KEYSIGHT

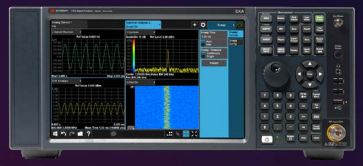
Signal, Spectrum, and Wireless Analyzers

From interference detection to next-gen wireless design

BUYING GUIDE

Keysight Benchtop Signal and Spectrum Analyzers

One family. Three performance grades. 4 classes.



ESSENTIAL

XA1, XA3-class

- 4 GHz to 50 GHz Maximum frequency
- 1 MHz to 510 MHz Maximum analysis bandwidth

EXPERT

XA5-class

- 32 GHz to 55 GHz Maximum frequency
- 40 MHz to 2 GHz Maximum analysis bandwidth

PRO

XA6, XA7-class

- 50 GHz to 110 GHz Maximum frequency
- 1 GHz to 8 GHz Maximum analysis bandwidth

Introduction

Selecting the right Keysight signal or spectrum analyzer depends on the measurement accuracy, frequency range, and real-time analysis your application requires. Keysight offers three performance grades of signal and spectrum analyzers — Essential, Expert and Pro. Whether you are analyzing simple signals or complex wideband signals in higher-level communication systems, aerospace and defense, or R&D labs, each analyzer tier offers a unique combination of frequency, bandwidth, phase noise, noise floor, and real-time spectrum analysis. Use this guide to determine which signal or spectrum analyzer grade aligns with your application requirements.

Essential

Essential signal and spectrum analyzers come in two classes. The XA1-class includes BSA, CXA, EXA models, and XA3-class includes the MXA and MXE models. Affordable and versatile, they support up to 50 GHz frequency, 510 MHz of analysis bandwidth, with fast sweeps and support for 75+ signal standards.

Expert

The XA5-class Expert signal and spectrum analyzers include PXA, PXE, and SA6210A models. These signal and spectrum analyzers support frequencies up to 55 GHz and up to 2 GHz analysis bandwidth. They build upon our Esssential models with wider analysis bandwidth and RTSA.

Pro

Pro signal and spectrum analyzers come in two classes. The XA6-class includes the SA6320A models, and XA7-class includes the UXA models. These signal analyzers deliver up to 8 GHz bandwidth at frequencies up to 110 GHz, ideal for next generation R&D and high-speed compliance to the latest standards like 5G NR, Wi-Fi 6E/7, and 802.11 ad/ay.

Step 1. Check the General Specifications

All Keysight signal and spectrum analyzers deliver high-performance signal integrity across a wide range of frequencies and bandwidths. Whether you're capturing fast-changing signals or detecting faint interference, the right specifications can dramatically impact your results. With support for over 75 signal standards, your lab can troubleshoot and debug designs, characterize signals, and ensure compliance with next-generation standards. The first part of your analyzer selection process begins with selecting the maximum frequency, maximum analysis bandwidth, and phase noise sensitivity that aligns to your effort, from basic RF validation to ultra-wideband signal exploration.

The table below summarizes the key specifications by product grade — Essential, Expert, and Pro — to help you select the signal and spectrum analyzer that is right for your application.

Signal and spectrum analyzer comparison of specifications

Specifications	Essential	Expert	Pro
Class	XA1, XA3	XA5	XA6, XA7-class
Maximum frequency	4 to 50 GHz	32 to 55 GHz	50 to 110 GHz
Maximum analysis bandwidth	1 MHz to 510 MHz	40 MHz to 2 GHz	1 GHz to 8 GHz
Phase Noise @ 1 GHz (10 kHz offset)	-130 dBc / Hz to -90 dBc / Hz	-136 dBc / Hz to -114 dBc / Hz	-135 dBc / Hz
DANL @ 1 GHz	-167 dBm to -152 dBm	-171 dBm to -166 dBm	-174 dBm to -168 dBm
Real-time spectrum analysis	Varies	Varies	Varies
	EXPLORE ESSENTIAL	EXPLORE EXPERT	EXPLORE PRO

Step 2.
Look at Key Features

Essential

Core Features

- frequency range up to 50 GHz
- analysis bandwidth up to 510 MHz
- fast sweep speeds
- support for 75+ modulation formats

Key Capabilities

Go far beyond standard expectations with enhanced capabilities in an affordable entry-level model providing reliable spectrum analysis, general signal validation, and low phase noise for accurate RF characterization.

Expert

Core Features

- multi-touch user interface
- real-time spectrum analysis
- up to 2 GHz bandwidth
- multi-channel options

Key Capabilities

Capture and analyze transient signals, perform emissions testing, and analyze harmonics. Ideal for higher-level debugging, compliance testing for modern communications protocols, and radar development.

Pro

Core Features

- frequency coverage up to 110 GHz
- ultra-wide analysis bandwidth up to 8 GHz
- ultra-low noise floor with optional noise floor extension
- high signal purity internal converters, designed specifically for RF and microwave

Key Capabilities

Offers the highest sensitivity and signal fidelity for mmWave, FR2, and complex modulations in aerospace, wireless communication, and higher-level research applications.

Step 3. Consider Your Use Cases

While specifications and features help you understand the capabilities of each analyzer, use cases reveal how they fit into real-world applications. Below are typical environments and tasks where each performance grade excels.

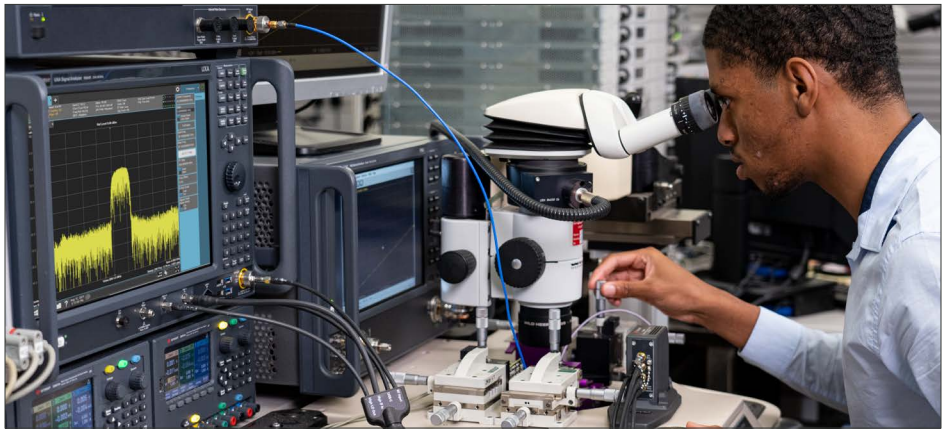
Essential: RF fundamentals and general debugging

Keysight Essential signal and spectrum analyzers go far beyond standard expectations, providing enhanced capabilities in an affordable entry-level model. These instruments provide the dynamic range, low phase noise, and high signal fidelity required for a wide range of general-purpose RF testing tasks. With measurement capabilities reaching up to 50 GHz, these analyzers support both microwave and millimeter-wave applications.

Ideal for tasks such as spectrum analysis, signal monitoring, and transmission/reflection measurements, Keysight Essential analyzers are also well-suited for interference testing, device characterization, and component testing.

Common use cases for Essential signal and spectrum analyzers include:

- How to Test Power Consumption in IoT Devices
- How to Set Up an Engineering Course on RF Microwave
- How to Test Wireless Coexistence for Medical Devices
- How to Measure Noise Figure Using the Y-Factor Method



Expert: Protocol development and compliance verification

Keysight Expert signal and spectrum analyzers build upon our Essential models with additional features like much wider analysis bandwidth, real time spectrum analysis (RTSA) for continuous acquisition of RF signals, and multi-channel analysis. Measurement setup is simple with the multi-touch user interface, customizable views, and application-specific software in our Expert models that enables fast and accurate signal analysis with the touch of a button.

Ideal for use in industries such as telecommunications, aerospace and defense, and wireless device testing, they also enable precise compliance testing and spectral analysis to ensure performance and regulatory compliance.

Common use cases for Expert signal and spectrum analyzers include:

- How to Analyze 5G Release 16 Base Station Signals
- How to Measure the Lowest EVM in WLAN Receiver Test
- How to Test a Satellite Transceiver with DVB-S2X Signals

Consider Your Use Cases (cont.)

Pro: Higher-level research and wideband signal exploration

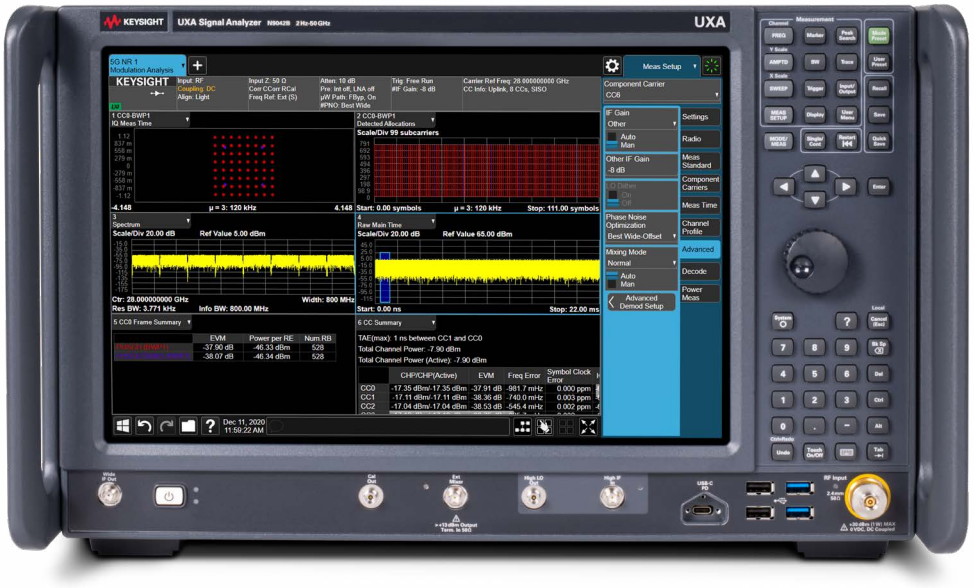
Keysight Pro signal and spectrum analyzers build upon our Expert models. Pro signal analyzers push the limits of performance with our highest frequency coverage up to 110 GHz, ultra-wide RTSA bandwidth, and lowest noise floor — designed to tackle your most difficult measurement challenges, including tight design margins and complex modulations.

Designed for next-generation wireless and high-frequency applications, they enable 5G NR FR2 and mmWave signal analysis and validation, as well as testing of wideband satellite payloads and phased array antennas. With capabilities tailored for capturing and demodulating ultra-wide bandwidth radar pulses, they are ideal for use in enhanced communication systems, aerospace and defense, and R&D environments.

Common use cases for Pro signal and spectrum analyzers include:

- How to Characterize Radar Pulses
- How to Measure Signal Quality in 5G Private Networks
- How to Test Satellite Receivers for Wideband Interfering Signals
- How to Characterize the Signal Quality of a Transmission Channel
- How to Make 6G D-Band Noise Figure Measurements

Explore more signal and spectrum analyzer use cases to help you innovate faster and with greater confidence.



Step 4. Final Key Considerations

Beyond basic features, enhanced features, and typical use cases, it is good to revisit how your application might drive your choice of instrument features and specifications.

Frequency range

Frequency range sets the limits on which signals are accessible for capture and analysis.

Choose Essential for general wireless testing up to 50 GHz, Expert for compliance testing up to 55 GHz, and Pro for higher-level R&D and mmWave applications up to 110 GHz.

Analysis bandwidth

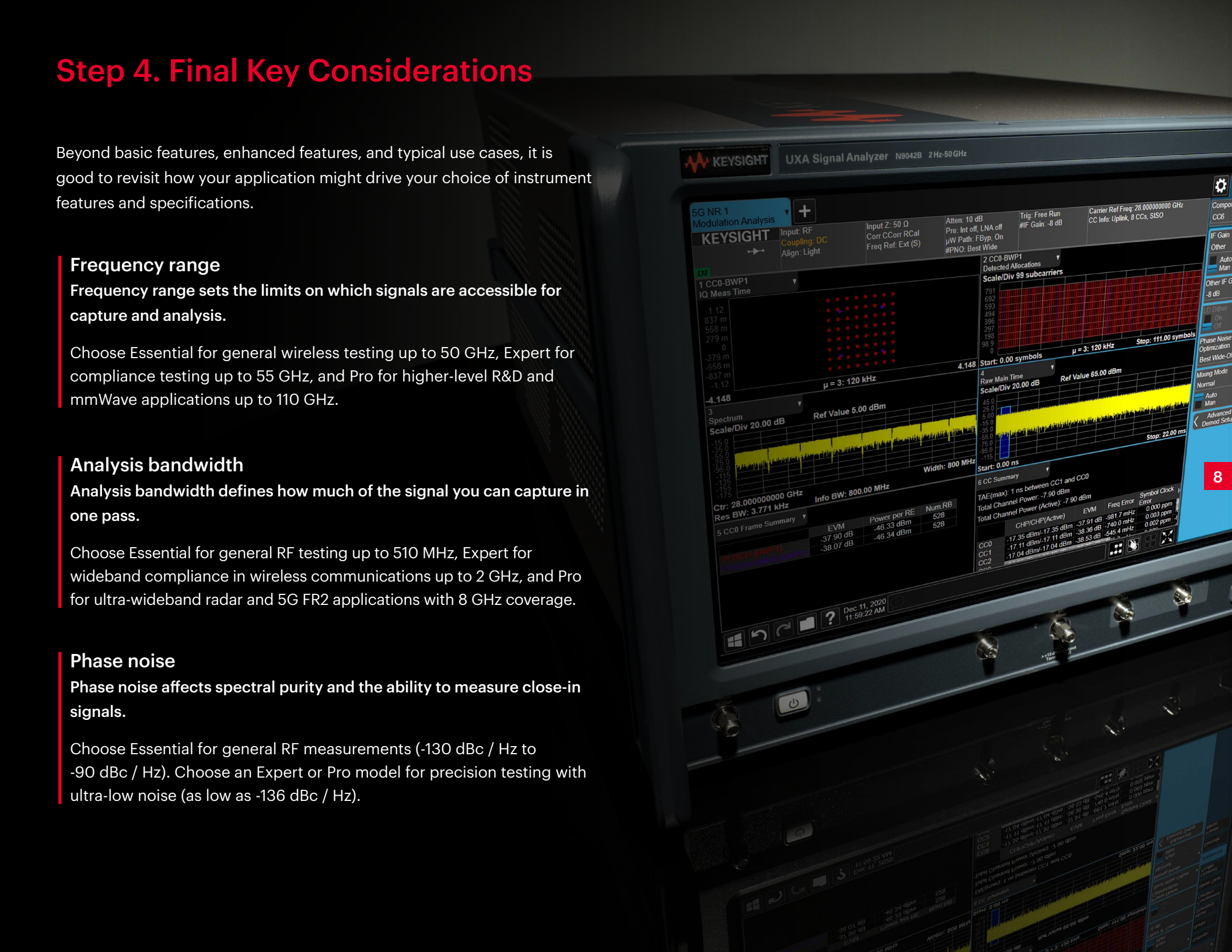
Analysis bandwidth defines how much of the signal you can capture in one pass.

Choose Essential for general RF testing up to 510 MHz, Expert for wideband compliance in wireless communications up to 2 GHz, and Pro for ultra-wideband radar and 5G FR2 applications with 8 GHz coverage.

Phase noise

Phase noise affects spectral purity and the ability to measure close-in signals.

Choose Essential for general RF measurements (-130 dBc / Hz to -90 dBc / Hz). Choose an Expert or Pro model for precision testing with ultra-low noise (as low as -136 dBc / Hz).



Final Key Considerations (cont.)

DANL (Noise floor)

DANL determines the ability to detect weak signals in noisy environments.

Select Essential for standard signal detection (-167 dBm to -152 dBm), Expert for low-noise compliance testing (-171 dBm to -166 dBm), and Pro for ultra-sensitive measurements in high-performance designs (-174 dBm to -168 dBm).

Real-time analysis

Real-time analysis captures transient or intermittent signals without gaps.

Choose Essential XA3-class and Expert for compliance and protocol debugging, and Pro for wideband, high-speed signal capture in complex systems.

Common mistakes to avoid when selecting a signal and spectrum analyzer

- Choosing insufficient bandwidth, leading to missed or distorted wideband signals.
- Underestimating the importance of low phase noise and DANL, leading to poor performance in detecting weak signals.
- Overlooking future upgradeability and software compatibility, limiting your ability to analyze complex modulations or compliance testing.
- Choosing a non-real-time analyzer for applications requiring gap-free capture.

Modular Signal Analyzers

Keysight modular signal and spectrum analyzers provide you with the power of a benchtop signal analyzer in a compact, flexible form factor, helping you save valuable rack space. Get the same performance as our Essential signal analyzers in a high-density PXIe module.

Select the modular signal analyzer that is right for your application.

Maximum frequency	26.5 MHz to 50 GHz
Maximum analysis bandwidth	10 MHz to 160 MHz
Phase noise	-110 dBc / Hz
DANL @ 1 GHz	-158 dBm to -163 dBm

EXPLORE

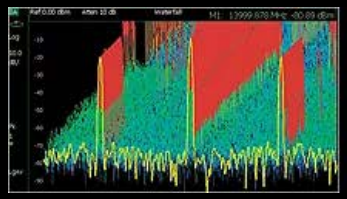
Handheld Spectrum Analyzers

Keysight FieldFox handheld spectrum analyzers include the handheld analyzers. They combine spectrum analysis, vector network analysis, and power measurements in a rugged, portable unit. Designed for field engineers, they include features like over-the-air testing, USB power sensor compatibility, and pulse signal generation for field-ready performance.

VNA capabilities	Model-dependent
Maximum frequency	10 GHz to 54 GHz
Maximum analysis bandwidth	40 MHz to 120 MHz

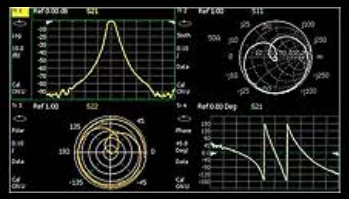
EXPLORE

You can upgrade your analyzer remotely with more than 25 license key-activated software options. Below are some examples. To explore the full range of software, visit our handheld analyzer software page.



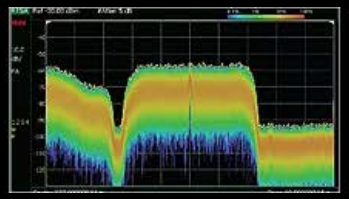
Spectrum Analysis

- real-time spectrum analyzer (RTSA)
- analog demodulation
- interference hunting
- IQ analyzer



Cable and Antenna Testing (CAT)

- vector network analyzer (VNA)
- 2 port S-parameters
- TDR cable measurements



5G / LTE Field Testing

- EMF measurements
- over-the-air (OTA) testing
- channel scanner
- wideband analysis

Power Measurements

- USB power sensor measurements
- built-in power meter
- pulse measurements
- peak power sensor

Utilities

- remote control
- GPS receiver
- indoor / outdoor mapping
- DC bias variable voltage source

Wireless Analyzers

Configurable test platform that captures and decodes

Keysight XA30-class wireless analyzers include WaveJudge models, offering end-to-end 5G solutions for modem, chipset, and radio access network (RAN). Provide field interoperability testing, enable fast debugging, and accelerate deployment. Our wireless analyzers provide problem-solving capabilities inside the wireless network through deep analysis tools that provide visibility into events spanning multiple layers. Locate protocol exchange errors not found in end equipment logs and understand how the PHY layer affects upper-layer performance.

Select the wireless analyzer that is right for your application.

Frequency range	**380 MHz to 6 GHz, 2 GHz to 11.4 GHz, 500 MHz to 8 GHz**
Chassis ports	**4 to 8**
Real-time	**LTE, eMTC, NB-IoT, 5G SA**

EXPLORE

Audio Analyzers

Configurable audio test solutions

Keysight AZ2-class audio analyzers include the U8903B. Designed for multi-function and high-performance measurements, Keysight's audio analyzer offers low residual distortion of less than -110 dB and an analysis bandwidth of 1.5 MHz. This ensures you achieve the highest resolution available for two-channel measurements. With versatile options including Bluetooth® audio measurements, digital audio, and voice quality analysis, our audio analyzer is fully configurable to meet your specific application needs. Experience precision and flexibility in audio testing.

Maximum frequency	**80 kHz**
Maximum analysis bandwidth	**1.5 MHz**
Phase noise @ 1 GHz (10 kHz offset)	**-110 dB**

EXPLORE

Signal and Spectrum Analyzer Software Functionality

Explore the wide variety of compliance, debugging, and application-specific software for Keysight signal and spectrum analyzers. Characterize RF components with spectrum, waveform, amplitude, phase, gain amplitude, gain phase, and group delay measurements. **Keysight signal analysis software** integrates seamlessly with our analyzers, providing powerful tools for automated testing, signal analysis, and data visualization.

Measurement software for benchtop signal and spectrum analyzers

Measurement application software

- Vector modulation measurement analysis
- Analog demodulation measurement
- Pulse analysis measurement
- Phase noise measurement
- WLAN 802.11ac/ax measurement
- LTE-Advanced TDD Measurement
- And more...

Vector signal analysis software

- Wireless connectivity
- WLAN modulation analysis
- LTE/LTE-A FDD modulation analysis
- Radar analysis
- Cellular communication analysis
- Custom OFDM analysis
- Cross-correlated EVM analysis
- And more...

Why Choose Keysight?

Keysight signal and spectrum analyzers deliver accurate, reliable, and high-performance RF and microwave measurements. Here's why engineers choose Keysight:

High accuracy and precision

- Low phase noise and high dynamic range for precise testing.
- Accurate, repeatable measurements with automated analysis.

Wide performance range

- Exceptional frequency range, critical for testing wideband signals.
- Wide bandwidth analysis to enable precise capture and characterization.

Real-time analysis

- Capture transient signals without gaps, critical for complex RF signals.
- Confidently analyze complex events like spurs and signal interference.

Powerful software tools

- Supports more than 75 signal standards for demodulation and signal analysis.
- Automate, visualize, and accelerate analysis with license key upgrades.

Feature	Specification
Frequency range	Up to 110 GHz
Analysis bandwidth	Up to 8 GHz
Phase noise performance	As low as -136 dBc/Hz
DANL @ 1 GHz	Down to -174 dBm

Calibration

Ensure your test system performs to specification and meets local and global standards.

Repair

Restore equipment to original functionality and specifications with trained technicians.

KeysightCare

Innovate at speed with curated support plans and prioritized response and turnaround times.

Education

Make measurements quickly with eLearning and in-house, instructor-led training.

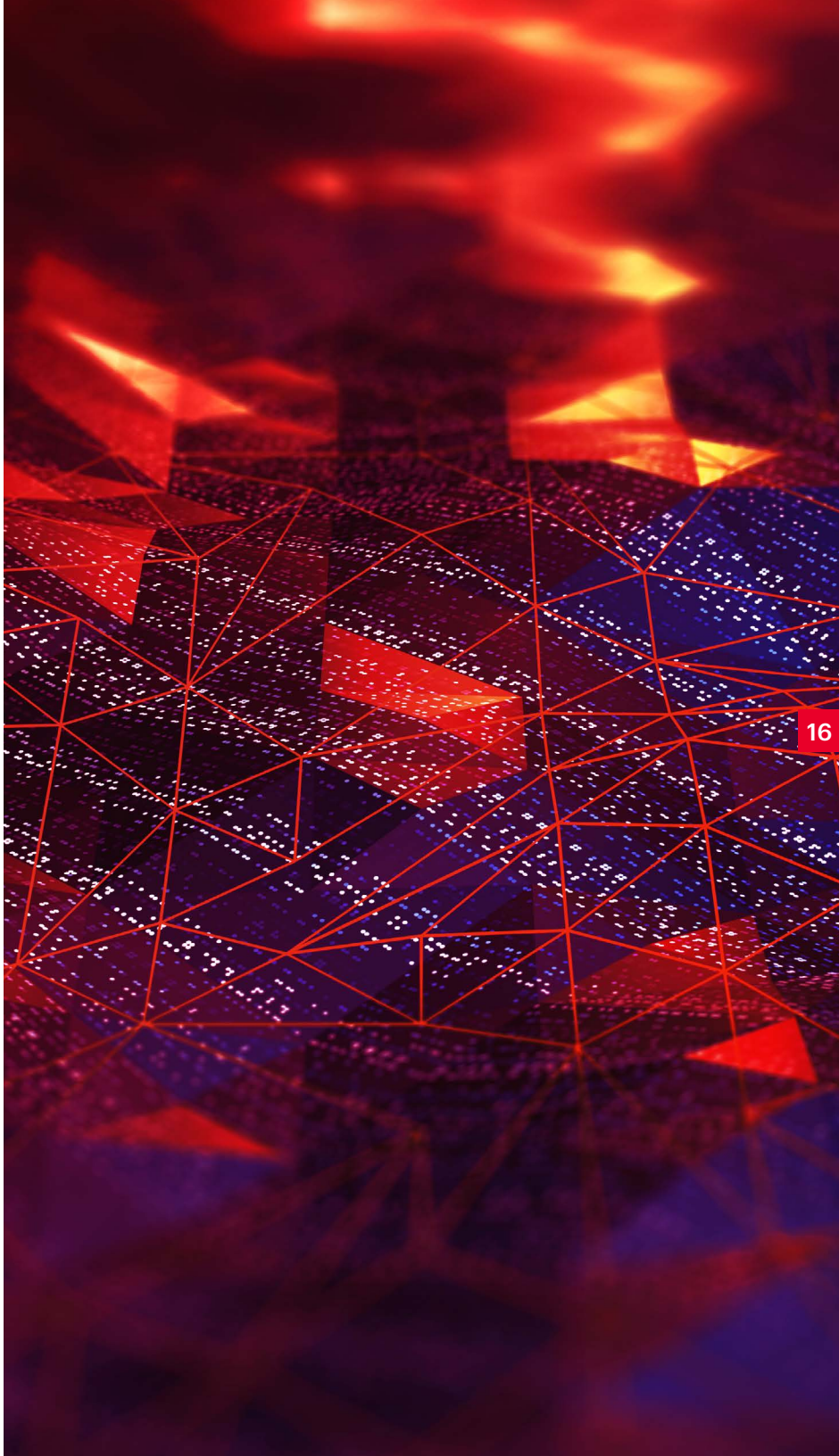
Keysight Support

Get 24x7 access to service requests, case management help, and technical articles.

Select the Signal or Spectrum Analyzer That Is Right for You

Should you need more information on Keysight signal and spectrum analyzer offerings, visit our extensive **library of resources** to help you select the right analyzer for your application. Here are some of the resources that can guide you in determining the best analyzer for your needs:

- Signal Analysis Measurement Fundamentals
- Spectrum Analysis Basics
- Four Best Practices for Precise Millimeter-Wave Measurements



When you're ready, visit **Keysight signal, spectrum, and wireless analyzers** to select one of our popular configurations or build one to meet your specific application.

KEYSIGHT

Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.