

# BSA Series Spectrum Analyzers

N9321C/N9322C 9 kHz to 4/7 GHz

N9323C/N9324C 1 MHz to 13.6/20 GHz

## Outperform expectations in your essential applications

We designed BSA series spectrum analyzers for general purpose spectrum analysis and low-cost manufacturing applications, helping you to achieve higher productivity on a smaller budget – whether you are tuning an RF circuit of an IoT module, hunting for noise for a system, fighting for higher throughput, or teaching students in a classroom

These easy-to-afford BSA spectrum analyzers put together just-enough performance, and superior reliability, assist you address common RF-microwave test and measurement challenges easier and faster

## Efficiency and Flexibility at their Best

In the quest of getting more done for less, we also equip the BSA series spectrum analyzers with an array of optional capabilities, that either enhance the performance of the analyzers or add more test capabilities for the analyzers, such as EMI emission test, stimulus/response test, and IoT signal demodulation analysis



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## Three great reasons of having a BSA spectrum analyzer on your bench

### Reliable performance up to microwave frequency range

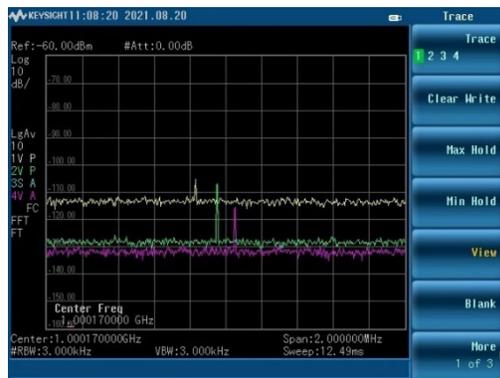


Figure 1. Detecting low-level and close-in signals made easy

- Up to 20 GHz frequency range
- Up to  $\pm 0.1$  ppm annual aging rate, reducing the frequency drift for more accurate measurement
- Resolution bandwidth: 10 Hz to 3 MHz
- Typical DANL (at 1 GHz): -162 dBm/Hz, allows low-level signal detection easily
- Typical absolute amplitude accuracy (at 1 GHz):  $\pm 0.3$  dB

### Value-added capabilities help you gain more insight during RF design and troubleshooting

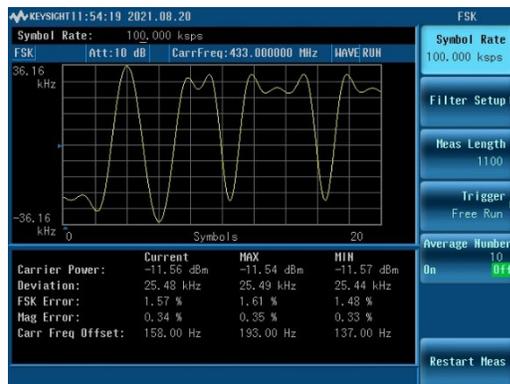


Figure 2. ASK/FSK signal demodulation analysis assists in IoT module characterization

Equip BSA with optional features to cover your extended testing needs:

- Tracking generator with built-in VSWR bridge, supports transmission and reflection measurements
- CISPR-16 compliant resolution bandwidth and quasi-peak detector supports general purpose EMI emission troubleshooting
- Demodulation mode allows you to gain more insight easily and cost-effectively into AM/FM, ASK/FSK demodulation metrics
- Built-in DC input channel for AM/FM in-band, on-channel (IBOC) measurement, and xDSL measurement from 9 kHz to 10 MHz
- Supports Keysight U2000 series and U2020 X-series USB power sensors for precision power measurement

### Simplicity at your fingertips

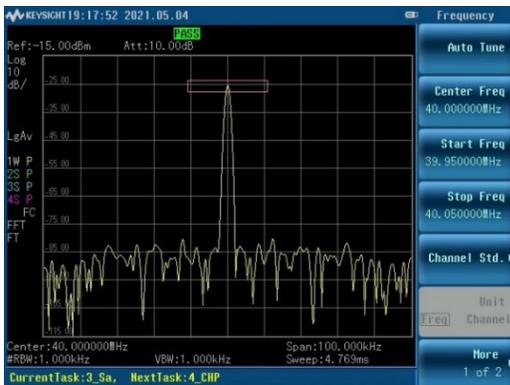


Figure 3. Window limit enables fast Pass/Fail testing

- Allows up to 18 user-definable softkeys for fast access to customized setups, helping you or your operator on the production line easily switch from one task to another
- “Auto-tune” captures the signal and display it in the middle of the screen automatically
- Window limit enables fast Pass/Fail test on frequency and power simultaneously
- I/O interface choices: USB, 10Base-T LAN, GPIB (optional)
- SCPI commands compatible with Keysight ESA and X-series

## Take a Closer Look

We incorporated all the proven architecture, measurement science, expertise, and software into this low-cost platform – BSA series spectrum analyzers.

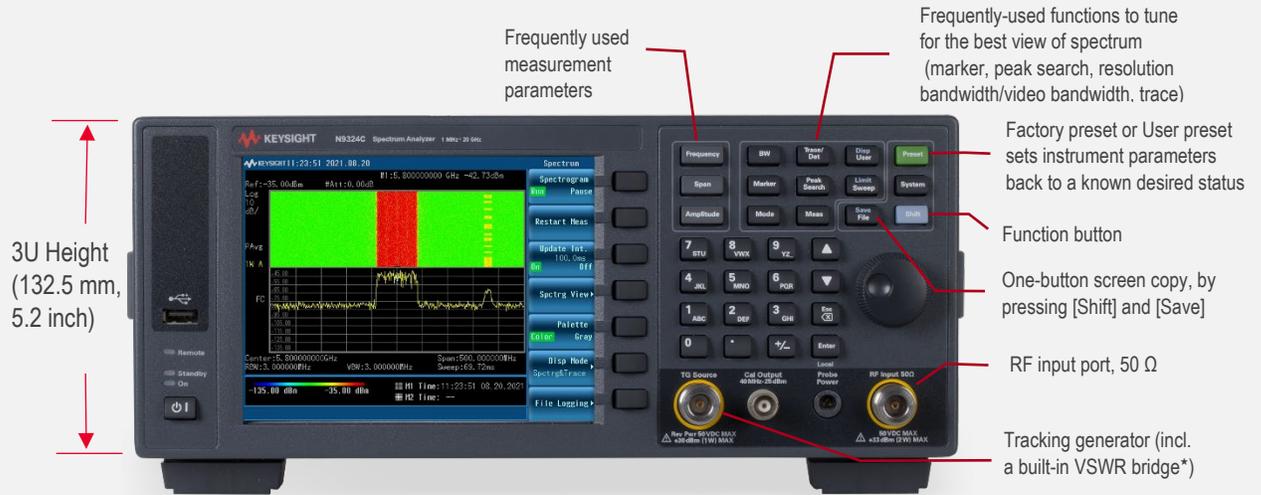


Figure 4. N9324C BSA spectrum analyzer front



Figure 5. The rear panel of N932xC spectrum analyzer

\* N9321C and N9322C support built-in VSWR bridge on the tracking generator for reflection measurement  
 \* N9323C and N9324C support tracking generator only

## Build a worry-free test bench with value priced N9321/22/23/24C BSA

The Keysight BSA series spectrum analyzers (N9321C, N9322C, N9323C, N9324C) covers up to 20 GHz frequency range, assisting budget-constrained operations to protect profitability and increase productivity through its breadth of measurement capabilities, competitive performance, and optimized usability. This includes  $-162$  dBm/Hz typical DANL, minimum 2 ms non-zero span sweep speed, and a 7 GHz tracking generator that includes a built in VSWR bridge. The BSA's capabilities make it well suited for general purpose RF design and verification, ISM band wireless connectivity measurement, component verification test, and military radio maintenance.

### General Purpose R&D

#### Using BSA spectrum analyzer for spurious test



If the pressure to deliver new products on a tight schedule rests with you, you recognize the importance of achieving faster verification without compromising the reliability of test results. We recommend the following two models of BSA:

- The N9323C and N9324C BSA spectrum analyzers offer maximum frequency range up to 13.6 GHz or 20 GHz, protecting your investment for now and future expansion
- The N9321C and N9322C BSA spectrum analyzers – offer the widest measurement capabilities, not only all the essential spectrum analysis up to 4 GHz or 7 GHz, but also scalar network analysis capability – you'll find N9321C and N9322C effective and cost-effective for building larger systems such as cutoff frequency, amplifier power output, gain, and antenna match.

### Manufacturing

#### Using BSA spectrum analyzer for power measurement



Maintaining the production line and ensuring dependable operation is part of your domain, and the demands are numerous. Topping the list are typically goals aimed at lowering product costs and shortening the production process. One method to reach these expectations is to shorten test times, without compromising product quality.

The BSA spectrum analyzers are your preferred value solution in manufacturing, regardless if your application is in RF or microwave frequency ranges.

Being in the consistent framework, software code set, they keep your engineering and manufacturing team highly consistent with your R&D team, enable faster speed of problem solving (troubleshooting) in the NPI engineering stage. Importantly, with “just right” functionality BSA spectrum analyzers give you the performance, reliability, and efficiency you need — at an attractively frugal price.

## On-line Repair

Mobile devices have increasingly higher performance expectations, meaning they are getting more and more complicated. Yet statistics dictate that a few mobile devices won't be able to pass all the test items on the production line in one-time effort. Quickly and cost-effectively repairing devices necessitates a spectrum analyzer that provides the functionality you need at a price in-line with repair goals. The BSA spectrum analyzers are easy to use and have features that simplify the identification and resolution of issues.

## Spectrum Management

### Spectrum monitoring utilizing spectrogram recording



The rapid release of new mobile devices is placing unprecedented demand on spectrum availability. Glitches in the system mean lost revenue and unhappy customers. Fundamental to your ability to detect low-level RF signals while simultaneously resolving closely spaced frequencies. You can depend on the BSA series spectrum analyzers. Included in its capability is its spectrum monitoring feature (opt. MNT) that allows you to record, and playback captured traces, so you can quickly identify interfering signals arising from unwanted or unexpected transmissions.

## Education

Every year a new crop of students rely on you to teach them the basic principles of radio transceiver and frequency domain analysis theories. You realize the most effective way for them to learn is with hands-on lab work. The constraint is often the number of available analyzers. Your solution is the N9321C BSA spectrum analyzer. It has classic architecture built inside, robust, and easy-to-use by teachers and students. It offers the basic functions students need to learn, at a price that allows you to get more spectrum analyzers than you thought possible.



Wireless



Internet of Things



RF + Microwave



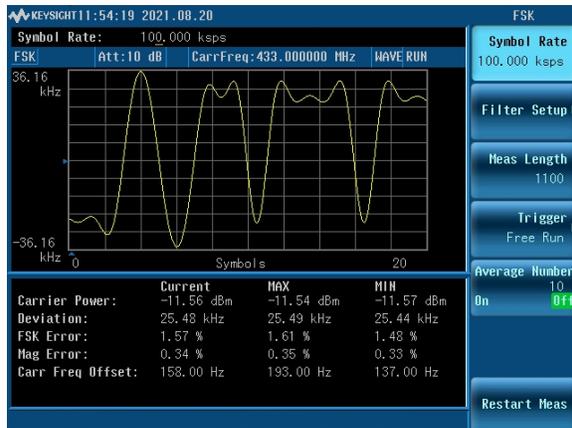
Satellite

## Value-added capabilities enable higher test efficiency for you

Besides their primary use in measuring frequency, power, harmonics, and spurious of RF/microwave components, we also equipped BSA with extended capabilities to address your evolving needs.

### ASK/FSK demodulation analysis

#### One-button FSK demodulation analysis with a BSA spectrum analyzer



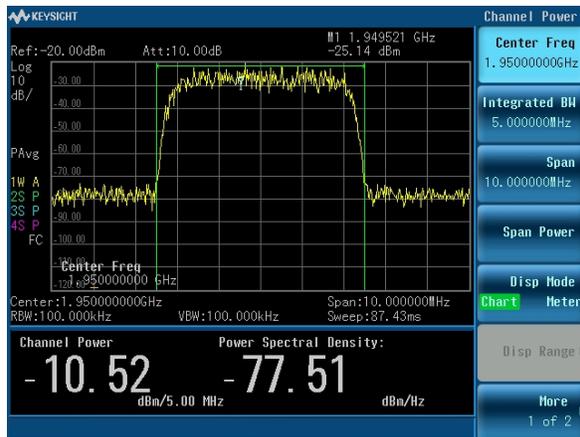
The ASK/FSK modulation has been widely adopted in low power, low data rate RF communications, because it ties low cost, high performance wireless connectivity with long battery life. Today, ASK/FSK modulation technology is embedded in a variety of products and system, ranging from personal consumer electronics, automotive electronics, RFID, and automatic meter reading, to giant industrial devices.

Option DMA offers a cost-effective, ASK/FSK demodulation analysis solution for you.

- It supports four display modes: Symbol, Waveform, ASK/FSK error, and Eye diagram.
- The demodulation metrics include carrier power, ASK modulation depth, ASK modulation depth, FSK frequency deviation, ASK/FSK error, and ASK index, and others

### Power measurements

#### One-button Powersuite measurements with a BSA spectrum analyzer



One of the most fundamental measurements performed by spectrum analyzers is the frequency domain measurement of RF power. However, detailed analysis of a signal often requires standards-defined spectral masks or more complex power, bandwidth, and detector measurement combinations. PowerSuite one-button power measurements make broadband power measurements and signal monitoring simple and intuitive. They are:

- Channel power (CHP)
- Occupied bandwidth (OBW)
- Adjacent channel power (ACP)
- Spectrum emission mask (SEM)
- Third order intercept (TOI)

## Stimulus/Response, and Reflection measurements

### Return loss measurement with a BSA spectrum analyzer



Adding the optional tracking generator with built-in VSWR bridge (Option TG4/TG7) and reflection measurement application (Option RM4/RM7) to the N9321C or N9322C expands its functionality to a solution that also performs reflection measurements. The multi-purpose N9321C or N9322C becomes an affordable and easy platform to evaluate reflection characteristics such as return loss, insertion loss, and VSWR for devices like antennae, RFID tags, and RF Tx modules.

N9311X-201 mechanical OSL calibrator (open short-load) is used together with the N9322C and N9321C in reflection measurements

## Key Specifications of BSA Spectrum Analyzers

Refer to the table for a summary of key specifications of the BSA spectrum analyzers:

	N9321C	N9322C	N9323C	N9324C
Frequency range	9 kHz – 4 GHz	9 kHz – 7 GHz	1 MHz – 13.6 GHz	1 MHz – 20 GHz
Resolution bandwidth	10 Hz – 3 MHz			
EMI bandwidth	CISPR-16 compliant bandwidth: 200 Hz, 9 kHz, 120 kHz, 1 MHz (Opt. EMC required)			
Detector types	Normal, positive peak, sample, negative peak, average (video, RMS, voltage) Quasi-peak (opt. EMC required)			
DANL at 1 GHz				
Preamp off	-131 dBm	-131 dBm	-127 dBm	-127 dBm
Preamp on	-149 dBm	-149 dBm	-140 dBm	-140 dBm
Amplitude accuracy	± 0.6 dB	± 0.6 dB	± 0.7 dB	± 0.7 dB
TOI	+15 dBm	+15 dBm	+11 dBm	+11 dBm
Phase noise	-90 dBc/Hz	-90 dBc/Hz	-92 dBc/Hz	-92 dBc/Hz
Tracking generator	Frequency range: 5 MHz – 7 GHz Output power range: -20 to 0 dBm			
Operating temperature	+5 to +45 °C			
Power consumption	≤ 25 W			
Dimension (H×W×L)	132.5 mm (5.2 inch) × 320 mm (12.6 inch) × 400 mm (15.7 inch)			
Weight (net)	7.9 kg (17.4 lbs.) nominal			

## Ordering information

Each BSA spectrum analyzer ships with standard accessory pack, that includes a calibration certificate, a USB cable, a N-BNC adapter, a BNC cable, and a country-specific power cord

Model number	What's included
N9321C	BSA spectrum analyzer, 9 kHz to 4 GHz
N9322C	BSA spectrum analyzer, 9 kHz to 7 GHz
N9323C	BSA spectrum analyzer, 1 MHz to 13.6 GHz
N9324C	BSA spectrum analyzer, 1 MHz to 20 GHz

## Related Literatures

Literature	What's included	Publish number
BSA Configuration Guide	A complete list of up-front options and upgrade kits for the N932xC BSA spectrum analyzers	<a href="#">3121-1290EN</a>
N9321C Data Sheet	A complete summary of instrument specifications	<a href="#">3121-1285EN</a>
N9322C Data Sheet	A complete summary of instrument specifications	<a href="#">5991-1167EN</a>
N9323C Data Sheet	A complete summary of instrument specifications	<a href="#">3121-1286EN</a>
N9324C Data Sheet	A complete summary of instrument specifications	<a href="#">3121-1287EN</a>
BSA User's Guide	Describes front panel operations	<a href="#">N9322-90002</a>
Making Fast Pass/Fail Testing	Describes the advanced window limit feature	<a href="#">5991-2930EN</a>
EMI troubleshooting: The need for close field probes	Locating, evaluating, and troubleshooting potential emission sources with close field probes	<a href="#">5991-0144EN</a>
App note: A flexible test solution for 2.4 GHz transceivers	Illustrates how BSA spectrum analyzer addresses the essential test needs of Zigbee transceivers	<a href="#">5992-0464EN</a>
App note: Low frequency RFID Tag characterization	Illustrates how N9321C/N9322C helps with RFID reader and tag characterization	<a href="#">5991-2061EN</a>
App note: A cost-effective way to measuring cable and antenna	Illustrates how BSA spectrum analyzer and its tracking generator with a built-in VSWR bridge addresses 1-port reflection measurement	<a href="#">5991-2082EN</a>
Spectrum analysis Basics (AN150)	The classic AN150 introduces the fundamentals of swept-tuned spectrum analyzers and the advances in modern signal analyzers	<a href="#">5952-0292EN</a>



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