HAROGIC

PXN-400 HANDHELD SPECTRUM ANALYZER

PXN-400 Introduction

Real Portable · Real Performance · Real Affordable

PXN-400 is the latest 40 GHz handheld spectrum analyzer from HAROGIC Technologies. Building on continuous innovation and SWaP-C design principle, it offers an unmatched combination of size, performance and cost. RF measurements and analysis from 9kHz to 40 GHz is now carried out in a robust instrument with 10.1-inch full-touch screen and weight of only 1.5 kg.

PXN-400 is a 40 GHz spectrum analyzer with analytical bandwidth of 100 MHz and ultra-fast speed of 500 GHz/s, delivering standard spectrum sweep (SWP), IQ streaming (IQS), zero span (DET) and real-time analysis (RTA) working mode. It is equipped with preamplifier and 11-segment preselector, achieving good dynamic range and phase noise level. It can provide customers with spectrum analyzer, spectrum monitoring, interference finding, RF test and measurement functions.

Features Highlights

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Frequency range: 9 kHz-40 GHz;	SHR architecture, 11-segments pre-selected filters;
Sweep speed > 500 GHz/s (RBW ≥ 300 kHz);	Analytical bandwidth: 100 MHz (std.)
Preamplifier (std.), 1GHz DANL: -161 dBm/Hz (typ.);	1GHz Phase Noise: -107 dBc/Hz @10kHz (typ.);
Typical IF rejection > 90dB;	Typical image suppression: 90 dB (90 MHz-33 GHz), >58 dB (33-40 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, digital demodulation;
Weight: 1.5 kg, 10.1-inch all touch screen;	Battery life: 3h+, support power bank supply;
3 years warranty.	HDMI interface support, extended desktop station

Working model overview

PX series is capable of four working modes, including SWP (standard spectrum analysis), IQS (IQ streaming), DET (power detection analysis or zero span), and RTA (real-time analysis).

Standard Spectrum Analysis (SWP): the instrument works via frequency hopping to obtain panoramic scanning data. The capabilities of SWP mode include: panoramic scanning, waterfall graph, record and playback, phase noise, IM3, channel power, XdB, OBW, ACPR.
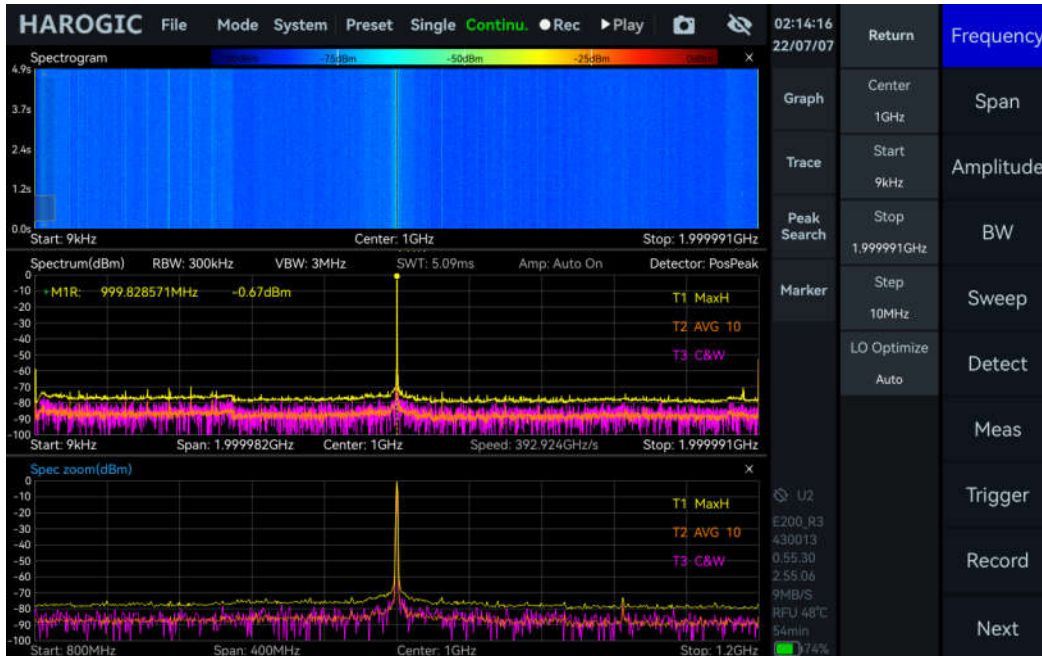

IQ Streaming (IQS): time domain IQ data is obtained at fixed frequency points for further spectrum analysis and demodulation. The capabilities of IQS mode include: observation of IQ time domain waveforms and corresponded spectrum data, recording and playback, demodulation, and digital down-conversion (DDC).
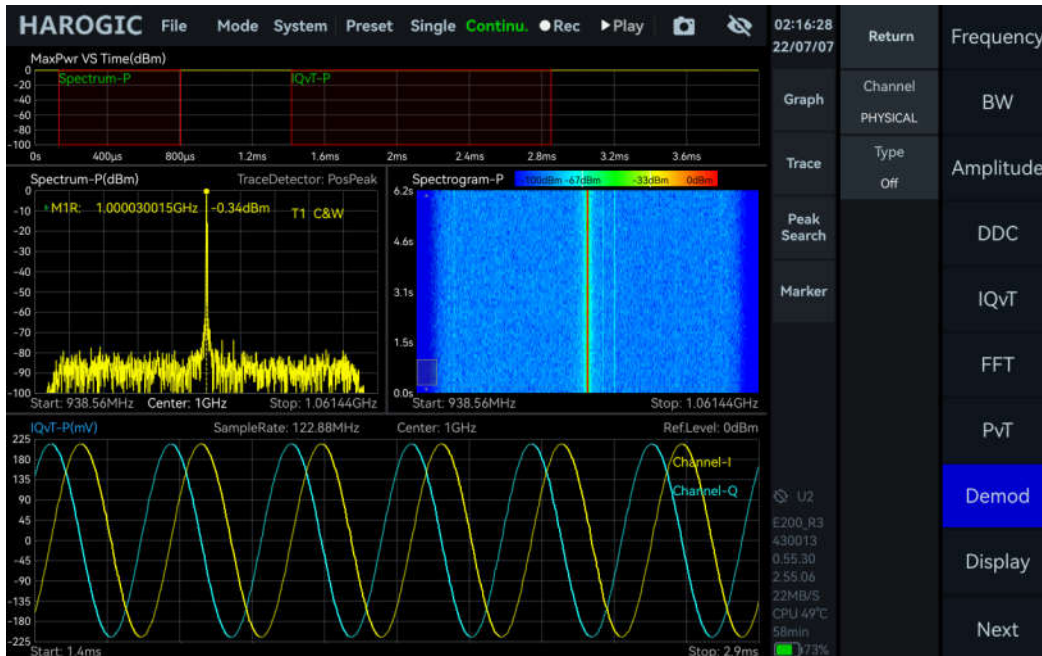
Detection Analysis Mode (DET): Time domain IQ data is obtained for processing under continuous power detector. Then power-time relationship of the signal is obtained. DET mode also provides you with power waveform observation and analysis, record and playback.


Real-time Spectrum Mode (RTA): Time domain IQ data is obtained for processing under continuous FFT analysis to ensure that each time-domain sample point is included in the FFT analysis at least once. RTA mode provides you with real-time spectral probability density plots, record and playback, and waterfall graph.
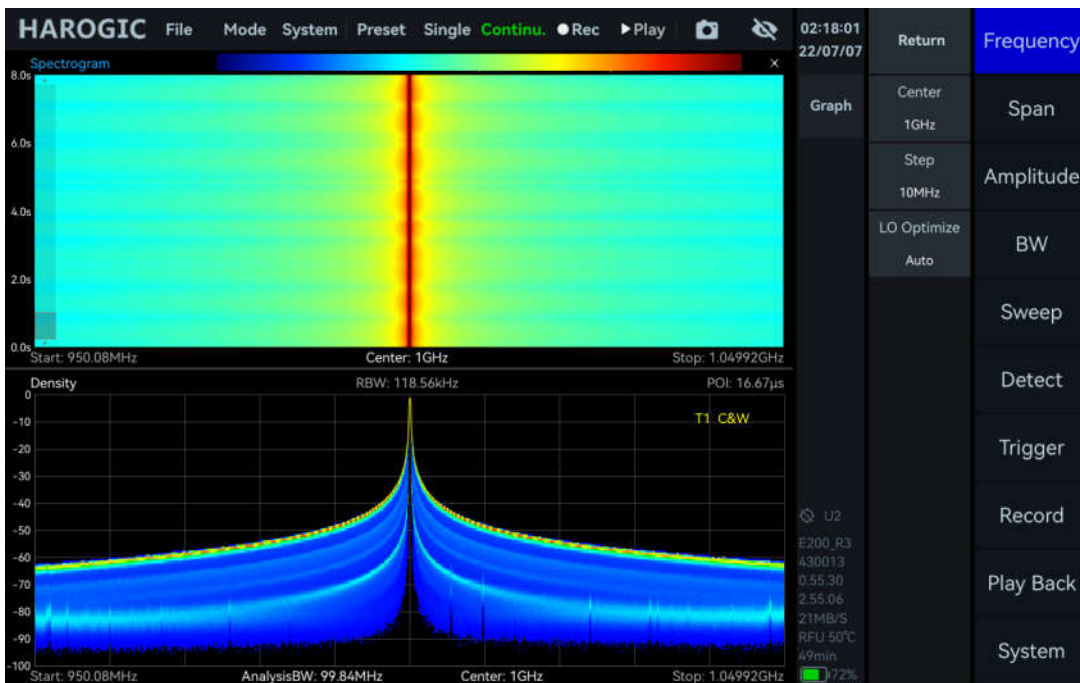
Technical Characteristics

The PXN-400 uses a direct sampling channel at 88 MHz and below, and a superheterodyne mixing channel at 88 MHz to 40 GHz. Within 7.8 GHz, enough preselected filter is distributed. Above 7.8 GHz, the number of preselected filters is limited and can only provide partial anti-jamming capability with very limited image suppression. PXN-400 provides additional image suppression by turning on the spurious suppression algorithm in standard spectrum sweep mode (not valid in other analysis modes). The image suppression and intermediate frequency suppression of each frequency band are given below.
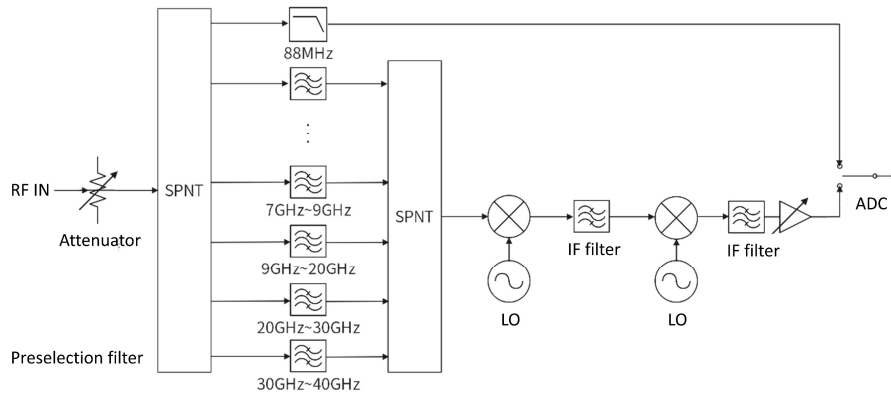
PXN-400 RF section simplified block diagram

Frequency range	Spurious rejection on		Spurious rejection off	
	image suppression	IF suppression	image suppression	IF suppression
90MHz~3.35GHz	≥90dBc	≥90dBc	≥90dBc	≥90dBc
3.35GHz~4.35GHz	≥90dBc	≥90dBc	≥83dBc	≥90dBc
4.35GHz~5.35GHz	≥90dBc	≥90dBc	≥79dBc	≥90dBc
5.35GHz~6.6GHz	≥90dBc	≥90dBc	≥81dBc	≥90dBc
6.6GHz~7.55GHz	≥90dBc	≥90dBc	≥84dBc	≥90dBc
7.55GHz~8.2GHz	≥90dBc	≥90dBc	≥90dBc	≥90dBc
8.2GHz~12GHz	≥90dBc	≥90dBc	≥25dBc	≥68dBc
12GHz~18GHz	≥90dBc	≥90dBc	≥15dBc	≥76dBc
18GHz~21.75GHz	≥90dBc	≥90dBc	≥21dBc	≥76dBc
21.75GHz~25GHz	≥90dBc	≥90dBc	No suppression or suppression of only a few components	≥90dBc
25GHz~29.95GHz	≥90dBc	≥90dBc		≥90dBc
29.95GHz~33GHz	≥90dBc	≥90dBc		≥90dBc
33GHz~35GHz	≥68dBc	≥90dBc		≥90dBc
35GHz~40GHz	≥58dBc	≥90dBc		≥90dBc

*Reference Level = 0 dBm

SAN-400 M2 Technical Specifications * (typical value)

Indicator test basis	Hardware Version: R2V2	API: 0.55.30	FPGA: 0.55.8	MCU: 0.55.30	SAS4: 1.54.42

Frequency

Frequency Range	9 kHz~40 GHz
Initial Frequency Accuracy	<1 ppm，Supporting program manual correction
Reference Clock	Internal TCXO aging<1 ppm/year, temperature drift<1 ppm; Internal OCXO (option), temperature drift<0.15 ppm

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
10MHz	-132.1	-131.3	-130.5	-126.6	-122.8

Residual Response 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~10 GHz	-72	-72	-93	-93
	10 GHz~20 GHz	-91	-94	-109	-113
	20 GHz~30 GHz	-85	-90	-104	-107
	30 GHz~40 GHz	-89	-92	-107	-110

Image Frequency Suppression (Spurious rejection on)	90MHz~33GHz > 90 dBc; 33GHz~40GHz， > 58dBc; refer to technical characteristics for details
IF rejection (Spurious rejection off)	> 90 dBc while for 8.2 GHz~21.75 GHz, > 68 dBc
IF rejection (Spurious rejection on)	> 90 dBc
Local Oscillator Related Spurious	<-65 dBc (Offset Center Frequency +/- (N/M)*125 MHz, N,M = 1,2,3,4,5…)
Input Related Spurious (Spurious rejection on)	<-60 dBc; refer to technical characteristics for details

Signal Processing

Analysis Bandwidth	Maximum 100 MHz
IQ Data	122.88 MSPS, 1 Hz step 1,2,4,8,16,32,64,128,256,512,1024,2048,4096 supported.
Storage Depth	The built-in memory depth is 128 Mbytes
	Supports continuous and uninterrupted storage when the data generation rate is less than the bus bandwidth, and the storage depth is only limited by the hard disk capacity
External Trigger Response	Maximum response frequency 500 times/sec
Analog IF Output	Supporting 307.2 MHz +/-50 MHz

Amplitude

Maximum safe input power (CW)	23 dBm	88 MHz~40 GHz and pre-amplifier off
	10 dBm	100 kHz~88 MHz or pre-amplifier on
Maximum DC Voltage	+/-12 VDC	
Display Range	DANL~23 dBm	
Amplitude Accuracy	+/- 2.0 dB (9 kHz~9 GHz)； +/- 3.0 dB (> 9 GHz)	

IF in-band spectrum ripple	+/- 1.75 dB (Analog IF bandwidth 40 MHz); +/- 2.0 dB (Analog IF bandwidth 100 MHz)			
Reference level (R.L.)	-50 dBm~23 dBm			
RF Preamplifiers	Pre-amplifier as standard			
Display 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~88 MHz	-132	-151	-157
	1GHz	-136	-155	-161
	88 MHz~9 GHz	-132	-148	-148
	9 GHz~19 GHz	-130	-151	-158
	19 GHz~30 GHz	-127	-145	-149
	30 GHz~40 GHz	-128	-146	-147

Standard Spectrum Analysis

Detector	Positive peak, Negative peak, Sampling, Average, RMS, Max Power		
RBW	0.1 Hz~10 MHz		
VBW	0.1 Hz~10 MHz		
Trace Function	ClearWrite, Positive Peak, Negative Peak, Local average, Maximum hold, Minimum hold, Average		
Data Chart	SAStudio4 software provides regular spectrum, waterfall graph, and historical trace		
Measurements	Phase noise, Channel power, Occupied bandwidth, X dB bandwidth, Adjacent channel suppression, IM3		
Sweep speed - Standard Spectrum Analysis	400 GHz/s	FPGA	RBW≥1 MHz, B-Nuttal window, spurious rejection: Standard
	400 GHz/s	FPGA	RBW = 250 kHz, B-Nuttal window, spurious rejection: Standard
	30 GHz/s	FPGA	RBW=30 kHz, B-Nuttal window, spurious rejection: Standard
	1 GHz/s	CPU	RBW=1 kHz, B-Nuttal window, spurious rejection: Standard

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 ns/(N * D * 8 ns); POI = 2*N*D*8ns N is the number of FFT points (2048, 1024,512,256,128,64,32), and D is the decimate factor (1, 2, 4, 8...)		
	Typical Settings	FFT Refresh Rate	POI
	N = 2048，D = 1	61,035 times /second	16.384 us
	N = 32，D = 1	3,906,250 times /second	0.256 us
Real-time Analysis Bandwidth	100 MHz		
Window Function	B-Nuttall, FlatTop		
RBW	14.73MHz-3.59kHz (Flattop window);7.81MHz~1.90kHz (B-Nuttall); 13 grades for each window type		
Amplitude Resolution	0.75dB		

General

Input and Output	Power Supply	USB PD (20 V)

	Data	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	NMD2.4J/2.4J-150FEP-73
	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, 3.3 V CMOS, input: high impedance
	External trigger output	Integrated in MUXIO, 3.3 V CMOS
	Analog IF Output	MMCX (F) (2), maximum output power −25 dBm, output impedance 50 Ω
Display		IPS LCD 1280x800, 10.1-inch multi-touch screen
EMMC storage		16 GB
Size (D * W * H) and weight		246x76x33 mm, ≤1.4 kg 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		0~50 ºC
Storage Temperature		-20~70 ºC (Standard temperature class)
Packaging and Accessories		Spectrum analyzer with protective shell*1, Power adapter*1, Power cable*1, Carrying strap*1

*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 ℃; (3) standard spectrum sweep Spurious rejection off; (4) 100MHz bandwidth and IFGainGrade=2

Code Name	Option	Explanation
01	Built-in OCXO reference clock (hardware)	Providing a reference clock with better stability than the standard configuration, with a temperature drift of<0.15 ppm, increasing the overall power consumption by 0.8 W