Keysight Technologies
N6141A & W6141A EMI
X-Series Measurement Application

Technical Overview



KEYSIGHT TECHNOLOGIES

EMI Measurement Application

To avoid costly delays that can result from failed compliance testing, Keysight's EMI measurement application on X-Series signal analyzers allows you to perform precompliance measurements and diagnostic evaluation of your designs. Find and fix problems before they enter the test chamber with the N6141A measurement application on the N9030A PXA, N9020A MXA, or N9010A EXA, or W6141A on the N9000A CXA for a low-cost pre-compliance test solution.

The application's wide range of features enables you to:

- Use the scan table to set up frequency ranges, gains, bandwidths, and dwell time
- Scan a frequency range and display the results in log or linear format
- Identify suspect signals in the frequency scan
- Measure the peak, quasi-peak, EMI-average or RMS-average values of these suspect signals and place the results in the signal list
- Easily identify signals that fail the regulatory agency limit

The EMI measurement application is just one in a common library of more than 25 measurement applications in the Keysight X-Series, an evolutionary approach to signal analysis that spans instrumentation, measurements and software. The X-Series analyzers, with upgradeable CPU, memory, disk drives, and I/O ports, enable you to keep your test assets current and extend instrument longevity. Proven algorithms, 100% code-compatibility and a common UI across the X-Series create a consistent measurement framework for signal analysis that ensures repeatable results and measurement integrity so you can leverage your test system software through all phases of product development. You can further extend your test assets by transporting applications across multiple X-Series signal analyzers.

Key features

- Measure emissions with built-in commercial–and MIL-STD–compliant bandwidths, detectors, and band presets
- Compare measured emissions to regulatory limits
- Continuously monitor signals with bar meters to detect maximum amplitude
- Collect lists of suspect emissions
- Differentiate between ambient signals and device emissions
- View signals over time to identify intermittent responses
- Generate reports in HTML format including signal list, images and trace, and correction data

EMI measurement application vs. Option EMI

There are two EMI options for X-Series signal analyzers: Option EMC and the N/W6141A measurement application. Option EMC enables basic EMC measurements. It contains CISPR 16-1-1 compliant bandwidths and detectors (peak, quasi-peak, EMI average, RMS average) as well as CISPR band presets (bands A through E), and MIL-STD bandwidths that meet MIL-STD 461D/E/F requirements.

The EMI measurement application includes Option EMC and provides a wide range of additional features that enable the user to perform precompliance conducted and radiated emissions tests to both commercial and MIL-STD requirements. The following table summarizes a comparison of features.

Table 1. Comparison of EMI measurement application and Option EMC features

Feature	EMI measurement application	Option EMC
CISPR 16-1-1 detectors	●	●
CISPR 16-1-1 bandwidths	●	●
MIL-STD 461 bandwidths	●	●
Log and linear display	●	
Signal list	●	
Scan table	●	
Simultaneous detectors	●	
Automatic limit testing	●	
Measure at marker	●	●
Delta to limit	●	
Strip Chart	●	
Step and swept scans	●	
Report generation	●	
Time domain scan[1]	●	
Monitor spectrum[1]	●	
Amplitude probability distribution (APD)[1]	●	
Disturbance analyzer (click measurements)	●	
UI commonality with MXE receiver	●	

1. Requires Options DP2 or B40. Not available for CXA.

EMI Precompliance Measurements

Over the past two decades, precompliance emissions measurements have been gaining in popularity. Performing precompliance radiated and conducted emissions measurements early in the design cycle can reduce development expense and speed time to market by ensuring new designs will pass final compliance testing at an accredited facility the first time around, without costly redesign and re-testing.

For a step-by-step guide on how to make precompliance measurements according to regulatory agency limits, refer to the application note, Making Conducted and Radiated Emissions Measurements, literature number 5990-6152EN.

Conducted emissions measurements

The EMI measurement application allows you to measure the emissions that are conducted along a power line. The transducer used to couple the emissions of the power line to the signal analyzer is a line impedance stabilization network (LISN). The frequency range of conducted emissions is 9 kHz to 30 MHz depending on the regulatory agency.

Radiated emissions measurements

Performing precompliance radiated emissions measurements is not as straight forward as conducted emissions measurements. When measuring to commercial standards, the antenna is placed 3 to 10 meters from the device under test (DUT) and the DUT should be rotated in order to find the maximum radiation. With the addition of the EMI measurement application, the X-Series signal analyzer becomes a powerful EMI precompliance measurement analyzer. Measure designs to the latest CISPR 16-1-1 or MIL-STD requirements. The robust signal list feature enables you to quickly differentiate between the DUT and the ambient signal environment.

Regulatory standards

X-Series signal analyzers with the EMI measurement application can be used for making precompliance measurements to any international EMC standard. Simply select the performance level and frequency range for your application.

Easily identify out-of-limit device emissions

Signal list, frequency scan, and active detector meters are displayed on a single screen for easy review of the measurement results. Continuously scan a specified frequency range or scan and search for signals above a margin or limit and place them in the signal list. Use the simultaneous detector meters to continuously measure a selected signal while maximizing the amplitude. Measure all the signals with the search and measure function using up to three detectors. Choose between peak, quasi-peak, EMI average, or RMS average detectors. The measurement results are compared to regulatory agency limits in the delta to limit column.

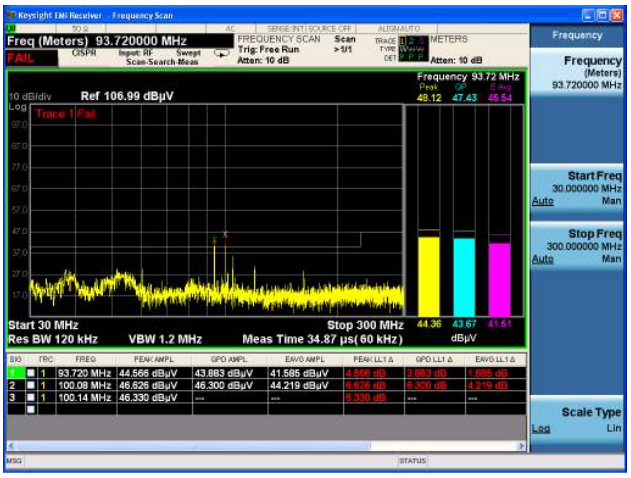


Figure 1. Frequency scan

Use the scan table to set up frequency ranges

The EMI measurement application includes a scan table with up to 10 ranges that can be set up for the specific frequency ranges of interest. The scan table also includes resolution bandwidths selection, step sizes, points per RBW, attenuation selection, and preamp selection. Use the CISPR band presets to easily set a range in the scan table.

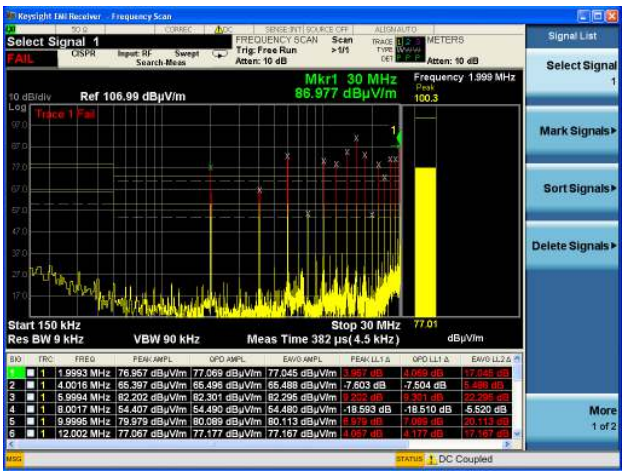


Figure 2. Conducted emissions with delta to limit

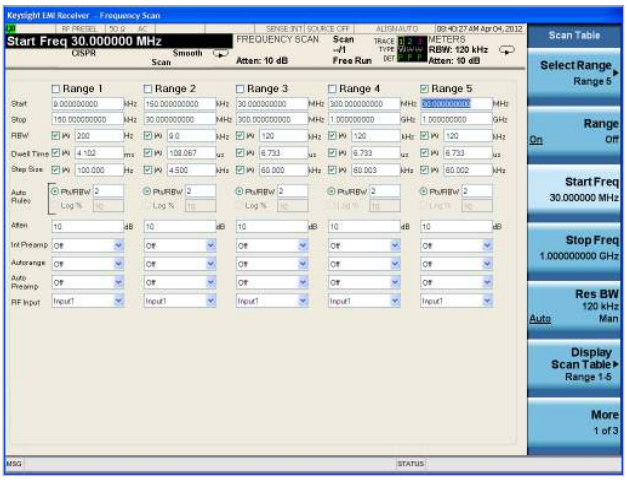


Figure 3. Scan table

Tune and listen to signals in the frequency scan list

Testing in an open area test site means that you have to deal with signals in the ambient environment. To help distinguish between DUT signals and signals in the ambient environment, you can use the tune and listen function to demodulate AM, FM, or phase modulation.

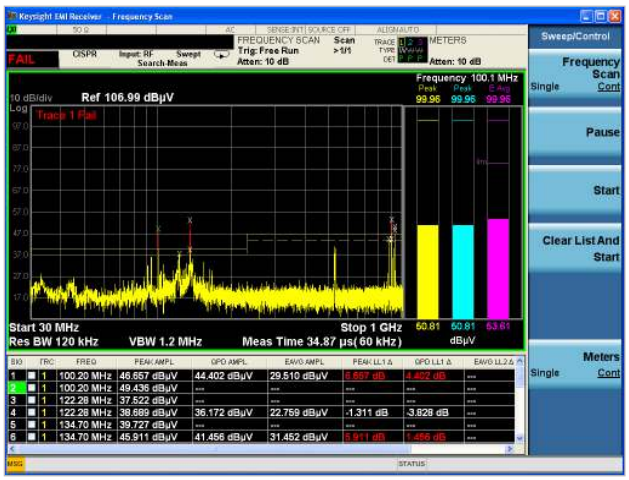


Figure 4. Radiated scan with meters

View signals over time using Strip Chart

Strip Chart lets you view signals over a long time period to identify widely spaced discontinuities. Limit lines can be placed on the display for regulatory agency comparison.



Figure 5. Strip Chart

Generate a report of the test results

Develop a report in HTML format that includes screen image, signal list, correction factors, trace data, and limit lines along with test and product descriptions.

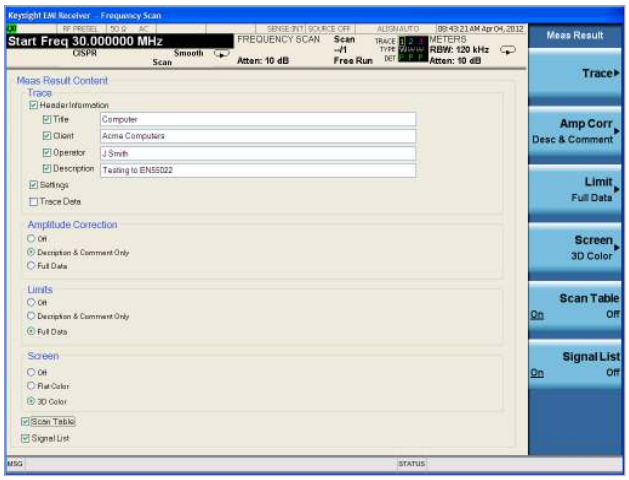


Figure 6. Report generation

Go faster with time domain scanning

The EMI measurement application offers three types of frequency scanning: swept, stepped, and time domain.[1] Time domain scan decreases total test time by reducing overall prescan collection times when longer measurement dwell times are required.

Time domain scan speeds measurements by using high-overlap fast Fourier transforms (FFTs) to collect emissions data simultaneously over an acquisition bandwidth that is multiple resolution bandwidths wide. This is in contrast to frequency-domain measurements, which collect data in individual resolution bandwidths.

With time domain testing, you can collect suspect lists rapidly, greatly improving overall test time and throughput.

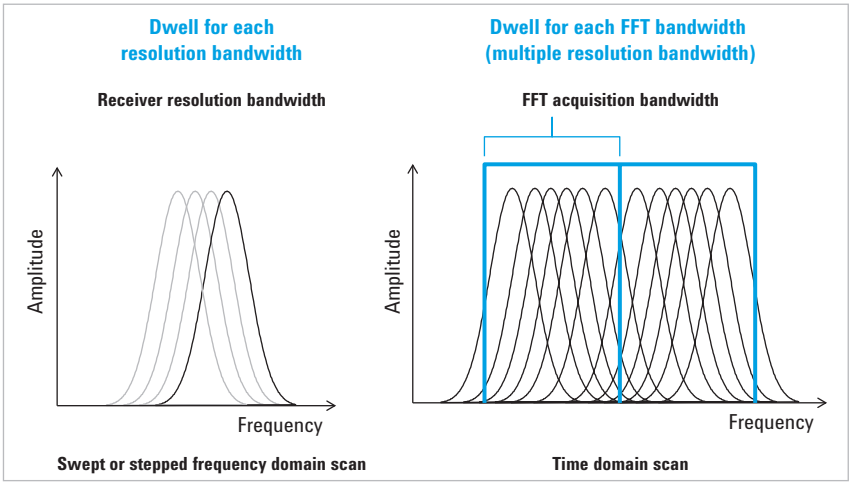


Figure 7. Comparison of resolution and FFT acquisition bandwidths

Automate click measurements

Use the built-in disturbance analyzer to easily make discontinuous disturbance, or click, precompliance measurements as specified in CISPR 14-1. Simplify and automate data collection, analysis, and report generation for these commonly tested emissions for more efficient testing.

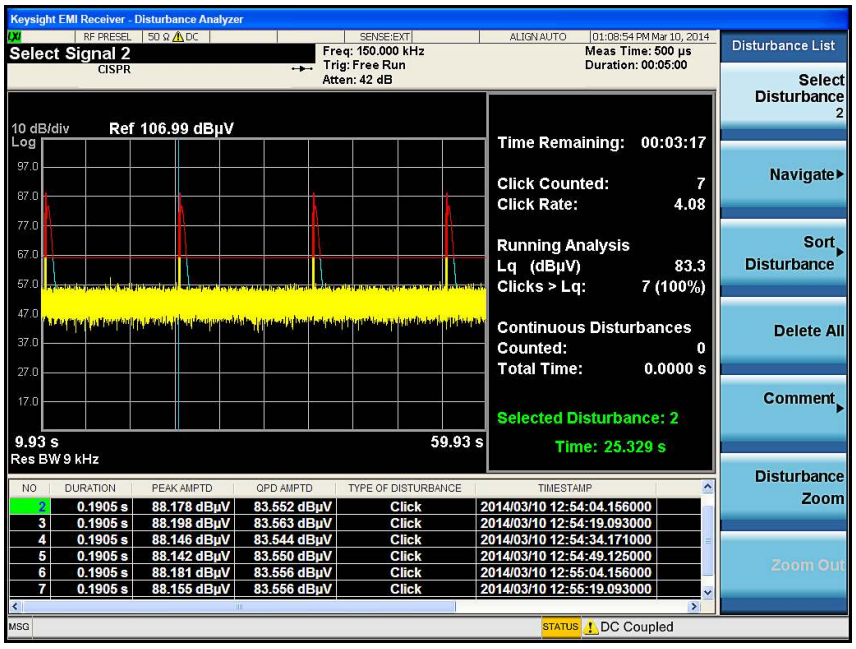


Figure 8. Simplify and automate data collection, analysis, and report generation for click measurements

1. Requires Options DP2 or B40. Not available for CXA.

Find the maximum with monitor spectrum

To ensure that you have identified the frequencies of maximum emissions in your suspect list, the EMI measurement application offers a new feature called monitor spectrum.[1] This feature offers both live-spectrum and meter displays that make it easy to see emission levels and find the maximum while adjusting the center frequency. Ultimately, monitor spectrum improves overall measurement time by reducing the time it takes to prepare your signal list for final measurements.

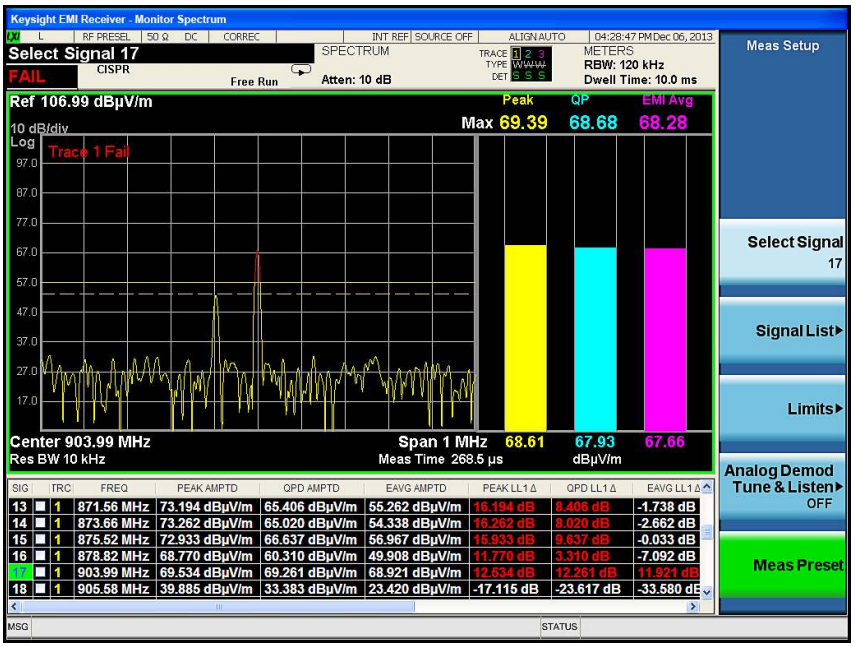


Figure 9. Monitor spectrum identifies frequency of peak emissions

Be ready for APD measurements

The EMI measurement application helps future-proof your lab by offering the amplitude probability distribution (APD) function that is being considered by CISPR for emissions testing of microwave ovens.[1]

To characterize slowly-varying emissions, the APD function displays the probability of an emission reaching or exceeding a given level. To facilitate use of this new function, the EMI measurement application also offers specific limit-line types that can be used with built-in evaluation capabilities to simplify DUT testing.

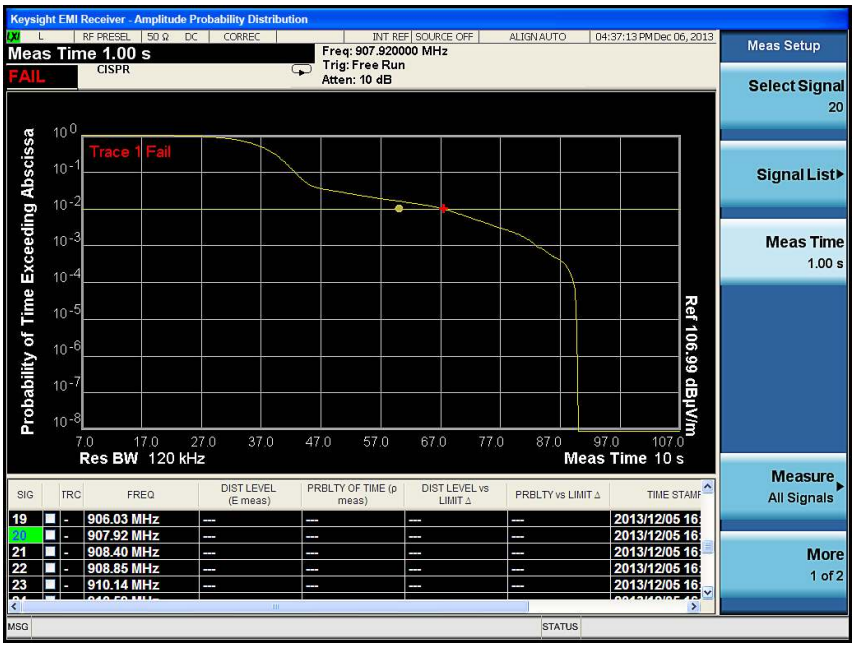


Figure 10. Be ready for future applications with the APD function

1. Requires Options DP2 or B40. Not available for CXA.

Enhanced display package for X-Series signal analyzers

Option EDP gives you three more diagnostic tools to be used with your X-Series signal analyzers. Use the spectrogram to view signal traces over time to identify intermittent signals. The display colors can be changed to give better contrast between background and intermittent signals. The trace zoom and zone span give you a closer look at signals that appear in broad measurement span.

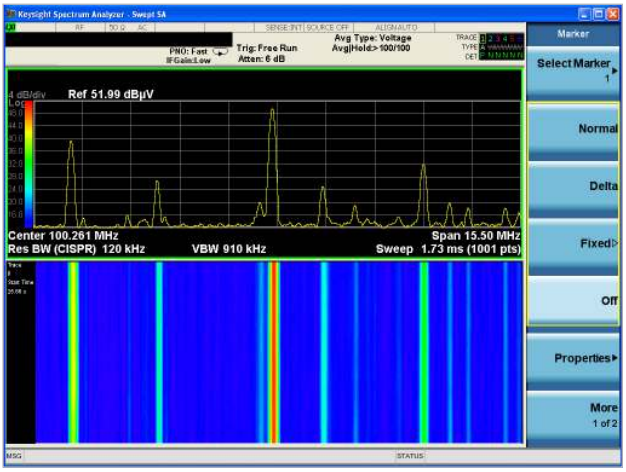


Figure 11. Spectrogram

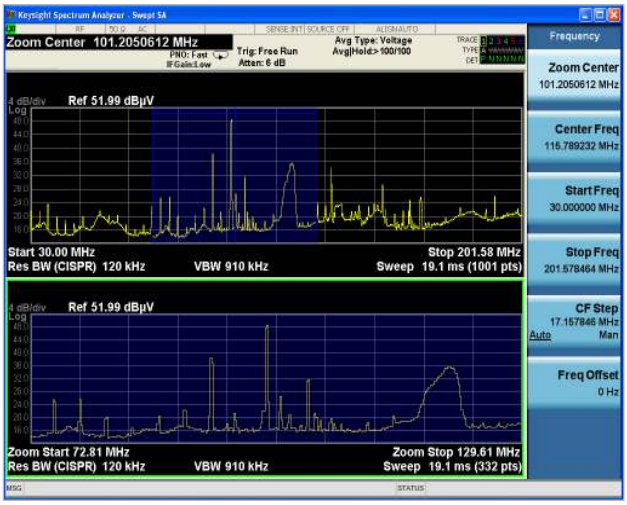


Figure 12. Trace zoom

Build a complete test system

Qualified Keysight Solution Partners provide a single point of contact to purchase complete EMI precompliance measurement solutions that meet commercial and MIL-STD specifications. These partners can provide equipment including probes, towers, and antennas, and services such as training and support. To further simplify testing, they also offer automation software that can meet your specific needs.

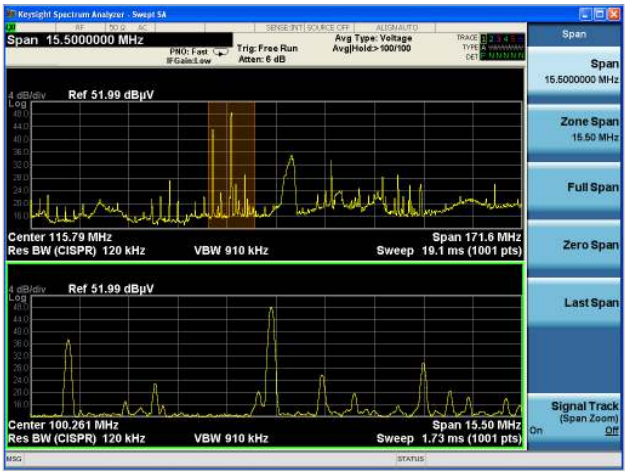


Figure 13. Zone span

Ordering Information

Software licensing and configuration

Choose from two license types:

- Fixed, perpetual license: This allows you to run the application in the X-Series analyzer in which it is initially installed.
- Transportable, perpetual license: This allows you to run the application in the X-Series analyzer in which it is initially installed, plus it may be transferred from one X-Series analyzer to another (PXA/MXA/EXA) and between CXA signal analyzers.

Try before you buy!

Free 30-day trials of X-Series measurement applications provide unrestricted use of each application's features and functionality on your X-Series analyzer. Redeem a trial license on-line today:

www.keysight.com/find/X-Series_trial

You can upgrade!

Options can be added after your initial purchase. Most X-Series options are license-key upgradeable.



N6141A EMI measurement application

Model-Option	Description	Notes
N6141A-2FP	Fixed perpetual license	For N9010A EXA, N9020A MXA, and N9030A PXA signal analyzers
N6141A-2TP	Transportable perpetual license	For N9010A EXA, N9020A MXA, and N9030A PXA signal analyzers

W6141A EMI measurement application for CXA

Model-Option	Description	Notes
W6141A-2FP	Fixed perpetual license	For the N9000A CXA signal analyzer
W6141A-2TP	Transportable perpetual license	For the N9000A CXA signal analyzer

Hardware configurations

N9030A PXA signal analyzer

Model-Option	Description	Notes
N9030A-503, -508, -513, -526, -543, -544, or -550	3.6, 8.4, 13.6, 26.5, 42.98, 44, or 50 GHz frequency range	One required
N9030A-P03, -P08, -P13, -P26, -P43, -P44, or -P50	Preamplifier, 3.6, 8.4, 13.6, 26.5, 42.98, 44, or 50 GHz	One recommended
N9030A-EDP	Enhanced display package for use in the spectrum analyzer mode	Recommended
N9030A-B40	40 MHz analysis bandwidth	Recommended
N9030A-DP2	Digital processor with 2 GB capture memory	Recommended

N9020A MXA signal analyzer

Model-Option	Description	Notes
N9020A-503, -508, -513, or -526	3.6, 8.4, 13.6, or -526 GHz frequency range	One required
N9020A-P03, -P08, -P13, or -P26	Preamplifier, 3.6, 8.4, 13.6, or 26.5 GHz	One recommended
N9020A-EDP	Enhanced display package for use in the spectrum analyzer mode	Recommended
N9020A-B40	40 MHz analysis bandwidth	Recommended
N9020A-DP2	Digital processor with 2 GB capture memory	Recommended

N9010A EXA signal analyzer

Model-Option	Description	Notes
N9010A-503, -507, -513, or -526	3.6, 7.0, 13.6, or 26.5 GHz frequency range	One required
N9010A-P03, -P07	Preamplifier, 3.6, or 7.0 GHz	Recommended
N9010A-EDP	Enhanced display package for use in the spectrum analyzer mode	Recommended
N9010A-B40	40 MHz analysis bandwidth	Recommended
N9010A-DP2	Digital processor with 2 GB capture memory	Recommended

N9000A CXA signal analyzer

Model-Option	Description	Notes
N9000A-503, -507, -513, or -526	3.0, 7.5, 13.6, or 26.5 GHz frequency range	One required
N9000A-P03, -P07, -P13, or -P26	Preamplifier, 3.0, 7.5, 13.6, or 26.5 GHz	One recommended
N9000A-EDP	Enhanced display package for use in the spectrum analyzer mode	Recommended

Related Literature

N6141A & W6141A EMI Self-Guided Demonstration

Technical Overview 5990-6158EN

Making Conducted and Radiated Measurements

Application Note 5990-6152EN

Related Web

Product Page

www.keysight.com/find/N6141A

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