



USB REAL-TIME SPECTRUM ANALYZER

SAM SERIES
6.3/8.5 GHz

Key facts

Frequency range: 9 kHz - 6.3/8.5 GHz

1 GHz DANL: -163 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

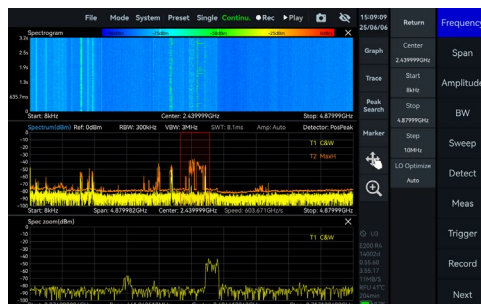
Windows 11/10/8/7 (x86, x64) are supported

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

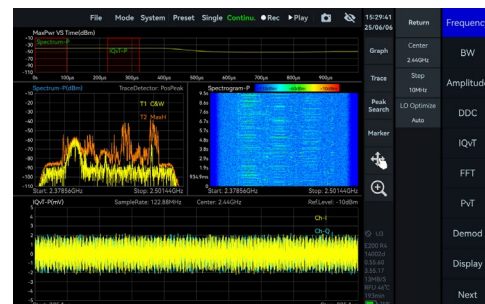
Ubuntu 24.04/22.04/20.04/18.04 (x64, AArch64) are supported

Applications

Standard spectrum sweep



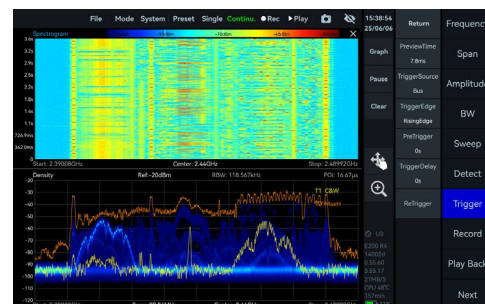
IQ streaming and analysis



Power vs time analysis



Real-time analysis



Specifications*

FREQUENCY

Frequency range	SAM-60	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 disciplined OCXO (opt23)	<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 disciplined OCXO (opt23)	<1 ppm/year, <0.05 ppm

SPECTRUM PURITY

SSB phase noise (dBc/Hz)				
	SAM-60		SAM-80	
Carrier frequency	1 GHz	6.3 GHz	1 GHz	8.5 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		SAM-80	
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)				
	SAM-60		SAM-80	
Carrier frequency	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=1 kHz

	SAM-60		SAM-80	
Reference level	-20 dBm	-50 dBm	-20 dBm	-50 dBm
9 kHz - 1 MHz	-135.9	-148.5	-141.4	-151.7
1 MHz - 30 MHz	-140.7	-162.8	-154.2	-161.6
30 MHz - 3.0 GHz	-152.1	-163.9	-150.8	-167.1
3.0 GHz - 6.3 GHz	-151.3	-162.0	-155.6	-164.7
6.3 GHz - 8.5 GHz	-	-	-144.0	-157.2

STANDARD SPECTRUM ANALYSIS

Detector	PosPeak, NegPeak, Sample, Average, RMS, MaxPower
RBW	0.1 Hz - 10 MHz
VBW	0.1 Hz - 10 MHz
Data chart	SASudio4 software provides spectrum, spectrogram, and historical trace
Measurements	Channel power, OBW, XdB bandwidth, Adjacent channel power ratio, IM3

Sweep speed	SAM-60	SAM-80
RBW = 250kHz FPGA Spur reject = standard	about 378.6 GHz/s	about 355.2 GHz/s
RBW = 250 kHz FPGA Spur reject = enhanced	about 191.1 GHz/s	about 176.9 GHz/s
RBW = 50 kHz FPGA Spur reject = enhanced	about 59.9 GHz/s	about 58.2 GHz/s
RBW = 1 kHz CPU Spur reject = enhanced	about 1.0 GHz/s	about 1.0 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	Maximum: 125 MSPS decimate factor: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096
External trigger response	Maximum response frequency 500 times/s

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/s	16.384 us
N = 32, D = 1	3,906,250 times/s	0.256 us

Max. analysis bandwidth	100 MHz
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RBW	14.73 MHz - 3.59 kHz (Flat-top) 7.81 MHz - 1.90 kHz (B-Nuttall) 13 grades for each window type
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Window function	B-Nuttall, Flat-top, LowSideLobe
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Amplitude resolution	0.75 dB
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GENERAL

Input and output

Power	Type-C, power supply dedicated port, please provide 5V2A peak power supply capacity Allowable voltage range 4.75 - 5.25 V, ripple less than 200mVp
Data	Type-C, USB 3.0 (USB 2.0 available but bandwidth limited) 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
External reference clock input	MCX (F), amplitude $\geq 1.5 \text{ Vpp}$, input impedance is 330 Ω
Reference clock output	Unavailable
External trigger input	Type-C, 3.3 V CMOS, input: high impedance
Trigger output	Type-C, 3.3 V CMOS
Analog IF output	Unavailable

Power consumption	SAM-60	SAM-80
	7 - 10 W	9 - 12 W
Size (D * W * H) and weight	156 * 62 * 22 mm and about 290 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
- (5) Sweep speed and display average noise level test conditions: MCU:0.55.57,FPGA:0.55.22,API:0.55.61

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 demodulation	software
72	Pulse detection	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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