



USB
REAL-TIME SPECTRUM
ANALYZER

SAM SERIES
6.3/8.5 GHz

Key facts

Frequency range: 9 kHz to 6.3/8.5 GHz

1 GHz DANL: -166 dBm/Hz

1 GHz phase noise: -110 dBc/Hz@10 kHz

Analysis bandwidth: up to 100 MHz

USB3.0/2.0 type C interface

Highly compatible API interface

Windows 11/10/8/7 (x86, x64) are supported

Debian 12/11/10 (x64, AArch64) are supported

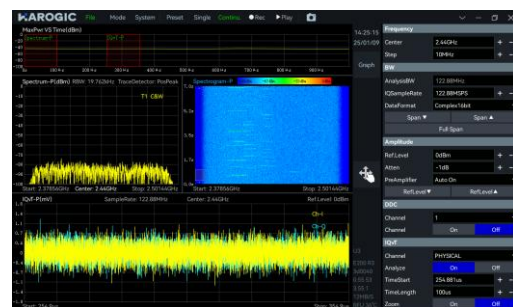
Ubuntu 24.04/22.04/20.04/18.04 (x64, AArch64) are supported

Applications

Standard spectrum sweep



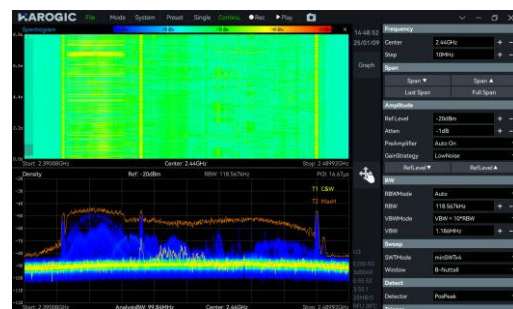
IQ streaming and analysis



Power vs time analysis



Real-time analysis



Specifications*

FREQUENCY

Frequency range	SAM-60 M3		SAM-80	
		9 kHz-6.3 GHz		9 kHz-8.5 GHz
Reference clock	Internal or external			
Frequency accuracy	TCXO (std.)		<1 ppm, manual correction is available	
	OCXO (opt01)		<1 ppm, manual correction is available	
	Ext. GNSS (opt23)	disciplined OCXO	<0.05 ppm, when locked to GNSS	
Aging and temperature stability	TCXO (std.)		<1 ppm/year, <1 ppm	
	OCXO (opt01)		<1 ppm/year, <0.15 ppm	
	Ext. GNSS (opt23)	disciplined OCXO	<1 ppm/year, <0.05 ppm	

SPECTRUM PURITY

SSB phase noise (dBc/Hz)				
	SAM-60 M3		SAM-80	
	Carrier frequency	1 GHz	6.3 GHz	1 GHz
1 kHz	-107.5	-92.7	-110.3	-93.5
10 kHz	-114.2	-99.7	-120.0	-100.5
100 kHz	-112.5	-98.6	-120.1	-100.8
1 MHz	-132.8	-120.1	-131.4	-116.9
Residual response (dBm) spur reject = enhanced RBW =1 kHz PosPeak detector				
	SAM-60 M3		SAM-80	
	0 dBm	-50 dBm	0 dBm	-50 dBm
Reference level (R.L.)	0 dBm	-50 dBm	0 dBm	-50 dBm
100 kHz-100 MHz	-101	-123	-99	-122
100 MHz-6.3 GHz	-87	-116	-88	-119
6.3 GHz-8.5 GHz	-	-	-84	-113
Image rejection	>90 dBc (typ.) for spur reject = enhanced >35 dBc (typ.) for spur reject = bypass			
IF rejection	Low IF architecture			

Local oscillator related
spurious

<-65 dBc
Center frequency $\pm (N/M)*125$ MHz, N,M = 1,2,3,4,5...

IIP3 / IIP2 (dBm)

Carrier frequency	SAM-60 M3		SAM-80	
	1 GHz	6.3 GHz	1 GHz	8.5 GHz
R.L. = 20 dBm	51.0 / 84.9	43.4 / 65.9	49.6 / 87.5	41.0 / 57.4
R.L. = 0 dBm	40.1 / 85.1	25.3 / 94.6	35.6 / 84.3	25.5 / 44.8
R.L. = -20 dBm	10.0 / 66.4	4.7 / 17.7	11.5 / 67.4	2.4 / 34.2

AMPLITUDE

Max. input power (CW)	23 dBm	30 MHz-6.3/8.5 GHz and the preamplifier is off
	10 dBm	9 kHz-30 MHz or preamplifier is on
Max. DC voltage	± 10 VDC	
Display range	DANL- 23 dBm	
Amplitude accuracy	± 2.0 dB	
IF in-band flatness	± 2.0 dB	
Reference level (R.L.)	-50 dBm - 23 dBm	
RF preamplifiers	automatically turn on or forcibly turn off	
VSWR	R.L. = 10 dBm	<1.7:1
30 MHz to Max.Freq.	R.L. = 0 dBm	<2.0:1
	R.L. = -40 dBm	<2.5:1

Display average noise level
(DANL) (dBm/Hz)
RBW=10 kHz

Reference level	SAM-60 M3		SAM-80	
	-20 dBm	-50 dBm	-20 dBm	-50 dBm
9 kHz	-134.6	-149.3	-133.3	-151.2
100 kHz - 30 MHz	-138.6	-161.2	-139.1	-161.1
30 MHz - 3.0 GHz	-145.0	-161.0	-150.4	-166.4
3.0 GHz - 6.3 GHz	-141.0	-158.0	-145.6	-164.4
6.3 GHz - 8.5 GHz	-	-	-134.3	-154.9

STANDARD SPECTRUM ANALYSIS

Detector	PosPeak, NegPeak, Sample, Average, RMS, MaxPower
RBW	0.1 Hz-10 MHz
VBW	0.1 Hz-10 MHz
Data chart	SASstudio4 software provides spectrum, waterfall chart, and historical trace
Measurements	Channel power, OBW, X dB bandwidth, Adjacent channel power ratio, IM3

Sweep speed	SAM-60 M3	SAM-80
RBW = 250kHz FPGA spur reject = standard	about 379 GHz/s	about 339 GHz/s
RBW = 250 kHz FPGA spur reject = enhanced	about 179 GHz/s	about 170 GHz/s
RBW = 30 kHz FPGA spur reject = enhanced	about 9 GHz/s	about 8 GHz/s
RBW = 1 kHz CPU spur reject = enhanced	about 1.3 GHz/s	about 1.2 GHz/s

IQ RECORDING

Burst recording bandwidth	Maximum: 100 MHz The built-in memory depth is 128 Mbytes
Continuous recording bandwidth	Maximum: 50 MHz Limited by the bandwidth of USB interface and hard disk. The storage depth is limited by the hard disk capacity
IQ sample rate	125MSPS, decimate factor: 1,2,4,8,16,32,64,128,256,512,1024,2048,4096 supported (FPGA)
External trigger response	Maximum response frequency 500 times/sec

DETECTION ANALYSIS

Lowest time resolution	8 ns
Max. analysis bandwidth	100 MHz
Detector	PosPeak, NegPeak, Sample, Average, RMS, MaxPower

REAL TIME SPECTRUM ANALYSIS

FFT analysis

FFT engine is implemented in FPGA. Frame compression and trace detection are supported. No missing samples between FFT frames

FFT frame update rate = $10^9 \text{ ns} / (N * D * 8 \text{ ns})$; POI = $N * D * 8 \text{ ns}$
 N for FFT points (2048, 1024, 512, 256, 128, 64, 32)
 D for decimate factor (1, 2, 4, 8...)

Typical settings	FFT refresh rate	POI
N = 2048, D = 1	61,035 times/sec	16.384 us
N = 32, D = 1	3,906,250 times/sec	0.256 us

Max. analysis bandwidth

100 MHz

Window function

B-Nuttall, Flat-top, LowSideLobe

RBW

14.73 MHz-3.59 kHz (Flat-top)
 7.81 MHz-1.90 kHz (B-Nuttall)
 13 grades for each window type

Amplitude resolution

0.75 dB

GENERAL

Input and output

Power supply

Type-C, dedicated power supply port. Acceptable voltage range: 4.75 to 5.25 V (ripple < 0.2 Vpp). Device will fetch up to 2 A current from this port

Data interface

Type-C, USB3.0 and USB2.0 (lower bandwidth)
 Device will fetch up to 1 A current from this port

RF input

SMA (F), Input impedance 50 Ω

RF output

SMA (F), Input impedance 50 Ω

Reference input

MCX (F), amplitude $\geq 1.5 \text{ Vpp}$, input impedance is 330 Ω

Reference output

Unavailable

External trigger input

Type-C, 3.3 V CMOS, input: high impedance

External trigger output

Type-C (3), 3.3 V CMOS

Analog IF output

Unavailable

SAM-60 M3

SAM-80

Power consumption

7-10 W

9-12 W

Enclosure

Core with no enclosure and fan is provided

Size (D * W * H) and weight	156x62x22 mm and about 278 g	
GNSS synchronization	External GNSS (opt21)	+/- 100 ns
	External GNSS (opt22)	+/- 75 ns
	External GNSS (opt23)	+/- 50 ns
System requirements	Windows 11/10/8/7	x86, x64
	Debian 12/11/10	x64, AArch64
	Ubuntu 24.04/22.04/20.04/18.04	x64, AArch64
Operating temperature (ambient/core)	T0 class (std.)	0-50 °C/0-70 °C
	T1 class (opt40)	-20-65 °C/-20-85 °C
	T2 class (opt41)	-40-85 °C (core)
Storage temperature (ambient)	T0 class (std.)	-20-70 °C
	T1 class (opt40)	-40-85 °C
	T2 class (opt41)	-40-85 °C (core)
Packaging and accessories	Flash disk * 1, USB 3.0 cable * 2, power adapter * 1	

*Specification applies under the following conditions:

- (1) Start up and warm up for 10 minutes
- (2) Ambient temperature 25 °C (core temperature 50 °C)
- (3) Stand spectrum analysis mode-spurious rejection enhance on.
- (4) Necessary heat dissipation is provided to ensure the ambient and core temperature within the rated range at the same time

OPTIONS

Code		
01	Built-in OCXO reference clock	built-in hardware
02	Built-in signal generator	built-in hardware
20	MUXIO IO board	accessory
21	External GNSS	accessory
22	External high precision GNSS	accessory
23	External GNSS disciplined OCXO reference clock	accessory
34	External omnidirectional antenna, 400-8000MHz, Gain<2dBi	accessory
40	T1 temperature class	built-in hardware
41	T2 temperature class, only available for core	built-in hardware
71	Basic digital modulation analysis	software
72	Pulse signal measurement	software

BUILT-IN SIGNAL GENERATOR (opt02)

Frequency range	100 kHz-6.3 GHz, step 10 Hz	
Power range	-50 dBm-0 dBm, 0.25 dB for each step	
VSWR	<2.0:1	30 MHz-6.3 GHz
Non-harmonic spurs	<-50 dBc	

Harmonics

Frequency range	Second harmonic	Third harmonic and above
100 kHz-30 MHz	<-10 dBc	<-10 dBc
30 MHz-1.6 GHz	<-10 dBc	<-10 dBc
1.6 GHz-3 GHz	<-20 dBc	<-20 dBc
3 GHz-3.2 GHz	<-20 dBc	<-20 dBc
3.2 GHz-6.3 GHz	<-20 dBc	<-20 dBc

Leakage to receiver

100 kHz-30 MHz	>90 dBc
30 MHz-3 GHz	>80 dBc
3 GHz-6.3 GHz	>70 dBc

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