

# SRA-400

## Handheld Real-Time Spectrum Analyzer

40GHz · Powerful Performance · 1.5kg Ultra Portable



Saluki Technology Inc.



# SRA-400 Introduction

## Efficient desktop instrument · Ultimate portable device

- **Powerful Core**

The advanced receiver core, through complex high-density mixed signal design and precise assembly process, condenses thousands of components into a volume only the size of a mobile phone, and the use of every inch of space has been carefully considered. Thanks to advanced design and precision technology, the SRA series real-time spectrum analyzer has a breakthrough small size, low weight, low power consumption, and balanced and excellent RF performance and analysis capabilities.

- **High-Speed Analysis And Real-Time Spectrum**

Using high-speed FPGA to complete high-speed signal processing, it has outstanding performance and power consumption advantages, bringing users an extremely fast experience beyond traditional designs. The SRA series can seamlessly complete real-time spectrum analysis of signals up to 100MHz bandwidth, and achieve THz/s-level high-speed scanning, greatly enhancing interference detection under panoramic scanning, without having to endure the slow scanning of small RBW in traditional spectrum analyzers.

- **Extremely Portable Handheld Device**

Ultra-light design, weighing only 1.4kg, equipped with a side hand strap, can be easily held in one hand, supporting hanging strap and handless operation. The standard battery capacity can provide more than 3 hours of typical working time, and can be extended to ultra-long battery life through a power bank. The spectrum analyzer application software SAstudio4 provides a tablet mode for handheld work, providing gesture operation, control bar hiding and other functions, optimizing the efficiency of use in the handheld state.

- **Efficient Workstation**

The instrument comes with a standard stand, which can be placed firmly on the desktop. The smart body effectively saves desktop space, and the 10.1-inch touch screen provides a good interactive experience. At the same time, it provides high-resolution extended display output through Micro-HDMI to connect additional monitors; provides multiple USB interfaces for connecting mice and keyboards; spectrum analyzer measurement software SAstudio4 provides a special workstation mode to optimize mouse and keyboard operations and multi-monitor presentation, making the PX product an efficient desktop RF workstation.

## Features

Frequency range: 9 kHz-40 GHz	SHR architecture, 11-segments pre-selected filters
Sweep speed > 900 GHz/s (RBW ≥ 300 kHz)	Analytical bandwidth: 100 MHz (std.), 110 MHz (opt.)
Standard preamplifier, DANL: -168 dBm/Hz (typ.)	SSB Phase Noise: -100 dBc/Hz @10kHz (1 GHz typ.)
Typical IF rejection > 90dB	Typical image suppression: 90 dB (≤9 GHz), >60 dB (≤20 GHz)
Channel power, ACPR, IM3, OBW, Phase noise	Real-time spectrum analysis based on FPGA, 100% POI < 3us
Analog modulation analysis: AM/FM	Time domain IQ, PvT, real-time spectrum R&P



Spectrum scan rate up to 900GHz/s (RBW $\geq$ 300kHz)	Standard multi-mode GNSS positioning and timing
Weight: 1.4 kg, 10.1-inch all touch screen	Battery life: 3h+, support power bank supply
3 years warranty	Unbelievable price
Provides various interfaces such as analog IF output, external reference input, trigger input	HDMI interface support, expandable desktop station
Standard measurement functions include channel power, adjacent channel suppression ratio, third-order intermodulation, occupied bandwidth, phase noise	Desktop and handheld dual-purpose, detachable protective shell, supports one-handed holding, supports hands-free operation

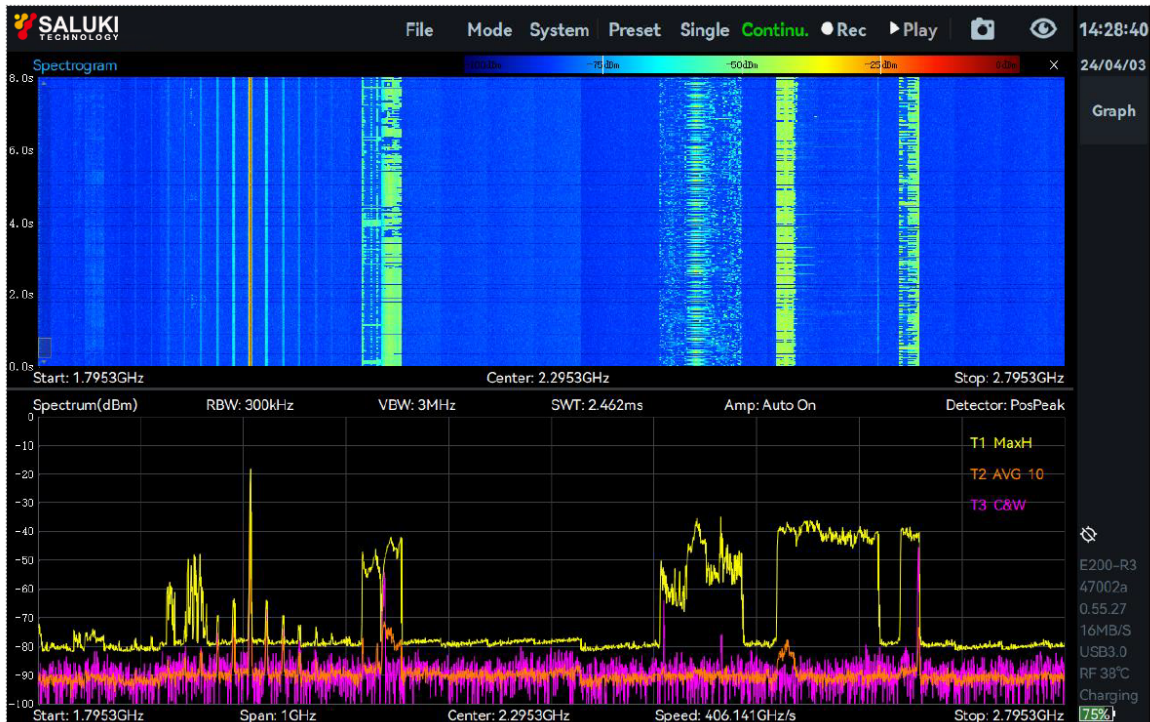




## Working model overview

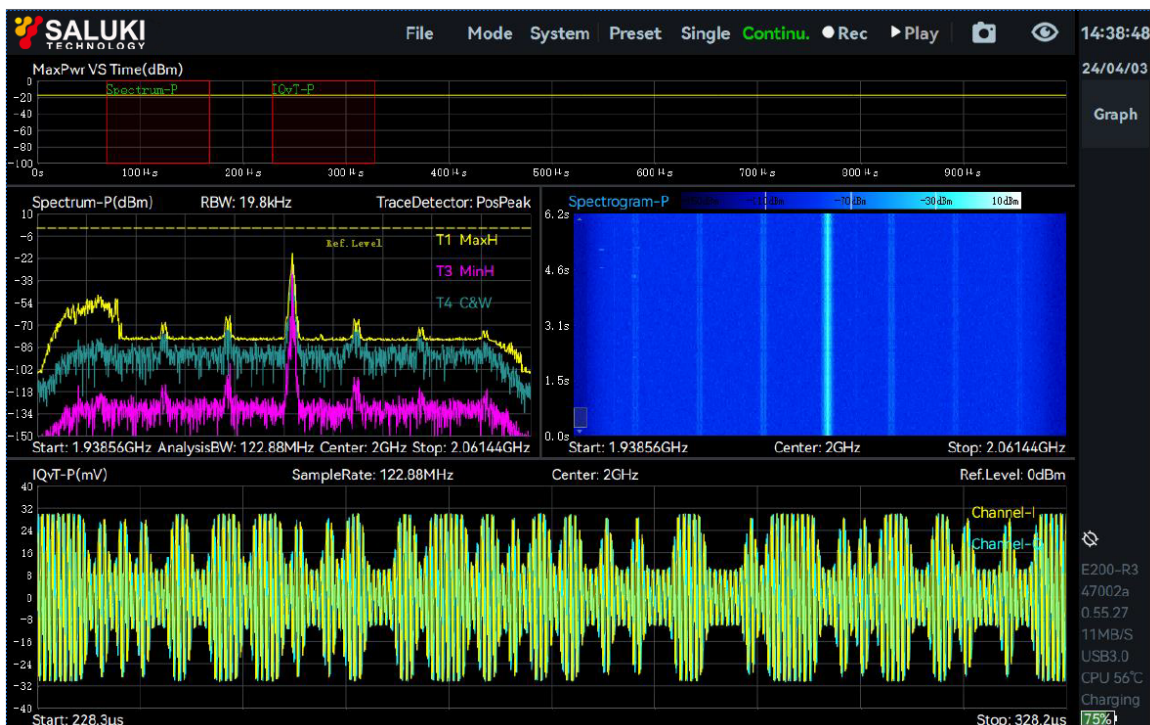
- **Standard Spectrum Mode**

This mode Provides standard spectrogram, waterfall graph, probability density graph, phase noise graph and other measurement graphs. It offers measurement functions such as channel power, adjacent channel suppression, occupied bandwidth, XdB bandwidth, phase noise, and IM3.



- **IQ Streaming Mode**

This mode provides time domain and spectrum view of IQ waveform, DDC function and AM/FM demodulation function, and delivers modulation depth and modulation frequency offset test.





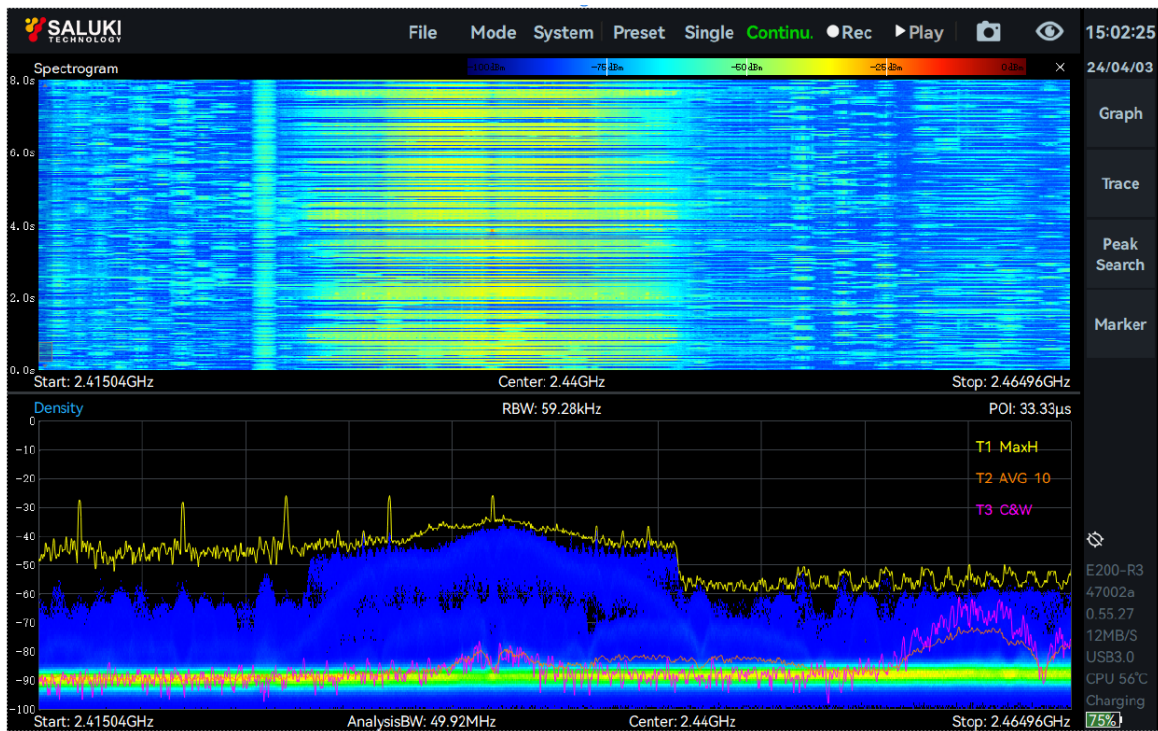
- **Power Detection Mode (Zero Span)**

This mode provides power time diagram (PvT) and its scaling, timing trigger, level trigger and other triggers.



- **Real-time spectrum Analysis mode**

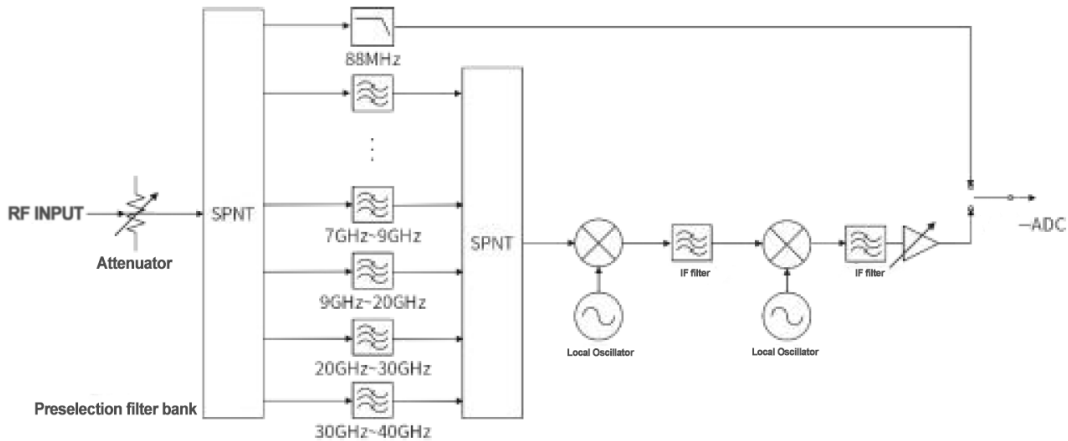
This mode provides spectrum, probability density graph, waterfall graph and other measurement graphs. It offers timing trigger, level trigger and other triggers.





## Technical Characteristics

- Direct sampling channels are used at frequencies up to 88MHz, and superheterodyne mixing channels are used at frequencies between 88MHz and 40GHz. Within 8.2GHz, relatively dense preselection filters are distributed;
- Above 8.2GHz, the number of preselection filters is limited, and only partial anti-interference capabilities and very limited image suppression are provided. In standard spectrum mode, SAN-400 M2 can provide additional image suppression capabilities by turning on the spurious suppression algorithm (not available in other modes).
- The following shows the image suppression and intermediate frequency suppression of each frequency band.



Simplified block diagram of RF section

Frequency band	Spurious rejection on		Spurious rejection off	
	Image Rejection	IF Suppression	Image Rejection	IF Suppression
90MHz to 3.35GHz	≥90dBc	≥90dBc	≥90dBc	≥90dBc
3.35GHz to 4.35GHz	≥90dBc	≥90dBc	≥83dBc	≥90dBc
4.35GHz to 5.35GHz	≥90dBc	≥90dBc	≥79dBc	≥90dBc
5.35GHz to 6.6GHz	≥90dBc	≥90dBc	≥81dBc	≥90dBc
6.6GHz to 7.55GHz	≥90dBc	≥90dBc	≥84dBc	≥90dBc
7.55GHz to 8.2GHz	≥90dBc	≥90dBc	≥90dBc	≥90dBc
8.2GHz to 12GHz	≥90dBc	≥90dBc	≥25dBc	≥68dBc
12GHz to 18GHz	≥90dBc	≥90dBc	≥15dBc	≥76dBc
18GHz to 21.75GHz	≥90dBc	≥90dBc	≥21dBc	≥76dBc
21.75GHz to 25GHz	≥90dBc	≥90dBc	No suppression or only a few components are suppressed	≥90dBc
25GHz to 29.95GHz	≥90dBc	≥90dBc		≥90dBc
29.95GHz to 33GHz	≥90dBc	≥90dBc		≥90dBc
33GHz to 35GHz	≥68dBc	≥90dBc		≥90dBc
35GHz to 40GHz	≥58dBc	≥90dBc		≥90dBc

\*Reference level =0dBm



## Technical Specifications \* (typical value)

Test basis	Hardware Version: R2V2		API: 0.55.30	FPGA: 0.55.8	MCU: 0.55.30	SAS4: 1.55.42
Frequency						
Frequency Range	9 kHz to 40 GHz					
Initial Frequency Accuracy	<1 ppm, supporting program manual correction					
Reference Clock	Internal or external, program-controlled switching Internal TCXO aging<1 ppm/year, temperature drift<1 ppm Internal OCXO (option): temperature drift <0.15 ppm GNSS disciplined OCXO (option): <0.1 ppm (lock), <0.3 ppm (keep)					
Spectrum Purity						
SSB Phase Noise	dBc/Hz					
Carrier Frequency	1 GHz	3 GHz	10 GHz	20 GHz	40 GHz	
1 kHz	-99.0	-96.1	91.4	-85.6	-78.4	
10 kHz	-107.5	-105.0	-99.5	-94.6	-85.7	
100 kHz	-107.7	-105.6	-99.6	-94.9	-85.1	
1 MHz	-122.7	-122.2	-115.7	-111.4	-100.8	
10 MHz	-132.1	-131.3	-130.5	-126.6	-122.8	
Residual Response Spurious rejection off dBm RBW =1 kHz Positive Peak Detector	Frequency Range	R.L.=0 dBm		R.L.=-20 dBm		
		Spurious rejection off	Spurious rejection on	Spurious rejection off	Spurious rejection on	
	9 kHz to 10 GHz	< -72	< -72	< -93	< -93	
	10 GHz to 20 GHz	< -91	< -94	< -109	< -113	
	20 GHz to 30 GHz	< -85	< -90	< -104	< -107	
30GHz to 40GHz	< -89	< -92	< -107	< -110		
Image Frequency Suppression	>90dBc; except 33GHz to 40GHz, >58dBc; Please refer to Technical Characteristics					
IF rejection (spurious rejection on)	>90dBc; except 8.2GHz to 21.75GHz, >68dBc					
IF rejection (spurious rejection off)	>90dBc					
Local Oscillator Related Spurious	<-65 dBc (Offset Center Frequency $\pm (N/M)*125$ MHz, $N/M = 1,2,3,4,5\dots$ )					
Input Related Spurious	<-60 dBc; Please refer to Technical Characteristics					
Signal Processing						
Analysis Bandwidth	Maximum 100 MHz, Decimate Factor: 1					
IQ Data	122.88 MSPS, decimate factor: 1,2,4,8,16,32,64,128,256,512,1024,2048,4096 supported (FPGA)					
IQ Data Cache Depth	128 MBytes					
	When the data generation rate is smaller than the EMMC write rate, the cache depth depends only on the EMMC capacity					
External Trigger Response	Maximum response frequency 500 times/sec					
Analog IF Output	Supporting, 307.2 MHz $\pm$ 50 MHz					
Amplitude						
Maximum safe input power (CW)	23 dBm		88 MHz to 40 GHz and the preamplifier off			
	10 dBm		9 kHz to 88 MHz or preamplifier on			

Maximum DC Voltage	±10 VDC			
Display Range	DANL to 23 dBm			
Amplitude Accuracy	± 2.0 dB (9kHz to 9GHz) ; ± 3.0 dB (>9GHz)			
IF in band spectrum ripple	± 1.75 dB (Analog IF BW Scale = 1); ± 2.0 dB (Analog IF BW Scale = 0)			
Reference level	-50 dBm to 23 dBm			
RF Preamplifiers	\			
Displayed Average Noise Level (DANL) dBm/Hz RBW = 10 kHz RMS detector	Frequency Range	R.L.= 0 dBm	R.L.= -20 dBm	R.L.= -50 dBm
	9 kHz	-121	-134	-145
	100 kHz to 88 MHz	-132	-151	-157
	1 GHz	-136	-155	-161
	88 MHz to 9.0 GHz	-132	-148	-148
	9.0 GHz to 19.0 GHz	-130	-151	-158
	19.0 GHz to 30 GHz	-127	-145	-149
30.0 GHz to 40 GHz	-128	-146	-147	
Standard Spectrum Analysis				
Detector	Positive peak, Negative peak, Sampling, Average, RMS, Max Power			
RBW	0.1 Hz to 10 MHz			
VBW	0.1 Hz to 10 MHz			
Trace Function	Sample, Positive Peak, Negative Peak, Local average, Maximum hold, Minimum hold, Average			
Data Chart	SAStudio4 software provides regular spectrum, waterfall chart, and historical trace			
Measurements	Phase noise, Channel power, Occupied bandwidth, X dB bandwidth, Adjacent channel suppression, IM3			
Sweep speed - Standard Spectrum Analysis	490GHz/s	FPGA	RBW≥1 MHz, B-Nuttal window, spurious rejection: Bypass	
	500 GHz/s	FPGA	RBW=250 kHz, B-Nuttal window, spurious rejection: Standard	
	65 GHz/s	FPGA	RBW=30 kHz, B-Nuttal window, spurious rejection: Bypass	
	2.4 GHz/s	CPU	RBW=1 kHz, B-Nuttal window, spurious rejection: Bypass	
Detection Analysis/Zero Span				
Highest Time Resolution	8 ns			
Maximum Analysis Bandwidth	100 MHz			
Detector	Positive peak, Negative peak, Sampling, Average, RMS, Max Power			
Real Time Spectrum Analysis				
FFT Analysis	Variable point FFT engine implemented by FPGA. frame rate compression and trace detection are supported. There is strictly no gap and overlap between FFT frames			
	FFT refresh rate = $10^9 \text{ ns} / (N \cdot D \cdot 8 \text{ ns})$ ; POI = $2 \cdot N \cdot D \cdot 8 \text{ ns}$ N is the number of FFT points (2048,1024,512,256,128,64,32), D is the 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
Real-time Bandwidth	Analysis 100 MHz			
Window Function	B-Nuttall, FlatTop			
RBW	14.73 MHz to 3.59 kHz (FlatTop); 7.81 MHz to 1.90 kHz (B-Nuttall); 13 grades for each window type			
Amplitude Resolution	0.75 dB			



General information		
Input and output	Power Supply	USB PD (20 V)
	USB interface	USB3.0 Type-C*1, USB2.0 Type-C*1, USB2.0 Type-A*1
	Video and audio interface	Micro HDMI*1 (Support for extended display), 3.5mm Headphone port*1
	RF input	2.92 (F), Input impedance 50 Ω
	External reference clock input	MMCX (F)(1), amplitude≥1.5 Vpp, input impedance 330 Ω
	External reference clock output	Integrated in MUXIO, 3.3 V CMOS, programmable on/off
	External trigger input	Integrated in MUXIO, 3.3V CMOS, input: high impedance
	External trigger output	Integrated in MUXIO, 3.3V CMOS
	Analog IF Output	MMCX (F)(2), maximum output power -25 dBm, output impedance 50 Ω
Display	IPS LCD 1280x800, 10.1inch multi-touch screen	
EMMC storage	16 GB	
Size (D * W * H) and weight	246x76x33 mm, ≤1.3kg 259.5x184.5x45.5 mm, ≤1.5 kg (including protective shell and bracket)	
Power Consumption	Typical 25 W	
Power adapter	100-240 V, 50/60 Hz USB PD	
Operating Temperature	0 to 50 °C	
Storage Temperature	-20 to 70 °C	
Packaging and Accessories	Standard	<ol style="list-style-type: none"> <li>1. Spectrum analyzer with protective shell*1</li> <li>2. Power adapter*1</li> <li>3. Power cable*1</li> </ol>
	Optional Accessories	<ol style="list-style-type: none"> <li>1. Hard transport case;</li> <li>2. N-type 18G test cable;</li> <li>3. 50G test cable;</li> <li>4. N-3.5mm adapter 18GHz;</li> <li>5. 2.4mm adapter;</li> </ol>

\*The typical values of the indicators are applicable for the following conditions: (1) Start up and warm up for 10 minutes; (2) Ambient temperature 25 °C; (3) standard spectrum sweep Spurious rejection off; (4) 100MHz bandwidth and IFGainGrade=2

No	Opt.	Explanation
01	Built-in OCXO reference clock	Providing a reference clock with better stability than the standard configuration, with a temperature drift of<0.15 ppm
02	Build-in premium GNSS	Providing improved positioning and timing capabilities.
03	Build-in GNSS disciplined OCXO reference clock	Providing GNSS disciplined reference clock and 1PPS