Keysight Technologies
EMI X-Series Measurement App, Traditional UI

N6141EM0D

Technical Overview

– 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
– Flexible licensing provides the option of using perpetual or time based licenses with one or multiple signal analyzers

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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 N6141EM0D measurement application.

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

EMI precompliance measurements

Performing precompliance radiated and conducted emissions measurements early in the design cycle can reduce development expense by ensuring new designs will pass final compliance testing at an accredited facility, avoiding 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 receiver 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.

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Measurement Summary

EMI measurement application (N6141EM0D)
vs. X-Series signal analyzer option EMC (N90x0A-EMC)

There are two EMI options for X-Series signal analyzers: Option EMC and the N6141EM0D 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	N6141EM0D EMI Measurement Application	X-Series Signal Analyzer N90x0A 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.

Top Features

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.
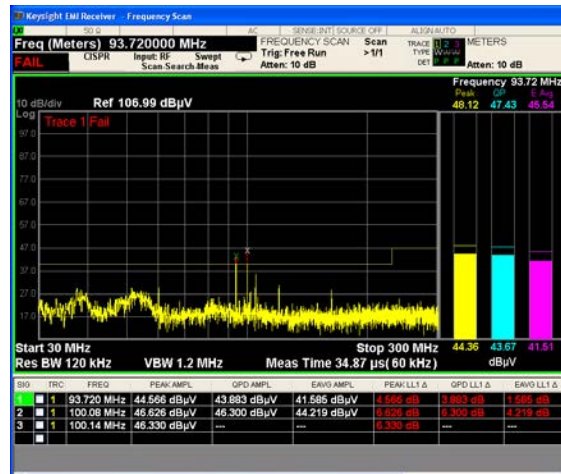

Figure 1. Frequency scan

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.
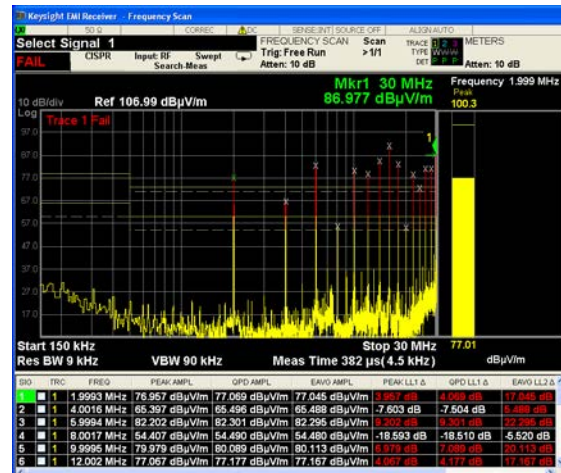

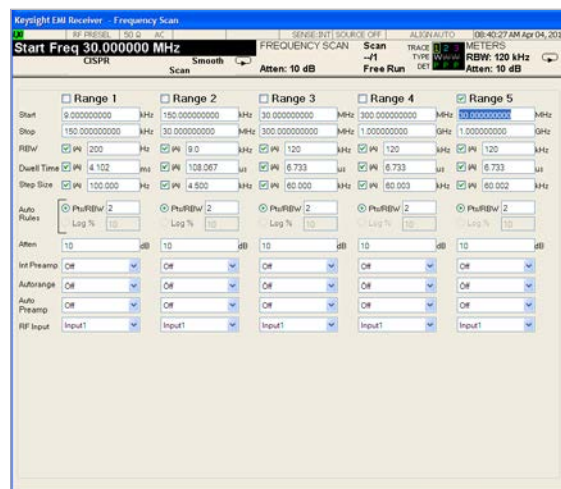Figure 2. Conducted emissions with delta to limit

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.
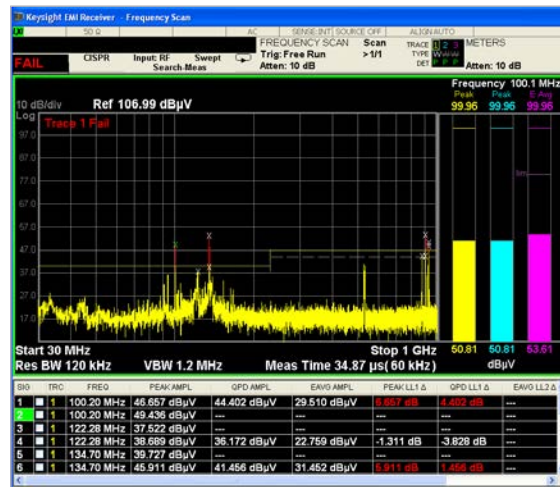

Figure 4. Radiated scan with meters

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.
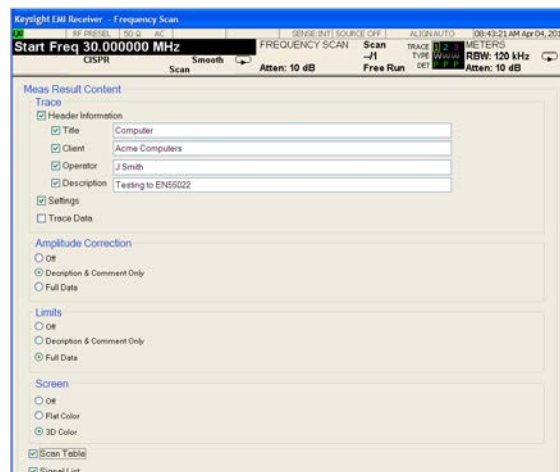

Figure 6. Report generation

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.

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.

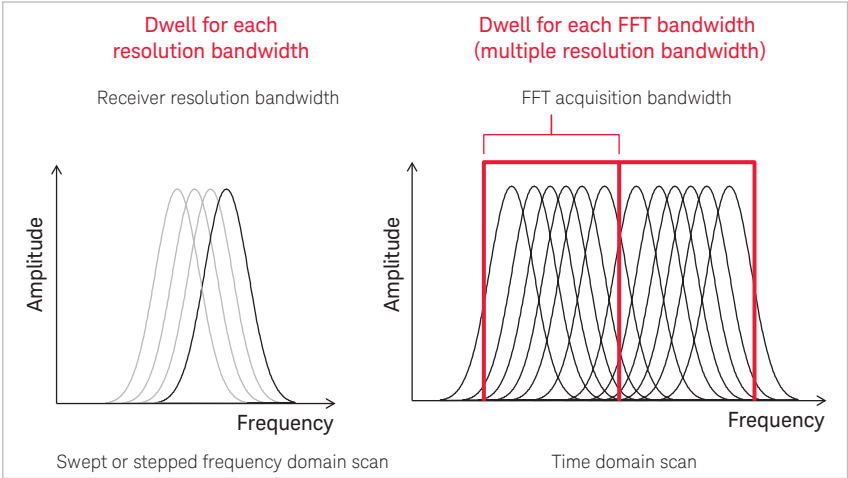1. Requires Options DP2 or B40. Not available for CXA.

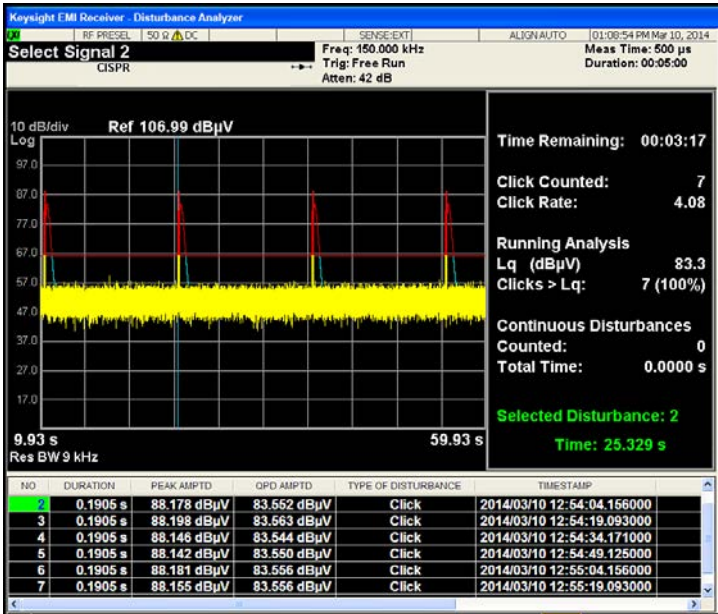Figure 7. Comparison of resolution and FFT acquisition bandwidths

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

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.
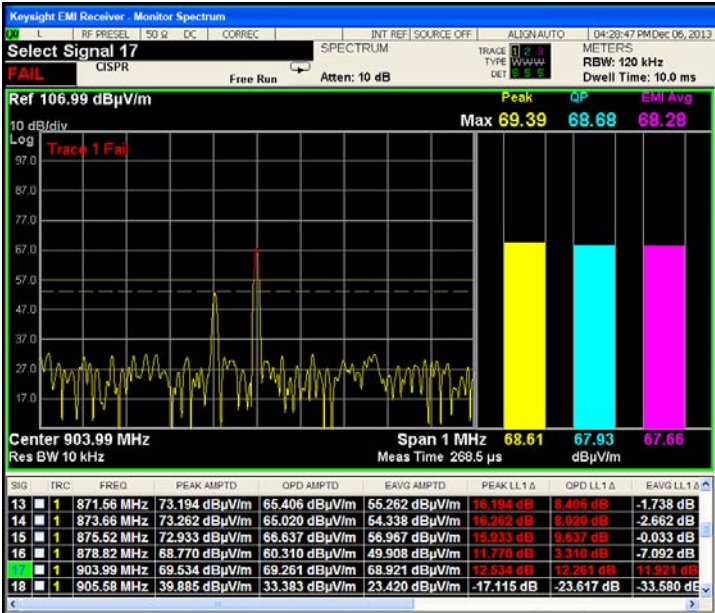

Figure 9. Monitor spectrum identifies frequency of peak emissions

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.

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

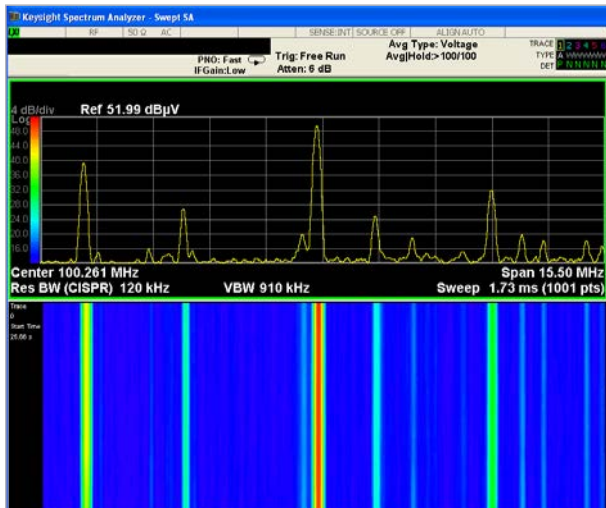Figure 10. Be ready for future applications with the APD function
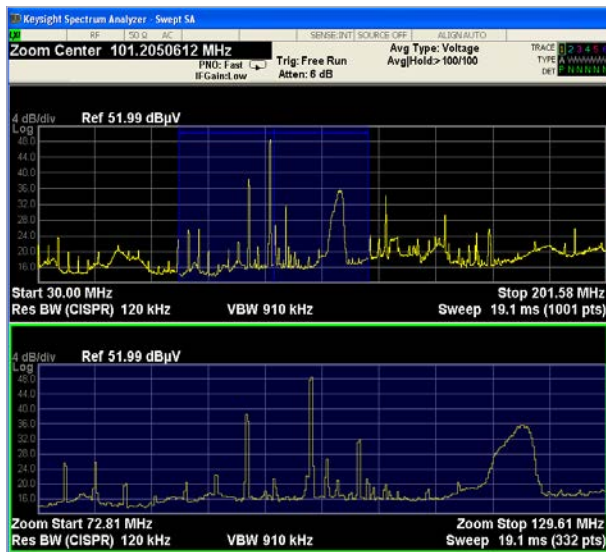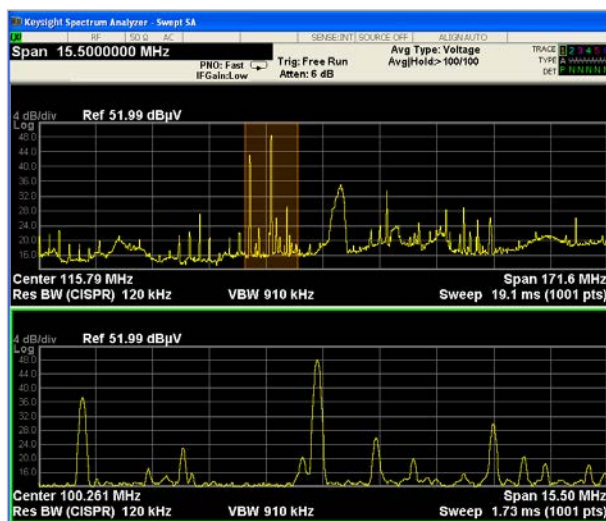
Figure 11. Spectrogram

Figure 12. Trace zoom

Figure 13. Zone span

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.

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.

Ordering Information

Flexible licensing and configuration

– **Perpetual:** License can be used in perpetuity.
– **Time-based:** License is time limited to a defined period, such as 12-months.
– **Node-locked:** Allows you to use the license on one specified instrument/computer.
– **Transportable:** Allows you to use the license on one instrument/computer at a time. This license may be transferred to another instrument/computer using Keysight's online tool.
– **Floating:** Allows you to access the license on networked instruments/computers from a server, one at a time. For concurrent access, multiple licenses may be purchased.
– **USB portable:** Allows you to move the license from one instrument/computer to another by end-user only with certified USB dongle, purchased separately.
– **Software support subscription:** Allows the license holder access to Keysight technical support and all software upgrades

You Can Upgrade!

All of our X-Series application options are license-key upgradeable.

UP GRADE

EMI measurement application (N6141EM0D)

Model	Software License Type	Support Contract	Support Subscription (12-month) [2]
N6141EM0D-1FP	Node-locked perpetual	R-Y5C-001-A[2]	R-Y6C-001-L[2]
N6141EM0D-1FL	Node-locked 12-month	R-Y4C-001-L[1]	Included
N6141EM0D-1TP	Transportable perpetual	R-Y5C-004-D[2]	R-Y6C-004-L[2]
N6141EM0D-1TL	Transportable 12-month	R-Y4C-004-L[1]	Included
N6141EM0D-1NP	Floating perpetual	R-Y5C-002-B[2]	R-Y6C-002-L[2]
N6141EM0D-1NL	Floating 12-month	R-Y4C-002-L[1]	Included
N6141EM0D-1UP	USB portable perpetual	R-Y5C-005-E[2]	R-Y6C-005-L[2]
N6141EM0D-1UL	USB portable 12-month	R-Y4C-005-L[1]	Included

One month software support subscription extensions [3]

Model	Description
R-Y6C-501[3]	1-month of software support subscription for node-locked license
R-Y6C-502[3]	1-month of software support subscription for floating license
R-Y6C-504[3]	1-month of software support subscription for transportable license
R-Y6C-505[3]	1-month of software support subscription for USB portable license

Try Before You Buy!

Evaluate a full-featured version of our X-Series measurement application with our *FREE* trial. Redeem one 30-day trial license of each measurement application online at: www.keysight.com/find/X-Series_apps_trial

Hardware Configurations

To learn more about compatible platforms and required configurations, please visit: www.keysight.com/find/X-Series_apps_platform

Software Models & Options

To learn more about X-Series measurement application licensing, model numbers and options, please visit: www.keysight.com/find/X-Series_apps_model

1. All time-based X-Series measurement application licenses includes a 12-month support contract which also includes the 12-month software support subscription as same duration.
2. Support contract must bundle software support subscription for all perpetual licenses in the first year. All software upgrades and Keysight support are provided for software licenses with valid support subscription.
3. After the first year, software support subscription may be extended with annual or monthly software support subscription extension.

Hardware Configuration

For optimizing the EMI measurement application, Keysight recommends a minimum level of X-Series instrument hardware functionality at each instrument performance point. Supported instruments include:

Benchtop:
  – PXA   N9030A
  – MXA   N9020A
  – EXA   N9010A
  – CXA   N9000A

N90x0A X-Series signal analyzer

Capability	Instrument Option	Benefit
Analysis bandwidth	10 or 25 MHz as default or higher	**Required** [1]: Wider analysis bandwidth options such as 25/40/85/160 MHz can be selected depending on the specified signal analyzer model
Precision frequency reference	-PFR	**Recommended**: For enhanced frequency accuracy and repeatability for lower measurement uncertainty
Electronic Attenuator	-EA3	**Recommended**: Fast and reliable attenuation changes ideal for manufacturing without the wear associated with mechanical attenuators up to 3.6 GHz in 1 dB steps
Pre-amplifier	3.6 GHz (-P03) or higher	**Recommended**: For maximizing the measurement sensitivity
Fine resolution step attenuator	-FSA	**Recommended**: Useful for maximizing useable dynamic range to see signals
Analog baseband I/Q inputs	-BBA on PXA and MXA only	**Optional**: To extend measurements at baseband if required by device under test

1. Measurements of time domain scan, monitor spectrum and amplitude probability distribution require the DP2 or B40 or above analysis bandwidth. CXA is not available.

Additional Information

Literature

N6141A & W6141A EMI Self-Guided Demonstration, Technical Overview, literature number 5990-6158EN

Making Conducted and Radiated Measurements, Application Note, literature number 5990-6152EN

Web

EMI X-Series measurement app, traditional UI product webpage
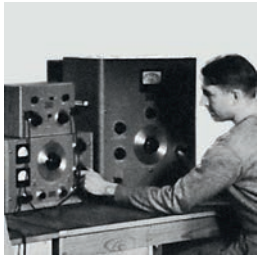**www.keysight.com/find/N6141D**

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