# ⠿ HAROGIC

# PXE-200

# Handheld real-time spectrum analyzer

20GHz · Powerful Performance · 1.5kg Ultra Portable



## Product Brochure

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# PXE-200 Introduction

## Real Portable · Real Performance · Real Affordable

PXE-200 is the latest released 20 GHz handheld real-time time spectrum analyzer from HAROGIC Technologies. Building on continuous innovation and SWaP-C design principle, the PXE-200 offers an unmatched combination of size, performance and cost. RF measurements and analysis from 9kHz to 20 GHz is now carried out in a robust instrument with 10.1-inch full-touch screen and weight only 1.4kg.

PXE-200 is a 20GHz real-time spectrum analyzer with analytical bandwidth of 100 MHz and ultra-fast speed of 900 GHz/s, delivering standard spectrum sweep (SWP), IQ streaming (IQS), zero span (DET) and real-time analysis (RTA) working mode. The PXE-200 is equipped with preamplifier and 19-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

| | |
|---|---|
| Frequency range: 9 kHz-20 GHz; | SHR architecture, 19-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; |
| Weight: 1.4 kg, 10.1-inch all touch screen; | Battery life: 3h+, support power bank supply; |
| 3 years warranty. | HDMI interface support, expandable desktop station; |



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# 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.
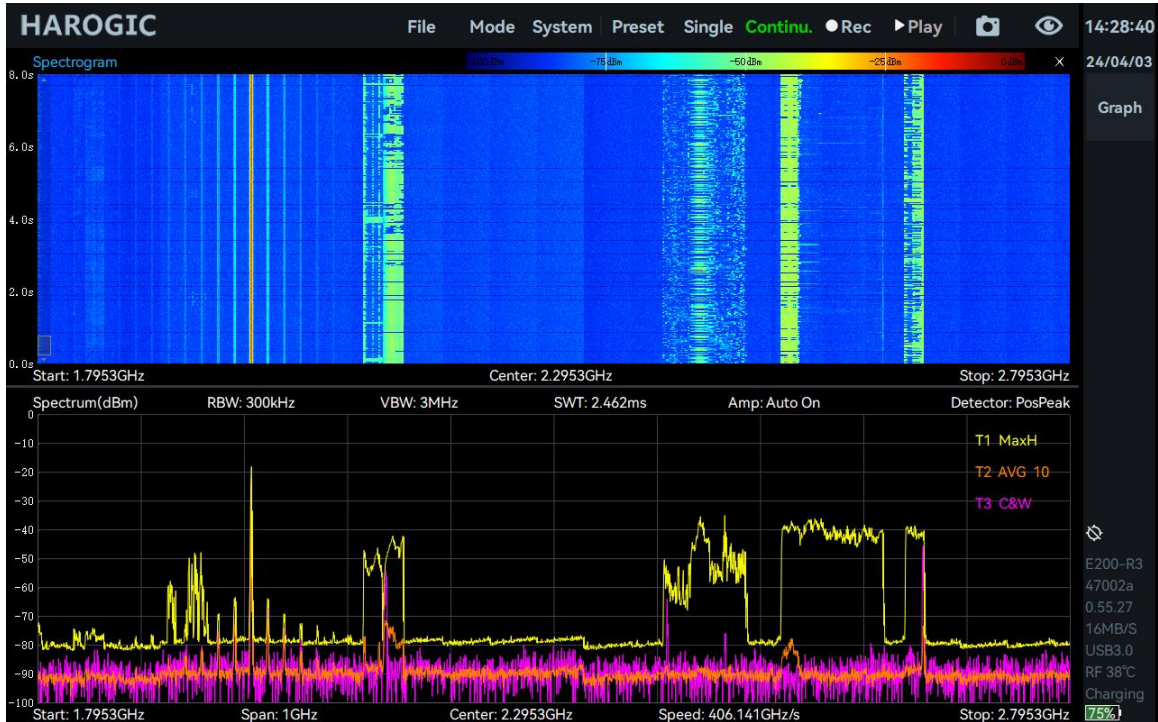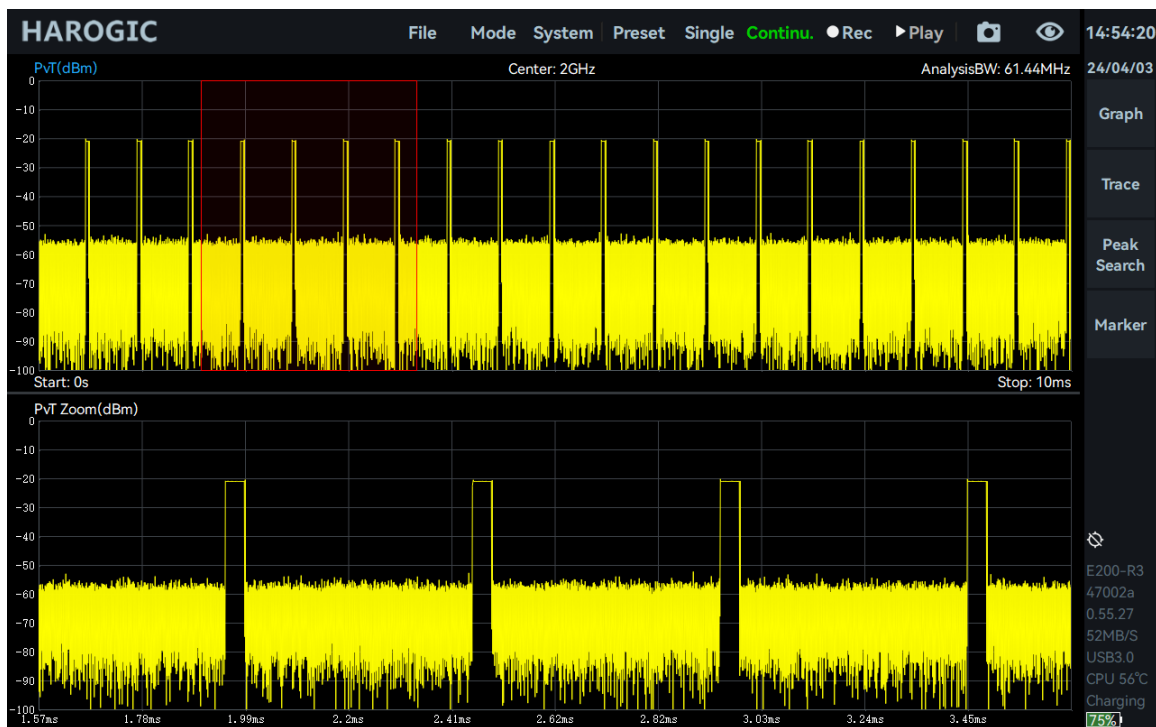


## IQ Streaming Mode

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.
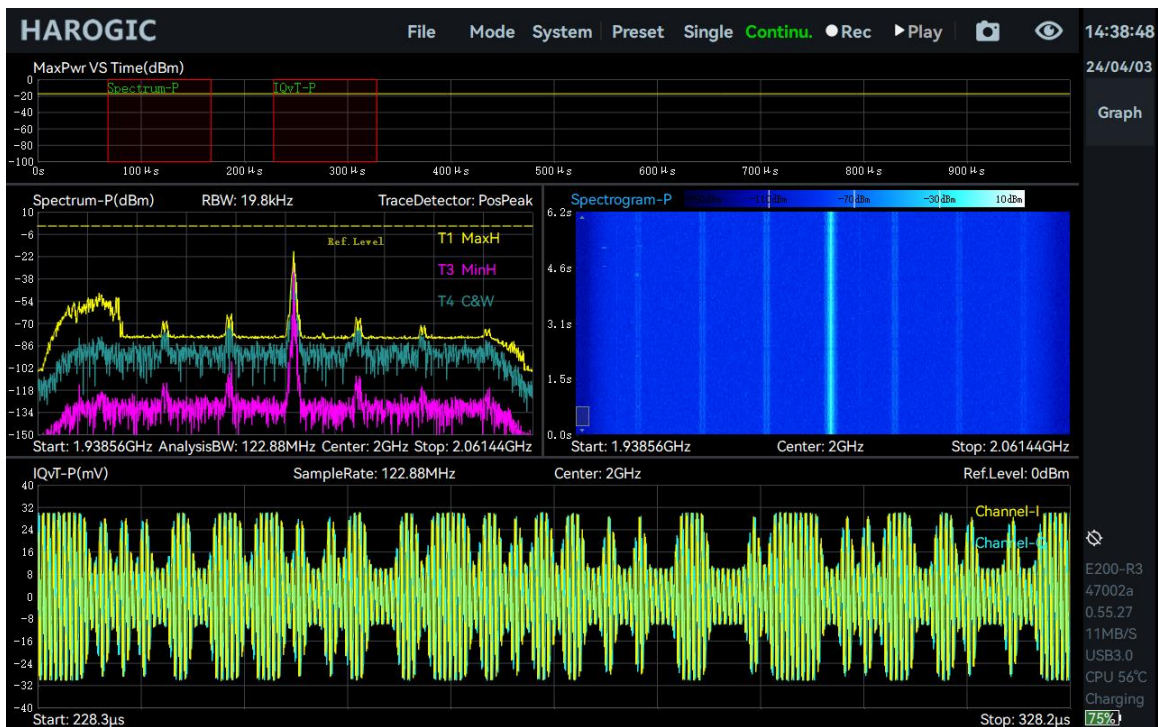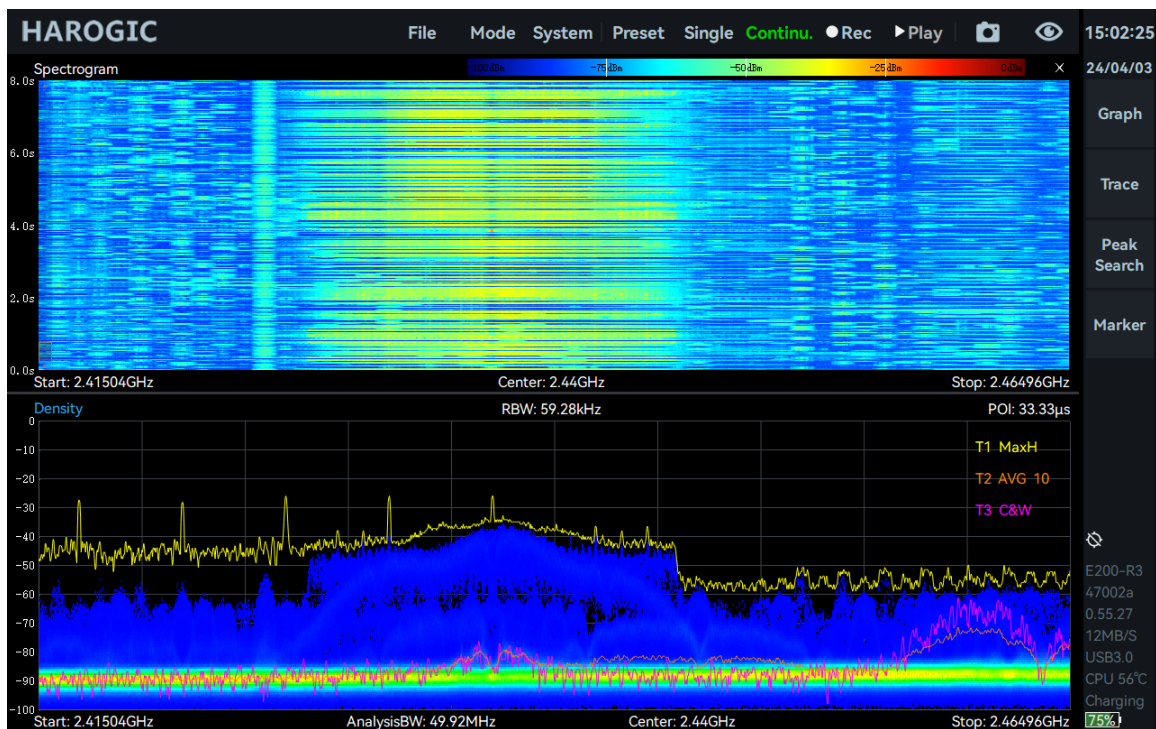
Power Detection Mode (Zero Span)

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 Specifications * (typical value)

| Test basis | Hardware Version：R3 | API：0.50.1 | FPGA：0.50.0 | MCU：0.50.2 | SAS4：1.50.40 |
|---|---|---|---|---|---|

### Frequency

| | |
|---|---|
| Frequency Range | 9 kHz~20 GHz |
| Initial Frequency Accuracy | <1 ppm, supporting program manual correction |
| Reference Clock | Internal or external, program-controlled switching<br>Internal TCXO aging<1 ppm/year, temperature drift<1 ppm<br>Internal OCXO (option): temperature drift <0.15 ppm<br>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 | 19.9 GHz |
| 1 kHz | -91.2 | -90.0 | 86.1 | -80.6 |
| 10 kHz | -99.7 | -100.9 | -92.5 | -90.6 |
| 100 kHz | -101.1 | -104.2 | -94.4 | -96.2 |
| 1 MHz | -121.6 | -123.4 | -112.1 | -111.5 |
| 10 MHz | -134.4 | -134.2 | -131.9 | -129.2 |

| Residual Response Spurious rejection off dBm RBW =1 kHz Positive Peak Detector | Frequency Range | R.L.=0 dBm | R.L.=-20 dBm | R.L.=-50 dBm |
|---|---|---|---|---|
| | 9 kHz~1.0 GHz | < -90 | < -100 | < -120 |
| | 1.0 GHz~3.0 GHz | < -80 | < -100 | < -120 |
| | 3.0 GHz~9.0 GHz | < -90 | < -100 | < -120 |
| | 9.0GHz~20GHz | < -90 | < -100 | < -120 |

| Image Frequency Suppression | 9 kHz~9.0 GHz | >90 dBc (spurious rejection off), >90 dBc (spurious rejection on) |
|---|---|---|
| | 9.0 GHz~20 GHz | >60 dBc (spurious rejection off), >90 dBc (spurious rejection on) |

| | |
|---|---|
| IF rejection (R.L.=0 dB) | >90 dBc (spurious rejection on), >80 dBc (spurious rejection off) |
| Local Oscillator Related Spurious | <-65 dBc (Offset Center Frequency +/- (N/M)*125 MHz, N/M = 1,2,3,4,5…) |
| Input Related Spurious | <-75 dBc (spurious rejection on), <-50 dBc (spurious rejection off) |

### Linearity

| IIP3 (dBm) | 1 GHz | 3 GHz | 10 GHz | 19.9 GHz |
|---|---|---|---|---|
| R.L.= 20 dBm | 45.5 | 47.3 | 43.6 | 35.3 |
| R.L.= 0 dBm | 27.5 | 27.2 | 23.2 | 21.0 |
| R.L.= -20 dBm | 4.7 | 7.5 | -8.9 | -3.0 |

### 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<br>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 +/-50 MHz |

### Amplitude

| Maximum safe input power (CW) | 23 dBm | 30 MHz~20 GHz and the preamplifier off (R.L. ≥ 0 dBm) |
|---|---|---|
| | 10 dBm | 9 kHz~30 MHz or preamplifier on (R.L. <0 dBm) |

| Maximum DC Voltage | +/-12 VDC | | | |
|---|---|---|---|---|
| Display Range | DANL~23 dBm | | | |
| Amplitude Accuracy | +/- 2.0 dB | | | |
| IF in band spectrum ripple | +/- 2.0 dB | | | |
| Reference level | -50 dBm~23 dBm | | | |
| RF Preamplifiers | Converting bands (frequency ≥ 50 MHz) are equipped with preamplifier that can be set as automatically turn on or forcibly turn off | | | |
| Displayed Average Noise Level (DANL) dBm/Hz RBW = 10 kHz RMS detector | Frequency Range | R.L.= 0 dBm (IFGainGrade = 2) | R.L.=-20 dBm (IFGainGrade = 2) | R.L.=-50 dBm (IFGainGrade = 2) |
| | 9 kHz | -123.3 | -141.2 | -152.3 |
| | 100 kHz~100 MHz | -135.2 | -152.2 | -160.2 |
| | 1 GHz | -137.0 | -148.9 | -168.3 |
| | 100 MHz~3.0 GHz | -134.1 | -147.2 | -165.3 |
| | 3.0 GHz~9.0 GHz | -132.2 | -139.1 | -157.1 |
| | 9.0 GHz~20 GHz | -133.1 | -138.2 | -159.5 |

## 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 | 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 | 900 GHz/s | FPGA | RBW≥1 MHz, B-Nuttal window, spurious rejection: Bypass |
| | 400 GHz/s | FPGA | RBW=250 kHz, B-Nuttal window, spurious rejection: Standard |
| | 40 GHz/s | FPGA | RBW=30 kHz, B-Nuttal window, spurious rejection: Bypass |
| | 1 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 ns / (N*D*8 ns); POI = 2*N*D*8 ns <br> 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 | 32.768 us |
| | N = 32，D = 1 | 3,906,250 times/sec | 0.512 us |
| Real-time Analysis Bandwidth | 100 MHz | | |
| Window Function | B-Nuttall，FlatTop | | |
| RBW | 14.73 MHz-3.59 kHz (FlatTop); 7.81 MHz~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 | N (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, ≤1.4 kg<br>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 |
| 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

| 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 |
| 05 | Build-in premium GNSS | Providing improved positioning and timing capabilities. |
| 07 | Build-in GNSS disciplined OCXO reference clock | Providing GNSS disciplined reference clock and 1PPS |

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