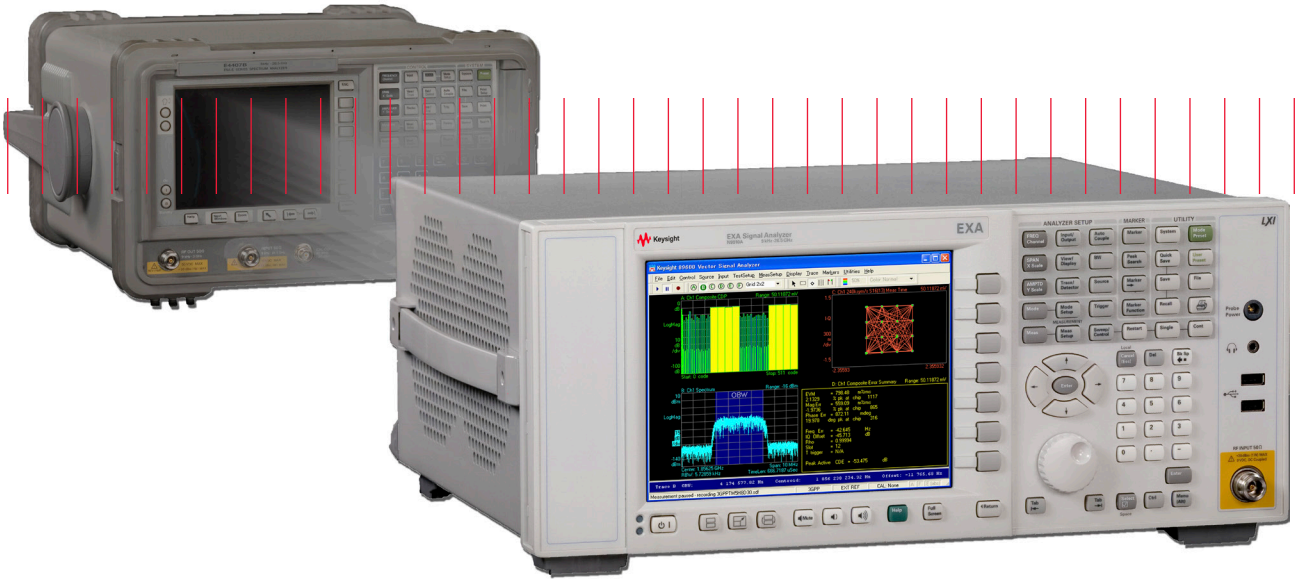
Keysight Technologies

7 Reasons to MIGRATE from the Agilent ESA-E Series Spectrum Analyzers to the EXA X-Series Signal Analyzers



KEYSIGHT TECHNOLOGIES

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Overview

The ESA-E spectrum analyzers have been a familiar sight on many engineers' desks since their introduction in 1999. Over the years the flexibility of the ESA has seen it utilized in a wide range of applications from aerospace and defense to wireless communications and many general purpose applications. The ESA meets the needs of many R&D engineers as well as being an integral part of manufacturing lines.

The Keysight Technologies, Inc. X-Series signal analyzers have set a new industry standard for signal analysis. The wide range of measurement applications allow the X-Series to provide essential standards-based modulation analysis and spectrum measurements as well as simplified complex measurements such as noise figure or phase noise.

The purpose of this document is to help ESA-E customers understand how the Keysight N9010A EXA signal analyzer can improve their signal analysis environments. There are many different concerns that need to be considered when migrating instruments and this document is intended to address these concerns and allow the correct decision to be made.

1. Easier Migration with Backward Compatibilities

When replacing an instrument there are many factors to consider, including programming compatibility, physical parameters, and whether or not the new product meets the technical requirements of today and tomorrow.

Programming compatibility

If the existing instrument is being used in an automated environment, it is important that the transition to the new instrument be as simple as possible. The instrument can be in a test system or on a test bench and programmed through MATLAB or Keysight VEE.

The ESA-E and the replacement EXA both use SCPI commands (standard commands for programming instruments, part of the IEEE-488-2 standard). This results in the EXA providing the highest level of compatibility with the ESA-E spectrum analyzers.

Along with the new, improved features of the EXA signal analyzer, a complete programming guide is available to complement the embedded help files. Example programs are also provided for use in various programming environments. Keysight also provides a single IVI-Com/IVI-C/MATLAB driver that covers the EXA, as well as other X-Series products such as the PXA, MXA and CXA signal analyzers.

Comparison of frequency coverage

With the exception of the 26.5 GHz model, the equivalent EXA model provides a higher maximum frequency, while all models offer a lower start frequency of 10 Hz, as compared to the ESA. In addition, the EXA offers two additional millimeter wave models with optional external mixing capability to measure signals up to 1.1 THz.

Table 1. Comparison of RF/microwave frequency coverage

ESA model number	ESA frequency	Equivalent EXA model	Equivalent EXA frequency
E4402B	9 kHz to 3.0 GHz	N9010A-503	10 Hz to 3.6 GHz
E4404B	9 kHz to 6.7 GHz	N9010A-507	10 Hz to 7.0 GHz
E4405B	9 kHz to 13.2 GHz	N9010A-513	10 Hz to 13.6 GHz
E4407B	9 kHz to 26.5 GHz	N9010A-526	10 Hz to 26.5 GHz
No equivalent model		N9010A-532	10 Hz to 32.0 GHz
No equivalent model		N9010A-544	10 Hz to 44.0 GHz

Feature comparison

The EXA provides many standard features that are currently offered as options on the ESA-E. This increases the value provided, simplifies ordering, and promotes flexibility for future applications and requirements.

Table 2. EXA to ESA-E feature comparison

Options	ESA-E Series	EXA signal analyzer
25 MHz bandwidth (standard)	NA	Option B25
40 MHz bandwidth (optional)	NA	Option B40
High performance dual core processor, 8 GB RAM, with removable solid state drive.	NA	Option PC4
Narrow RBW	1DR	Standard
Web remote control	230 B70	Standard; Remote desktop & embedded web server
Time gating	1D6	Standard
Fast zero sweep	AYX	Standard
RF comms hardware/fast ADB	B7D, B7E	Standard
ACPR DR extension	120	Standard
Markers	4	12
Traces	3	6
Connectivity	GPIB, 3.5” floppy, RS-232, Parallel	7 USB ports, 1000Based-T LAN, GPIB
Low frequency extension	UKB	Standard

One example of the added value provided by the standard features on the EXA is the markers. The ESA-E allows 4 markers to be selected but the EXA provides more flexibility with up to 12 markers and their delta pairs for up to 24 markers on screen. These markers can be easily kept track of with the marker table as shown in Figure 3. To easily compare features and options on both the ESA-E and EXA, please refer to *Agilent ESA-E Series Spectrum Analyzer Configuration Guide*, literature number 5989-9953EN.

Figure 3. The EXA provides up to 12 markers that are fully configurable.

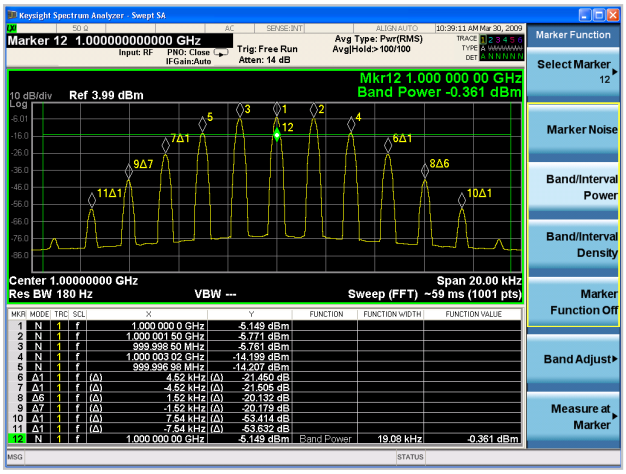


Table 3. Comparisons of dimensions and weight between ESA-E and EXA

	ESA-E	EXA
Dimensions (W x H x D)	416 mm x 222 mm x 409 mm	426 mm x 177 mm x 368 mm
Dimension in rack	1 full 5-U in by 19 inch chassis	1 full 4-U in 19 inch chassis
Weight	17.1 kg (37.7 lb)	16 kg (35 lb)
Power consumption	< 300 Watts	< 350 Watts

The EXA is type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation and end use. These stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power line conditions. Test Methods are aligned with IEC 60068-2 and levels are similar to the ESA tests that adhere to MIL-PRF-28800F Class 3.

Table 4. EXA Environmental Tests

Environmental conditions	MIL-PRF-28800F Class 3	Keysight X-Series
Temperature, non-operating	–41 to 71 °C	–40 to 70 °C
Temperature, operating	0 to 50 °C	5 to 55 °C
Relative humidity	5% to 95% ± 5%	15% to 95% ± 5%
Altitude, non-operating	4600 meters	4600 meters
Altitude, operating	4600 meters	4600 meters
Vibration, random, 5 – 500 Hz	2.09 G rms	2.09 G rms
Shock, functional	30 g	30 g
Bench handling	Yes	Yes
Water tight	Where required	No
Splash proof	Where required	No
Drip proof	Where required	No
Fungus resistance	Where required	No
Explosive atmosphere	Where required	No

Physical dimensions and weight comparison

Parameters such as the physical dimensions and weight can be important considerations for bench use as well as for operation within a rack mounted cabinet. The EXA requires less space in a rack, 1 full 4-U 19 inch chassis, compared to the 5-U required for the ESA.

The standard EXA is provided in a bench top configuration and provides two side carrying straps as well as four bottom feet with a tilt stand. For applications requiring more rugged packaging, the option for portable configuration (N9010A-PRC) provides a pivoting carrying handle and rubber protective corners and end guards. See Figure 27.

2. Flexibility and Speed

Whether your focus is time to market, time to volume, or cost of test, your economy signal analyzer should help you achieve those goals. The EXA signal analyzer accelerates the transition from design into manufacturing while eliminating the compromise between speed and price.

During product design, the EXA signal analyzer helps you identify signal quality issues, enabling optimization of test margins and error budgets. For automated test systems the EXA offers speed and simplicity with features such as fast remote sweep and rapid trace transfer to accelerate throughput. For manual testing, features such as auto tune, flexible markers and quick save capabilities allow the user to concentrate on the testing and debugging.

Manual operation

When using the instruments manually, the speed advantages of the EXA compared to the ESA-E are also obvious. When both instruments are sweeping over a 25 kHz frequency span with the same conditions, the ESA-E takes more than three times longer in comparison to the EXA. This can become more significant when a number of averages are being used.

Additionally, the EXA has an optional fast sweep capability (Option FS1) that is enabled when any of the following options are ordered: B40, DP2 or MPB. With the fast sweep capability, sweep speeds can be over 50 times faster than that of an EXA without fast sweep enabled.

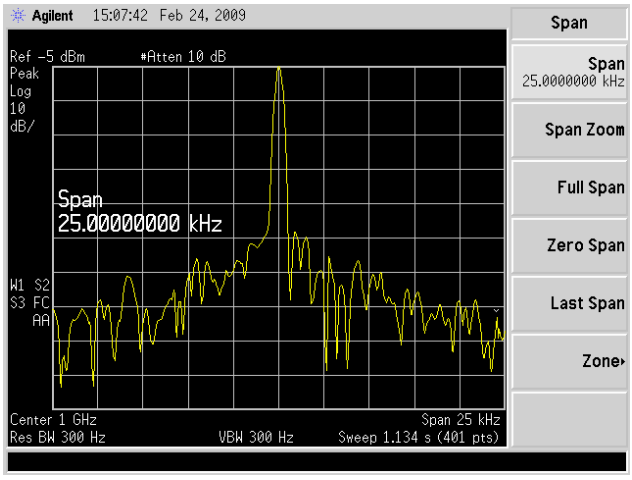


Figure 4a. The ESA-E takes 1.134 s for a 25 kHz span at 1 GHz (RBW=VBW= 300 Hz).

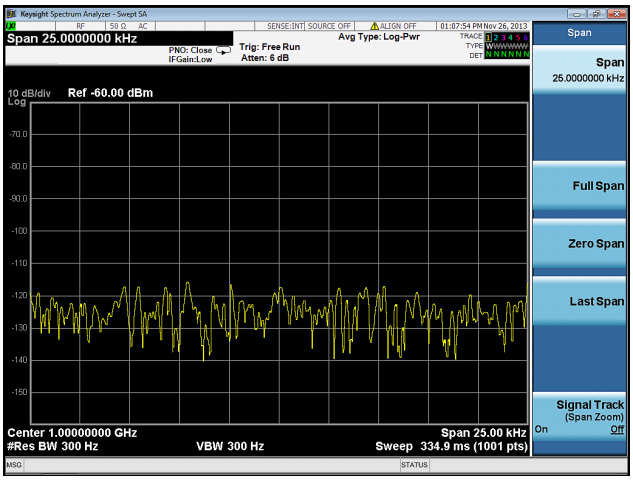


Figure 4b. The EXA takes 335 ms (without fast sweep Option FS1) for a 25 kHz span at 1 GHz (RBW=VBW=300 Hz)

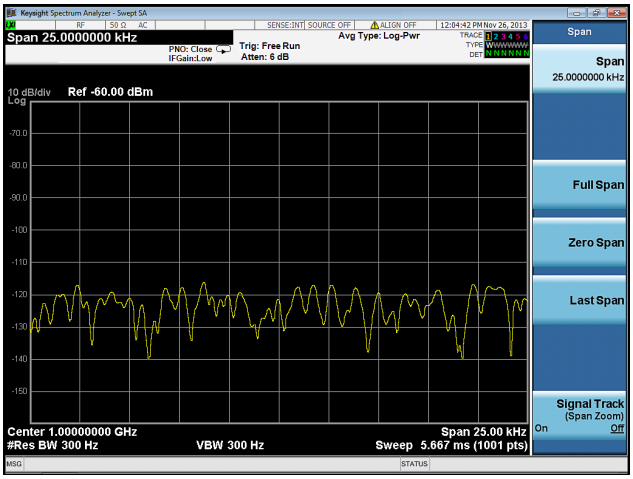


Figure 4c. The EXA takes 5.667 ms (with fast sweep Option FS1) for a 25 kHz span at 1 GHz (RBW=VBW=300 Hz)

When very low level signals are being measured, the noise floor needs to be minimized and this requires narrow resolution bandwidth settings. The EXA sweep type can be set to FFT mode which further shortens the sweep time. If the settings are the same as in Figure 5, but the span is reduced to 20 kHz and the RBW is reduced to 100 Hz, the EXA automatically changes to FFT sweep mode (this can be manually set to Swept or FFT).

Other standard features of the EXA help the user when operating the instrument manually. A few examples are shown in the following figures.

Remote operation

The EXA is up to 50 times faster than the ESA-E over GPIB. This can be further increased using one of the seven standard USB ports or the 1000Based-T LAN. The optional dual core processor (Option PC4), with removable solid state drive and provides even more speed and flexibility.

Table 5. Comparison of measurement speed

Measurement/Operation	ESA-E	EXA standard
Local measurement and display update rate	33 ms	4 ms
Remote measurement and LAN transfer rate	n/a	5 ms
Marker peak search	300 ms	1.5 ms
Center frequency tune and transfer (RF)	90 ms	20 ms
Center frequency tune and transfer (µW)	350 ms	47 ms
Measurement/mode switching		39 ms

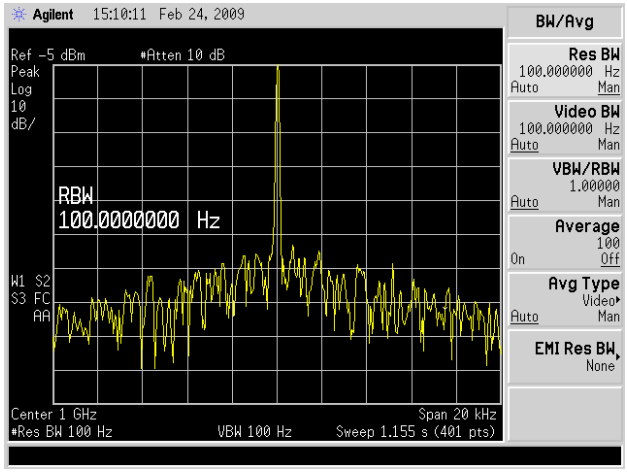


Figure 5. The ESA-E remains in swept mode for a narrow 20 kHz span and a sweep time of 1.155 s.

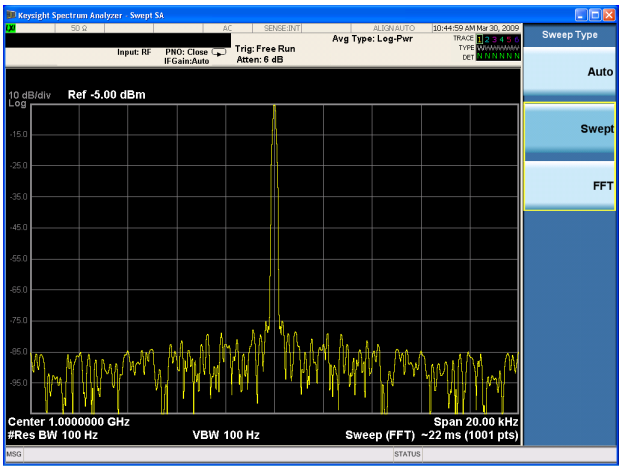


Figure 6. The EXA switches to FFT mode for a 20 kHz span and sweep speed of only 22 ms.

Auto tune

Auto tune allows the user to tune to the desired signal very quickly. When the Auto Tune key is pressed, the analyzer changes center frequency to the strongest signal in the frequency range of the instrument. It then sets the span, amplitude level and RBW based on the type of signal detected.

Figure 7. Auto Tune sets the EXA to the appropriate center frequency, span and amplitude depending on the signal present at the RF input.

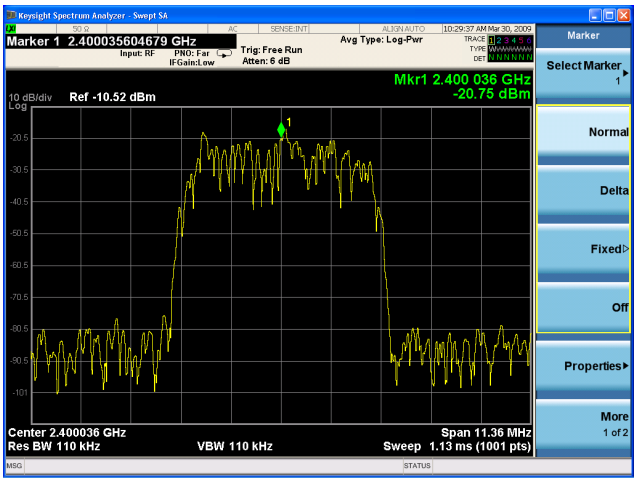
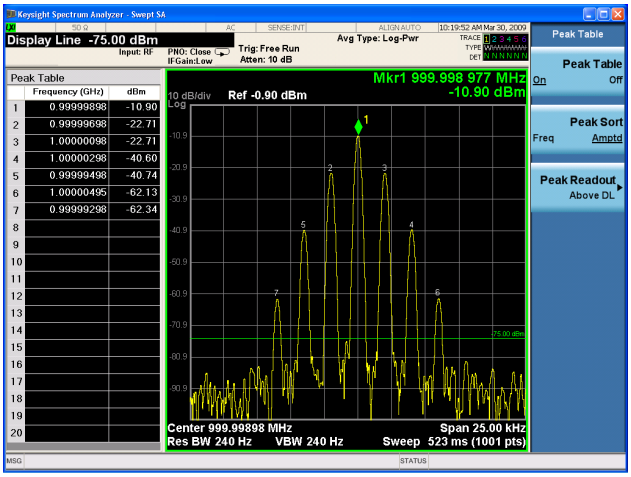


Figure 8. The EXA can display up to 20 peaks which can be sorted by frequency or amplitude.



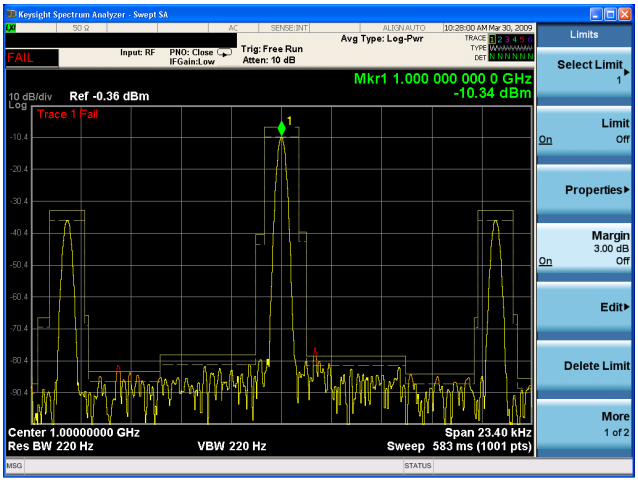
Peak table

The peak table allows up to 20 signal peaks, compared to 10 on the ESA, to be displayed from the current trace. The peak table identifies the highest peaks and is updated after each sweep. The peak table can be sorted by frequency or amplitude and a display line can be used to restrict the section of the trace to be evaluated.

Limit lines

The ESA has the ability to display two limit lines which could be either upper or lower limit lines, with each limit line allowing up to 200 points. The EXA has up to six limit lines available with each limit, accommodating 2000 points. The color screen of the EXA makes it very easy to see where a trace fails a limit and also where it exceeds a pre-defined margin.

Figure 9. The EXA limit lines allow the user to see where the signal exceeds the limit or the margin.



3. Broader Range of Applications

The ESA-E spectrum analyzer provides many different options that allow the analyzer to be customized for specific applications including general purpose applications such as phase noise and noise figure as well as cellular standards such as LTE/W-CDMA/GSM.

The EXA signal analyzer extends significantly the measurement applications available by providing the industry's broadest offering of measurement applications and modulation types. Applications available in the EXA include general-purpose applications such as phase noise and analog demodulation, 2G/3G applications including GSM/EDGE, W-CDMA and TD-SCDMA, 3.9G/4G applications such as LTE and WiMAX™ and additional applications such as 856xEC remote language compatibility and MATLAB software

The 89600 vector signal analysis (VSA) software is a powerful PC-based software that offers the industry's most sophisticated general-purpose and standards-specific signal evaluation and troubleshooting tools. The 89600 VSA software can communicate with the EXA from a separate PC or can be embedded inside the EXA to provide support for more than 75 modulation formats. Customers who prefer to have the 89600 VSA software embedded in the EXA for front panel control and easy SCPI programming should consider the 89601X Keysight VXA Signal Analyzer Measurement Application, shown in Figure 11.

Mode switching time on the EXA is approximately 300 ms, whereas on the ESA mode switching time can be lengthy (seconds).

To determine the equivalent EXA and ESA-E options, please refer to the *ESA-E Configuration Guide*, literature number 5989-9953EN. For the latest list of applications, refer to the *X-Series Signal Analyzer Measurement Applications Overview*, literature number 5989-8019EN.

Figure 10. Analyze AM/FM/PM analog modulation with the N9063A application, providing demodulated waveform, AF and RF spectrum and demodulated metrics.

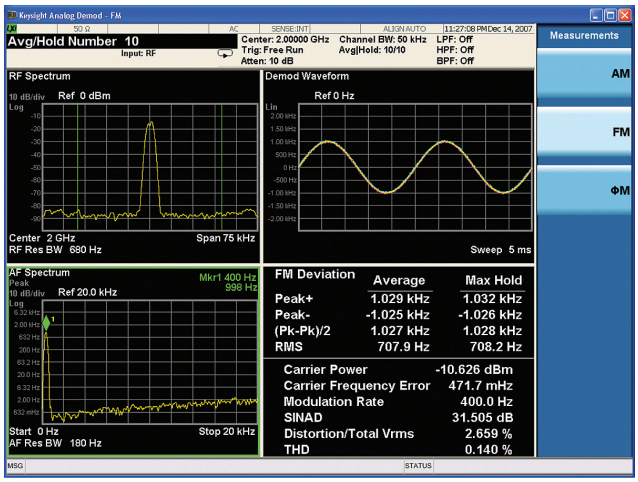


Figure 11. The VXA vector signal analyzer measurement application provides a deep, flexible set of tools that puts comprehensive vector signal analysis in the EXA. Formats include FSK, BPSK, QPSK, and QAM, as well as many standard formats.

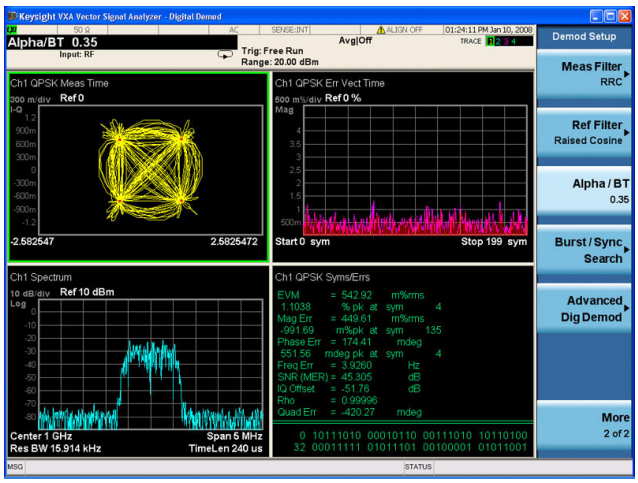
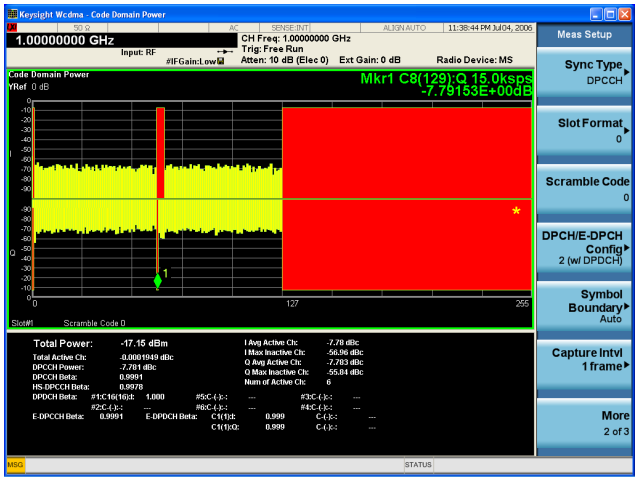


Figure 12. For R&D and manufacturing, the N9073A application provides in-depth modulation analysis and fast measurement speed. Option 2FP provides a full suite of HSDPA/HSUPA measurement capabilities.



Visit: **http://www.keysight.com/find/Xseries_apps** for the latest list of available applications for the EXA.

To allow evaluation of these measurement applications on the EXA signal analyzer, a full-featured 30-day trial license, along with demonstration guides to simplify evaluation of these measurement applications, can be found at:

www.keysight.com/find/xseries_trial

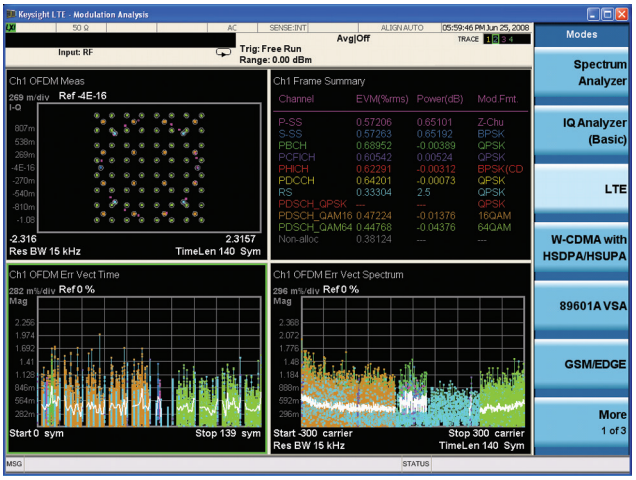


Figure 13. Decipher the complexities of LTE systems with in-depth modulation analysis as well as RF power measurements. The extensive active channel-based color coding simplifies the measurements and troubleshooting.

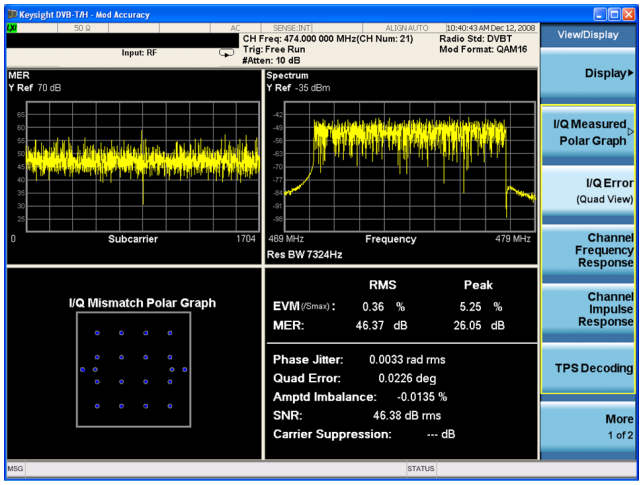


Figure 14. For digital TV formats such as DVB T/H and DTMB, power and modulation accuracy measurements can be provided for R&D and manufacturing applications.

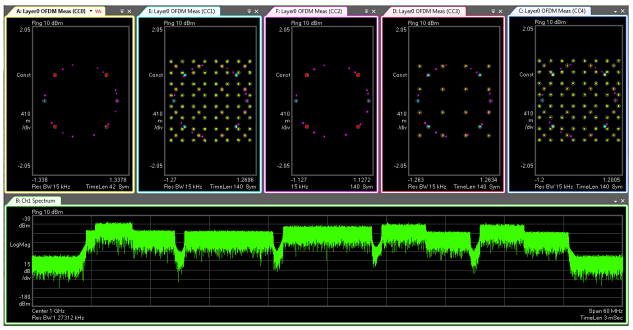


Figure 15. The 89600 VSA software provides sophisticated tools for the R&D engineer to capture and analyze signals across multiple formats and instruments.

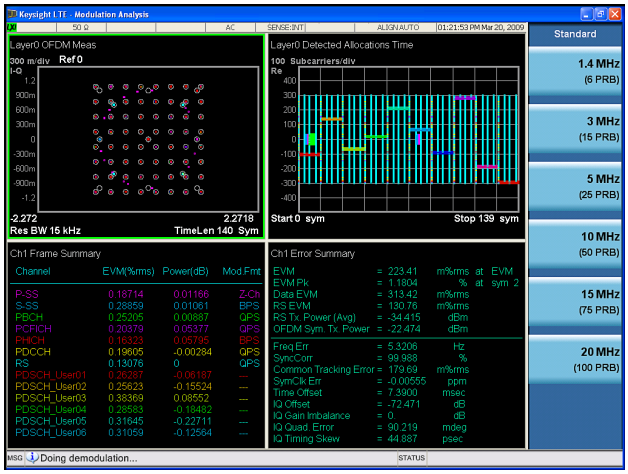
4. Wider Analysis Bandwidth up to 40 MHz

The analysis bandwidth in a signal analyzer is different than the resolution bandwidth. Analysis bandwidth is the instantaneous bandwidth available around a center frequency over which the input signal can be digitized for further analysis or processing in the time, frequency or modulation domain.

In today's modern communication systems the requirements for analysis bandwidth is increasing for applications such as multi-carrier WCDMA testing, WLAN, WiMAX, LTE or other wideband signals. The ESA is limited to a 10 MHz analysis bandwidth with Option AYX or B7D whereas the EXA offers 25 MHz analysis bandwidth as standard and 40 MHz bandwidth with Option B40. This can be seen in the IQ analyzer mode or when demodulating a LTE signal.

Figure 16. IQ analyzer display with 40 MHz analysis bandwidth

Figure 17. LTE OFDM demodulation analysis using 20 MHz bandwidth



5. Improved Selectivity and Accuracy with Digital IF

The advances in analog-to-digital converters (ADCs) and digital signal processing (DSP) over recent years have enabled functionality and performance improvements in the EXA signal analyzers that were not present in the ESA spectrum analyzers. The improvements obtained include measurement accuracy, frequency resolution, and speed and cover frequency domain as well as modulation domain measurements.

In practice, the digital IF is implemented after the RF frequency down conversion stage where the signal is digitized in a 14 bit ADC before passing the data on to the DSP. Within the DSP, the log amplifier, resolution bandwidth filters, and video filters are all implemented digitally.

Some of the key specification improvements with a digital IF are shown in Table 4.

Table 6. Improvements with upgrade

Specification	ESA-E	EXA
RBW switching uncertainty	< ±0.3 dB	< ±0.1 dB
Display scale fidelity	±0.3 dB to ±1.15 dB	±0.15 dB
Resolution bandwidth accuracy	±15% at 1 kHz RBW	±1% at 1 kHz RBW

Improved measurement accuracy

There are many factors which contribute to the overall measurement accuracy within a spectrum analyzer. The predictable nature of the frequency and time response of the digital filters enable more accurate corrections, which improve the amplitude and frequency accuracy of the analyzer.

Digital IF

In the past, best practice recommended that the signal of interest be located as close to the top of the screen as possible for optimum accuracy. In the analog architecture, the saturation level for the log amplifier was also set at the reference level and any signal exceeding this level caused the log amplifier to saturate, causing overload and measurement errors.

With a digital IF, the reference level does not set any saturation level, which means that the signal of interest no longer needs to be at the top of the display. It also means that signals can be above the reference line, resulting in an increased usable dynamic range with the EXA.

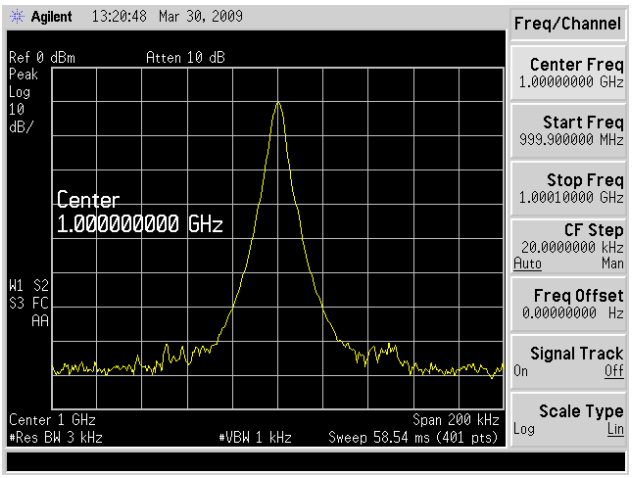


Figure 18. The increased shape factor of the ESA analog IF hides the adjacent signals with the same RBW. (See "Improved selectivity" section on next page.)

Figure 19. The narrow shape factor of the 3 kHz RBW on the EXA digital IF means resolution is improved and the smaller close in signals are visible.

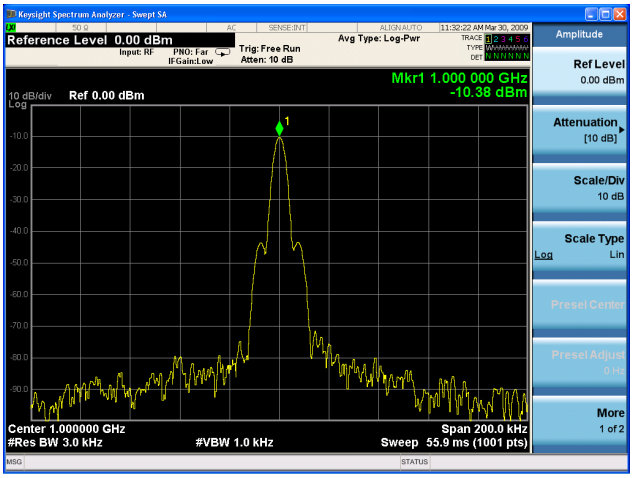


Figure 20. Analog filters in the ESA provide a sweep speed of 8.5 ms in the 400 kHz span (RBW=VBW=10 kHz).

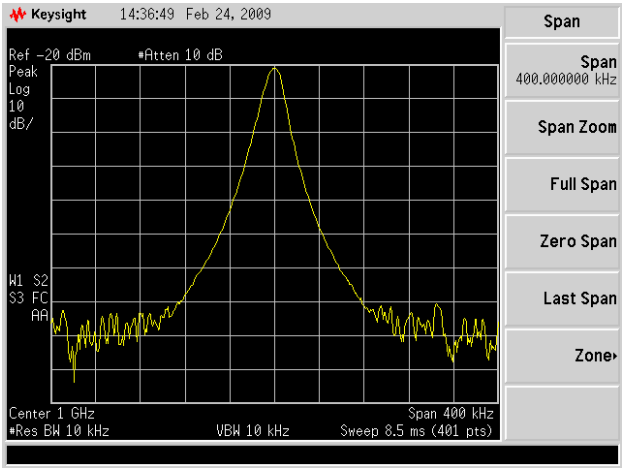
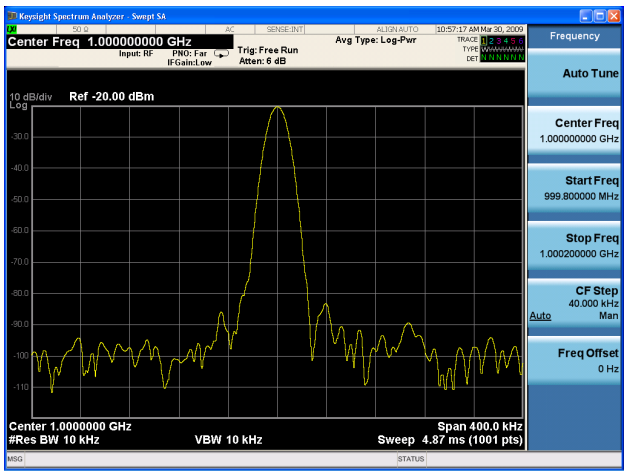


Figure 21. The digital filters in the EXA provide a reduced sweep time of 4.87 ms in the 400 kHz span (RBW=VBW=10 kHz).



Improved selectivity

The ESA uses digital filtering for resolution bandwidths between 1 Hz and 300 Hz, with all the remaining RBW filters being analog. The EXA implements all the RBW filters (1 Hz to 8 MHz) digitally, which provides benefits in terms of selectivity as well as increasing the number of RBW filters available.

Selectivity, or shape factor as it is also known, is the ratio of the -60 dB BW to the -3 dB BW. The smaller the shape factor, the sharper the RBW filter frequency response and the narrower the skirt at the bottom of the filter. The smaller the selectivity ratio, is the easier it is for signals close together to be resolved.

The ESA has a shape factor of 15:1 for the analog RBW filters and 5:1 for RBW filters < 300 Hz. All RBW filters in the EXA are digital filters with selectivity of 4.1:1, enabling signals to be resolved more easily.

The digital filters also increase the number of filters available in the instrument. Traditional spectrum analyzers such as the ESA have RBW steps of 1-3-10. The EXA has RBW increments in 10% steps from 1 Hz to 3 MHz. This is a total of 160 RBW settings in the EXA compared to 15 for the ESA. These additional RBW settings allow the user to optimize the measurement for speed, DANL, and dynamic range.

Improved sweep speed

As mentioned, the digital RBW filters in the EXA signal analyzers have significant speed advantages over the analog filters in the ESA. This can be seen in the following example where both instruments have the same conditions but the EXA sweep time is almost half that of the ESA.

6. Modern Connectivity and Advanced Usability

The Keysight X-Series signal analyzers offer an innovative combination of traditional signal analysis architecture with an open Windows 7 operating system that enables use of all the standard Windows features such as Windows Explorer and remote desktop. Additionally, the Windows environment also allows the user to run other applications such as MATLAB or 89600 vector signal analysis software inside the instrument.

For applications in remote locations the EXA can be controlled via the Windows remote desktop software or with the embedded web server.

The EXA has a comprehensive context-sensitive Help system available. If you have a question when operating the analyzer, you can simply press the "HELP" key on the front panel to get all the information you need including a description of the key function, a remote command table providing SCPI commands, as well as dependencies.

There are seven USB 2.0 ports available in the EXA (6 type-A, and 1 type-B). A user can connect the analyzer to external peripherals such as a DVD drive, keyboard, mouse, and USB flash drive via the A-type USB ports. The type-B port allows the acquisition of IQ waveforms and allows control of the analyzer remotely from an external PC.

Using a USB flash drive, you can save the measurement data and easily transfer it from the analyzer to an external PC. The USB connection is also used for upgrading the hardware and measurement application software functionality of the instrument as compared to the need for floppy disks or LAN/GPIB gateway on the ESA-E. The USB connection is also used for transporting application software licenses between instruments.

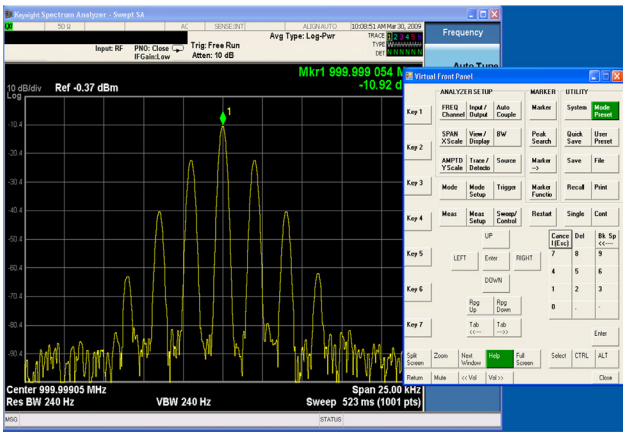


Figure 22. Remote desktop allows full control of the EXA from a PC.

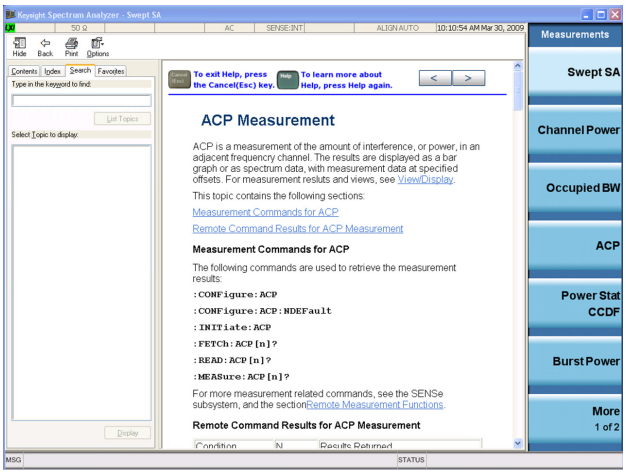


Figure 23. Context sensitive Help provides description of features and SCPI commands.

1000Based-T connectivity that comes standard on the EXA, offers an easy and fast analyzer connection to your network environment. The X-Series analyzers are also LXI-compliant, further enabling fast, efficient and cost-effective creation and reconfiguration of your test system. Like most signal/spectrum analyzers in its class, the EXA is also equipped, as a standard option, with a GPIB (IEEE-488 bus) port for the instrument remote control and data transfer.

In comparison, the ESA-E spectrum analyzer is provided with a GPIB port, an optional RS232 port, a Centronics printer interface, and a 3.5" floppy disk drive.

7. Cost of Ownership

Upgrading the ESA spectrum analyzer requires a hardware, software or licensing upgrade. The number of slots available for upgrade are limited, meaning it may not be possible for all desired options to be installed. Options requiring a hardware upgrade kit often require a few hours installation time either locally or at the Keysight Service Center, as well as adjustments to be performed after installation, adding cost and inconvenience.

Adding functionality to the EXA signal analyzer is simple, whether it is in the form of hardware options such as a preamplifier or electronic attenuator or any of the embedded measurement applications. Many available options are license-key-enabled to allow fast upgrades without the need to return to the Keysight Service Center. The basic frequency range requirement can be selected up front and then additional functionality can be added as necessary.

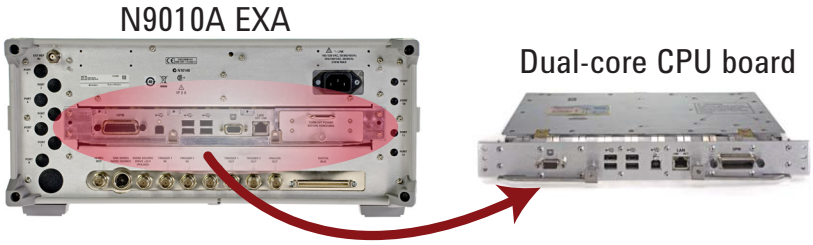


Figure 24. Future-proof EXA and enhanced security with easily upgradeable CPU

Cost of calibration and repair

The ESA spectrum analyzer has a 3 year warranty and a 1 year calibration cycle, whereas the EXA has a standard 3 year warranty and a 2 year calibration cycle. When looking at the overall cost of ownership, it is important to look at the costs throughout the life of the product.

The extended warranty costs, as well as the repair and calibration costs, for the EXA are lower than for the equivalent ESA analyzer, which reflects the enhanced reliability and more modern parts used in the EXA signal analyzer.

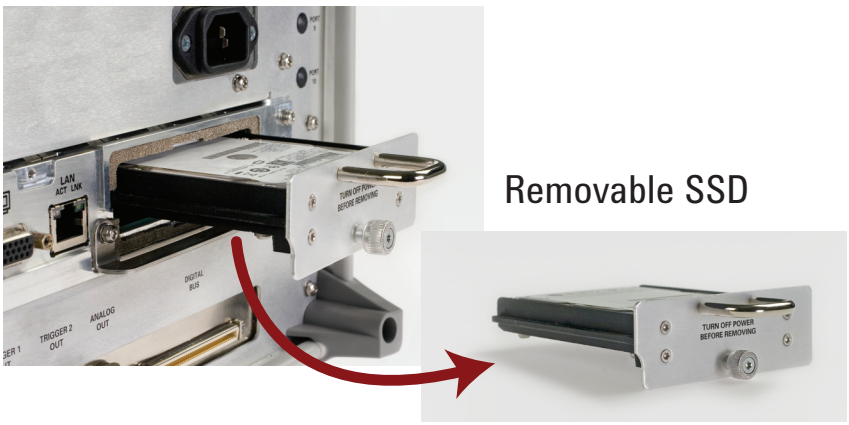


Figure 25. Future-proof EXA with removable solid state drive

Transportable licensing

For locations where there is a large installed base of instruments, it can be costly to have all instruments fully configured for all applications. Transportable measurement applications allow them to be transferred easily from one instrument to another. This provides flexibility to manage test and measurement capabilities across an organization and to include multiple sites, as the business needs evolve.

Future proof instrument investment

Technology can progress quickly. The EXA signal analyzer has been designed to simplify the process of upgrading to meet future technology requirements in a way that was previously unavailable in an economy signal analyzer.

One example of this is with the CPU on the EXA signal analyzer. The standard product has a single core CPU with 4 GB of RAM. Option PC4 can be ordered as an upgrade to increase the performance of the EXA to a dual core CPU with 8 GB of RAM.

Both the single core and dual core CPUs have a removable solid state drive with a SATA 3 Gb/s data interface and 80 GB storage volume. Optional additional solid state drives are also available to order with the single core and dual core CPUs.

Ordering Information

The Keysight X-Series Signal Analyzers

Eliminate the compromises

When your test requirements demand top speed, the Keysight X-Series meets your needs without compromise. The midrange Keysight MXA signal analyzer delivers amazing speed and performance, while the economy Keysight EXA signal analyzer provides excellent speed for the price. For advanced analysis, the Keysight 89600 VSA software and our full range of X-Series applications run inside both the MXA and EXA. In automated testing, code written for the MXA works with the EXA and vice versa. From the front panel, all X-Series analyzers provide an innovative and useful user interface.

To learn more about the X-Series advanced measurement applications, please visit:

www.keysight.com/find/xseries_apps

www.keysight.com/find/exa

Figure 26. N9010A-PRC portable configuration

Description	Ordering number	Upgradeable
Instrument		
EXA signal analyzer N9010A (includes spectrum analyzer measurement application)		
Frequency range, 10 Hz to 3.6 GHz	N9010A-503	No
Frequency range, 10 Hz to 7.0 GHz	N9010A-507	No
Frequency range, 10 Hz to 13.6 GHz	N9010A-513	No
Frequency range, 10 Hz to 26.5 GHz	N9010A-526	No
Frequency range, 10 Hz to 32.0 GHz	N9010A-532	No
Frequency range, 10 Hz to 44.0 GHz	N9010A-544	No
Dual core processor with removable solid state drive	N9010A-PC4	Yes
Additional removable solid state drive	N9010A-SSD (requires PC2, PC4 or PC5)	Yes
Basic precompliance EMI features	N9010A-EMC	Yes
Performance options		
Precision frequency reference	N9010A-PFR	Yes
Electronic attenuator, 3.6 GHz	N9010A-EA3	Yes
Analysis bandwidth, 40 MHz	N9010A-B40	Yes
Preamplifier, 3.6 GHz	N9010A-P03	Yes
Preamplifier, 7 GHz	N9010A-P07	Yes
Preamplifier, 13.6 GHz	N9010A-P13	Yes
Preamplifier, 26.5 GHz	N9010A-P26	Yes
Preamplifier, 32.0 GHz	N9010A-P32	Yes
Preamplifier, 44.0 GHz	N9010A-P44	Yes
Fine step attenuator	N9010A-FSA	Yes
Accessories		
Hard transit case	N9010A-HTC	Yes
Portable configuration	N9010A-PRC	Yes
Rack mount kit with handles	N9010A-1CP	Yes
USB DVD-ROM/CD-R/RW drive	N9010A-DVR	Yes
Rack slide kit	N9010A-1CR	Yes
Minimum loss pad, 50 to 75 ohms (Type N to BNC)	N9010A-MLP	Yes
Calibrations		
Commercial calibration certification with test data	N9010A-UK6	No
ISO 17025 accredited calibration	N9010A-AMG	No
ANSI Z540 compliant calibration	N9010A-A6J	No

Other options and accessories are available; see the EXA configuration guide (5989-6531EN) for details.

Ordering Information (Continued)

Note: The last two letters of the ordering numbers indicate the license type—FP stands for fixed perpetual, TP for transportable perpetual; it is recommended that you configure each application with the same license type; visit **www.keysight.com/find/X-Series_transportable** for more information about transportable licenses

Description	Fixed license	Transportable license	Additional information
Cellular communications			
LTE-FDD	N9080A-1FP	N9080A-1TP	Standard-based, one-button LTE (FDD) measurements; requires Option B25 or Option B40 for analysis greater than 10 MHz
LTE-TDD	N9082A-1FP	N9082A-1TP	Standard-based, one-button LTE (TDD) measurements; requires Option B25 or Option B40 for analysis greater than 10 MHz
Multi-Standard Radio (MSR)	N9083A-1FP	N9083A-1TP	Standard-based, one-button MSR measurements on any combination of LTE-FDD, W-CDMA/HSPA/HSPA+, GSM/EDGE/EDGE Evo, cdma2000 and 1xEV-DO signals
W-CDMA/HSPA+	N9073A-1FP	N9073A-1TP	Standard-based, one-button W-CDMA measurements
	N9073A-2FP	N9073A-2TP	Adds HSPA measurements; requires 1FP/1TP
	N9073A-3FP	N9073A-3TP	Adds HSPA+ measurements; requires 1FP/1TP, 2FP/2TP
	N9073A-XFP	N9073A-XTP	Adds single acquisition combined measurement, a SCPI-command-based measurement optimized for high-volume, high-throughput manufacturing; requires 1FP/1TP; not compatible with Options DP2, B40, or MPB; not compatible with Options 532 or 544
GSM/EDGE/EVO	N9071A-2FP	N9071A-2TP	Standard-based, one-button GSM/EDGE measurements
	N9071A-3FP	N9071A-3TP	Adds EDGE Evolution and VAMOS measurements; requires 2FP/2TP
	N9071A-XFP	N9071A-XTP	Adds single acquisition combined measurement, a SCPI-command-based measurement optimized for high-volume, high-throughput manufacturing; requires 2FP/2TP; not compatible with Options DP2, B40, or MPB; not compatible with Options 532 or 544
TD-SCDMA/HSPA	N9079A-1FP	N9079A-1TP	Standard-based, one-button TD-SCDMA measurements
	N9079A-2FP	N9079A-2TP	Adds HSPA/8PSK measurements, requires 1FP/1TP
1xEV-DO	N9076A-1FP	N9076A-1TP	Standard-based, one-button 1xEV-DO Rel 0, Rev A, and Rev B measurements
cdma2000®/cdmaOne	N9072A-2FP	N9072A-2TP	Standard-based, one-button cdma2000 and cdmaOne measurements
iDEN/WiDEN/MotoTalk	N6149A-2FP	N6149A-2TP	Standard-based, one-button iDEN measurements
Wireless connectivity			
Mobile WiMAX™	N9075A-2FP	N9075A-2TP	Standard-based, one-button Mobile WiMAX measurements
Fixed WiMAX	N9074A-XFP	N9074A-XTP	Single acquisition combined measurement, a SCPI-command-based measurement optimized for high-volume, high-throughput manufacturing; not compatible with Options DP2, B40, or MPB; not compatible with Options 532 or 544
WLAN 802.11a/b/g/n/ac	N9077A-2FP	N9077A-2TP	Standard-based, one-button 802.11a/b/g measurement
	N9077A-3FP	N9077A-3TP	Adds 802.11n; requires 2FP/2TP
	N9077A-4FP	N9077A-4TP	Adds 802.11ac; requires 2FP/2TP, 3FP/3TP
	N9077A-5FP	N9077A-5TP	A SCPI-command-based list sequence that allows manufacturing users to make accelerated measurements for high-volume, high-throughput production; not compatible with Options 532 or 544; requires Option B40
Bluetooth®	N9081A-2FP	N9081A-2TP	Standard-based, one-button ***Bluetooth*** version 2.1+ EDR and Low Energy (LE) measurements

Digital video			
CMMB	N6158A-2FP	N6158A-2TP	Standard-based, one-button, CMMB measurements
Digital cable TV	N6152A-2FP	N6152A-2TP	Standard-based, one-button DVB-C (J.83 Annex A/C) measurements
	N6152A-3FP	N6152A-3TP	Standard-based, one-button J.83 Annex B measurements
DTMB (CTTB)	N6156A-2FP	N6156A-2TP	Standard-based, one-button DTMB (CTTB) measurements
DVB-T/H/T2	N6153A-2FP	N6153A-2TP	Standard-based, one-button DVB-T/H measurements
	N6153A-3FP	N6153A-3TP	Adds DVB-T2; measurements require 2FP/2TP
ISDB-T/Tmm	N6155A-2FP	N6155A-2TP	Standard-based, one-button ISDB-T, ISDB-T_B, and ISDB-T_{SB}
	N6155A-3FP	N6155A-3TP	Adds ISDB-Tmm measurements; requires 2FP/2TP
General purpose			
Spectrum analyzer	Standard	Not available	Traditional spectrum analysis plus many new and enhanced functions; power measurements based on industry specifications
Analog demodulation	N9063A-2FP	N9063A-2TP	Adds one-button measurement for AM/FM/PM demodulation with metrics, tune and listen, and AF spectrum
	N9063A-3FP	N9063A-3TP	Adds FM Stereo and RDS; requires 2FP/2TP
Phase noise	N9068A-2FP	N9068A-2TP	Adds one-button measurements for analyzing phase noise in frequency domain (log plot) and time domain (spot frequency)
Noise figure	N9069A-1FP (requires preamplifier to meet specifications)	N9069A-1TP (requires preamplifier to meet specifications)	Adds one-button measurements for noise figure, gain, and related metrics; requires preamplifier to meet specifications; works with Keysight N400xA Series smart noise sources and 346 Series noise sources
	N9069A-2FP	N9069A-2TP	Advanced NF measurement features including external LO control over GPIB/LAN/USB, and manual mode to simulate the legacy NF meter; requires 1FP/1TP
VXA vector signal analysis	N9064A-1FP	N9064A-1TP	Vector signal analysis; high-resolution, FFT-based spectrum and time-domain measurements, time gating, AM/FM/PM demodulation, statistical measurements
	N9064A-2FP	N9064A-2TP	Adds flexible digital modulation analysis; general purpose digital modulation for 2-16FSK, 2-8PSK, and 16-1024QAM, as well as more than 15 additional formats; requires -1FP/1TP
EMC	N6141A-2FP	N6141A-2TP	Pre-compliance conducted and radiated emission measurements
MATLAB software	N6171A-M01	Not available	Basic signal analysis package; adds MATLAB software environment and the Instrument Control Toolbox (not upgradeable)
	N6171A-M02	Not available	Standard signal analysis package; includes basic package and adds Communications Toolbox and Signal Processing Toolbox (not upgradeable)
	N6171A-M03	Not available	Advanced signal analysis package; includes standard package and adds Filter Design Toolbox, RF Toolbox, and System Test (not upgradeable)
Pulse	N9051A-2FP	Not available	Automates pulse measurements; combines signal analysis and amplitude-vs-time measurements
	N9051A-3FP	Not available	Adds phase and frequency measurements; requires 2FP
	N9051A-4FP	Not available	Adds extended analysis and statistics; requires 2FP
SCPI command language compatibility	N9062A-2FP	Not available	Adds capability to emulate the R&S FSP/FSU/FSE spectrum analyzers
Remote language compatibility	N9061A-1FP	Not available	Adds capability to emulate the HP/Keysight 8566/68 spectrum analyzers
	N9061A-2FP	Not available	Adds capability to emulate the HP/Keysight 856xE/EC spectrum analyzers
89600 VSA software	Not available	89601B (transportable license is standard)	Industry-leading measurement software for evaluating and troubleshooting signals in R&D; PC-based software supporting more than 30 measurement platforms, plus more than 75 signal standards and modulation types including MIMO analysis; www.keysight.com/find/89600vsa

Literature and Web

Literature title	Literature number
Keysight EXA Signal Analyzers	
Brochure	5989-6527EN
Data Sheet	5989-6529EN
Configuration Guide	5989-6531EN
Keysight MXA Signal Analyzers	
Brochure	5989-5047EN
Data Sheet	5989-4942EN
Configuration Guide	5989-4943EN
Keysight X-Series Signal Analyzers (MXA/EXA)	
Demonstration Guide	5989-6126EN
X-Series Signal Analyzer Measurement Application Overview	5989-8019EN
EMI Precompliance Measurements Using MXA/EXA	5990-3690EN
Analog Demodulation Measurement Application Technical Overview	5989-6535EN
Noise Figure Measurement Application Technical Overview	5989-6536EN
Phase Noise Measurement Application Technical Overview	5989-5354EN
Pulse Measurement Software Technical Overview	5990-3801EN
W-CDMA, HSDPA/HSUPA Measurement Application Technical Overview	5989-5352EN
802.16 OFDMA Measurement Application Technical Overview	5989-5353EN
GSM/EDGE Measurement Application Technical Overview	5989-6532EN
EDGE Evolution Measurement Application Flyer	5989-9837EN
cdma2000, 1xEV-DO Measurement Application Technical Overview	5989-6533EN
TD-SCDMA Measurement Application Technical Overview	5989-6534EN
LTE Measurement Application Technical Overview	5989-6537EN
Single Acquisition Combined WLAN Measurement Application Technical Overview	5990-3519EN
Single Acquisition Combined Fixed WiMAX Measurement Application Technical Overview	5990-3520EN
DVB-T/H Measurement Application Technical Overview	5990-3569EN
DTMB Measurement Application Technical Overview	5990-3570EN
Remote Language Compatibility Technical Overview	5989-6539EN
Speed Enhancement and Removable Hard Drive	5989-6541EN
Using Keysight X-Series Analyzers (MXA/EXA) for Measuring and Troubleshooting Digitally Modulated Signals	5989-4944EN
Using Keysight X-Series Analyzers (MXA/EXA) Preselector Tuning for Amplitude Accuracy in Microwave Spectrum Analysis	5989-4946EN
Maximizing Measurement Speed with Keysight X-Series Signal Analyzers (MXA/EXA)	5989-4947EN
Option BBA: Analog Baseband IQ Inputs Technical Overview	5989-6538EN
Making Precompliance Measurements with Option EMC on X-Series Analyzers (MXA/EXA)	5990-3133EN
8 Hints for Better Spectrum Analysis	5965-7009E
Keysight VXA Vector Signal Analyzer Measurement Applications	
VXA Vector Signal Analyzer Measurement Application, Technical Overview	5989-7463EN
Option AYA Vector Modulation Analysis, Technical Overview	5989-7464EN
Option B7R WLAN Modulation Analysis, Technical Overview	5989-7465EN
Web	
ESA to EXA Product Migration	
http://www.keysight.com/find/esa2exa	

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