 4. 5. Phase Noise

- Settings: CF=1GHz, RBW= 10Hz, VBW = 10Hz

Frequency Offset	Phase Noise
100Hz	-96dBc/Hz
1kHz	-115dBc/Hz
10kHz	-125dBc/Hz
100kHz	-125dBc/Hz
1MHz	-135dBc/Hz (-145dBc/Hz typ.)

2. 5. Settings

No. of Markers	12
No. of Traces	6
Average Types	Video, Power, Voltage
Trace Math Functions	Power Sum, Power Diff, log Sum, log diff, Voltage sum, Voltage diff
Trace Operation	clear/write, Max Hold, Min Hold, Avg

2. 6. Interfaces

2. 6. 1. Front Panel

Interface Description	Interface Type	
RF Input Port	S3503A	N type (F)
	S3503B	N type (F)
	S3503C	N type (F)
	S3503D	N type (F)
	S3503E	3.5mm (M)
	S3503F	2.4mm (M)
	S3503G	2.4mm (M)
	S3503H	2.4mm (M)
LO Output Port	10GHz - 40GHz, 50ohm, 2.4mm (f)	
IF Output Port (Option H02,H03)	425MHz, 50ohm, 3.5mm(f)	
Sync Sweep Output	BNC (F)	
USB	USB type B x 2	
Trigger In	BNC (F)	

2. 6. 2. Rear Panel

Interface Description	Interface Type	Interface Description
RF Rear Input Port (Option H01)	S3503A	N type (F)
	S3503B	N type (F)
	S3503C	N type (F)
	S3503D	N type (F)
	S3503E	3.5mm (M)
	S3503F	2.4mm (M)
	S3503G	2.4mm (M)
	S3503H	2.4mm (M)
Keyboard Port	PS/2	
Video Port	VGA	
LAN Port	RJ-45,1000Base-T	
GPIB	IEEE-488	
USB	USB type A x 1	

Interface Description	Interface Type	Interface Description
		USB type B x 2
Sync Sweep Output		BNC (F)
Narrow band I output (Option H04)		50ohm, SMA(F)
Narrow band Q output (Option H04)		50ohm, SMA(F)
Broad band I output (Option H04)		50ohm, SMA(F)
Broad band Q output (Option H04)		50ohm, SMA(F)
10MHz reference in		50ohm, SMA(F)
10MHz reference out		50ohm, SMA(F)
Trigger In		BNC (F)
Trigger Out 1		BNC (F)
Trigger Out 2		BNC (F)

2. 7. General

Power Supply	AC 220V \pm 10% , 50/60Hz \pm 5%	
Power Consumption	Max.	400W
	Standby	20W
Operation System	Windows 7	
Storage Capacity	160GB SSD	
Display	1280 x 800, XGA. 10.1" screen	
Operation Temperature	0°C - 50°C	
Storage Temperature	-40°C - 70°C	
Weight	Net Weight	25Kg
	Shipping Weight	34Kg
MTBF	5000h	
Calibration cycle	1 year (Recommended)	
Warranty	36 months	
Dimension	LxWxH = 510 x 190 x 534 (with handles. Fouts)	
	LxWxH = 426 x 177 x 460 (without handles. Fouts)	

2. 8. Compliant

2. 8. 1. CE



- EMC

Complies with the requirements of the EC EMC directive 2014/30/EU with amendments.

Test Standards:

EN 61326-1:2013

EN 61000-3-2:2014

EN 61000-3-3:2013

- Safety

Complies with EC LVD Directive 2014/35/EU with amendment.

Test Standard

EN61010-1:2010

2. 8. 2. ISO



- Manufacturing

This instrument is manufactured in an ISO-9001 registered facility

- End of Document -