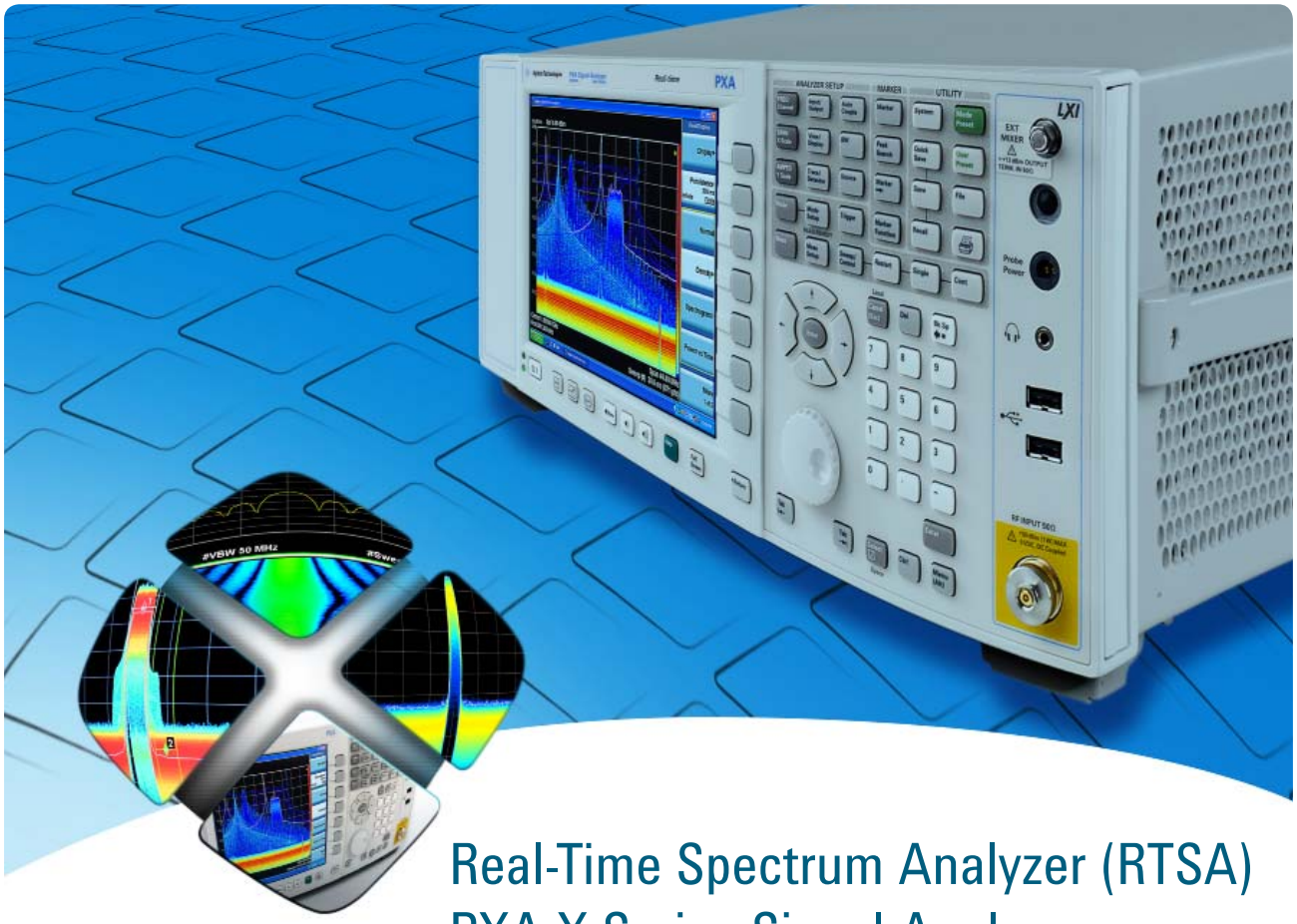


Real-Time Spectrum Analyzer (RTSA)
PXA X-Series Signal Analyzer
N9030AK-RT1 & N9030AK-RT2

Technical Overview

- Detect signals with 100% POI with durations as short as 3.57 µs
- Scan with 160-MHz real-time bandwidth up to 50-GHz frequency range
- See small signals in the presence of large ones with up to 75 dB spurious-free dynamic range
- Eliminate the need for a dedicated instrument: RTSA is an upgradable option for new and existing PXAs
- Thoroughly analyze complex signals with 89600 VSA software

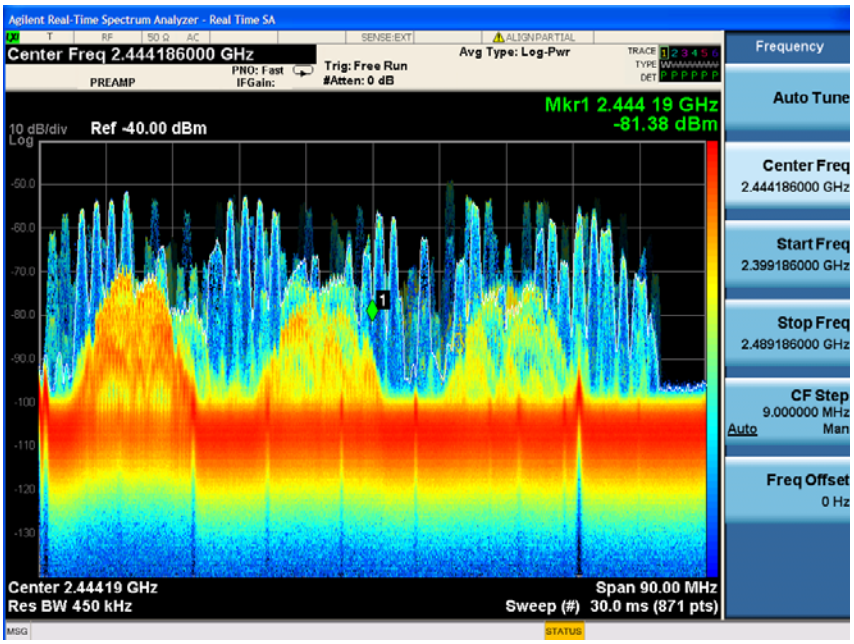
Anticipate ___Accelerate ___Achieve

Agilent Technologies

Experience Real-Time Spectrum Analysis – the Agilent Way

The PXA is the first mainstream signal analyzer to be upgradable to real-time capabilities. You can readily convert an existing PXA in-place without hardware retrofits or re-calibration. With the PXA as the foundation, you get new levels of performance, flexibility and usability in real-time spectrum analysis.

With our real-time spectrum analyzer (RTSA) option, the PXA delivers excellent sensitivity, analysis bandwidth, frequency range and, most important, probability of intercept (POI). In addition, a real-time PXA provides continuous acquisition of RF signals, including low-level signals occurring close to larger ones. Its conditional triggering capabilities can watch for transient or intermittent events and initiate signal capture, measurement and display. The ultimate result: you can see more, capture more and understand more.



Summary of Key Specifications

Frequency ranges	Minimum: 3 Hz Maximum: 3.6, 8.4, 13.6, 26.5, 43, 44 and 50 GHz
Real-time analysis bandwidth	85 MHz (N9030AK-RT1) or 160 MHz (N9030AK-RT2)
Probability of intercept (POI)	100% with durations as short as 3.57 µs with full amplitude accuracy
Displayed average noise level	–157 dBm at 10 GHz and no preamp
Dynamic range	Up to 75 dB spurious-free

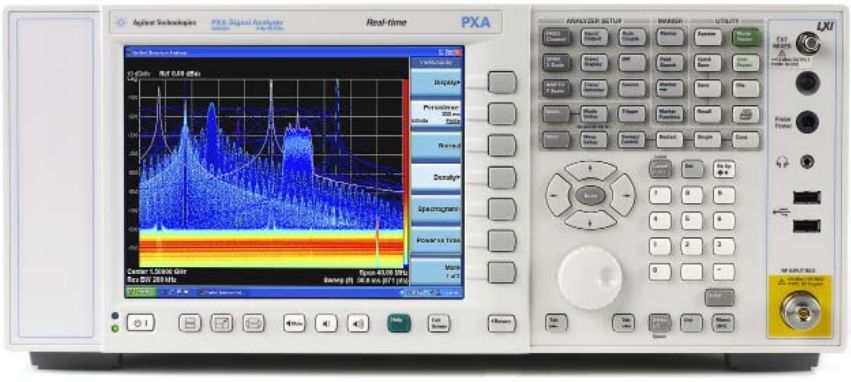
See side-by-side comparison and other videos on YouTube at **http://qrs.ly/3o2ykl1**

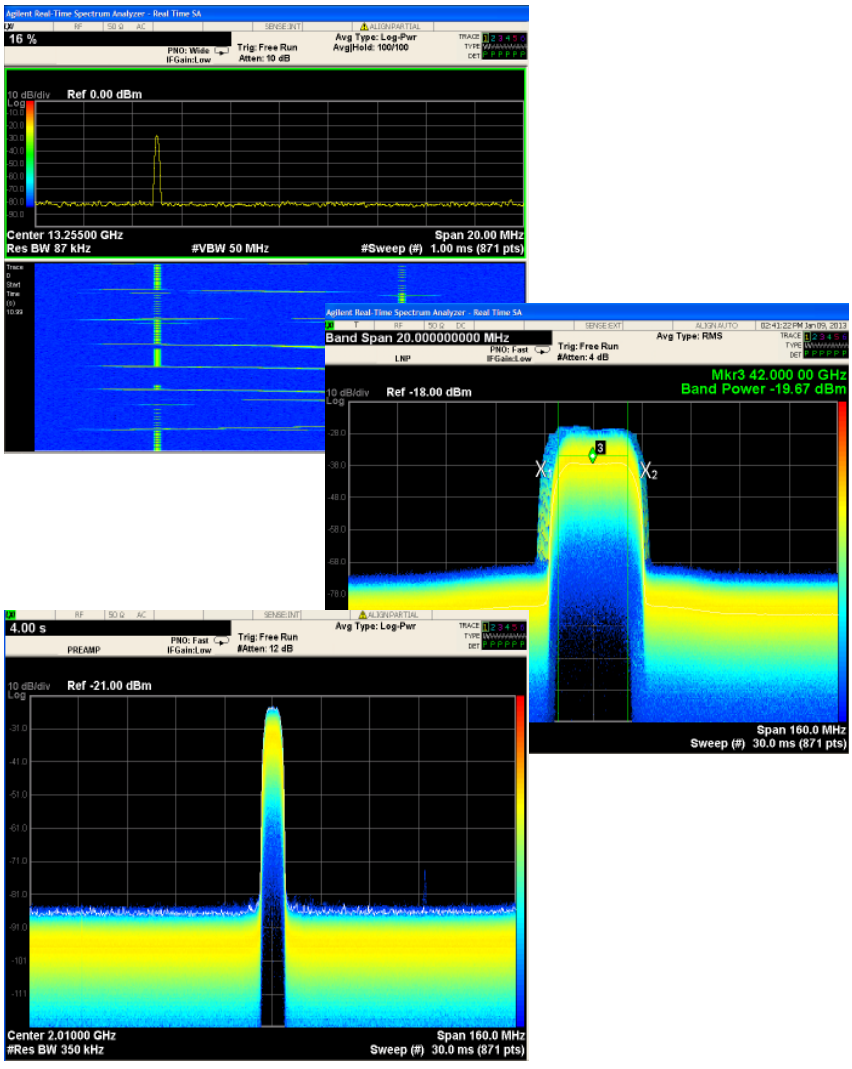
Know You've Got It

Even at the extremes of signal analysis, your high-performance analyzer should be ready for anything. That's why we're offering real-time spectrum analysis (RTSA) as an upgradable option for new and existing PXA signal analyzers.

Adding RTSA lets you see, capture and understand the most elusive signals—known or unknown. To go deeper, you can combine a real-time PXA with the 89600 VSA software to create a solution that lets you thoroughly characterize complex signals.

Inside signal-rich systems and environments, go real-time with Agilent and know you've got it.





Defining real-time analysis

In a spectrum or signal analyzer with a digital intermediate frequency (IF) section, real-time operation is a state in which all signal samples are processed for some sort of measurement result or triggering operation. In most cases the measurement results are scalar—power or magnitude—corresponding to traditional spectrum measurements.

In addition to gap-free analysis, a real-time RF analyzer may be defined as having four more key attributes: high-speed measurements, consistent measurement speed, frequency-mask triggering and advanced composite displays.

In general, the stream of spectra from real-time processing can be used in one of two ways: The spectra can be combined into a composite spectrum display or successively compared to a limit mask to implement frequency-mask triggering. Both of these capabilities are present in the RTSA option.

See, Capture and Understand the Most Elusive Signals

The real-time PXA includes four key innovations: wider bandwidth, better dynamic range, higher POI and integrated analysis capabilities. Individually and collectively, these capabilities bring you a host of important benefits.

See more with wider bandwidth and better dynamic range

The PXA has the required combination of IF bandwidth, signal sampling and signal processing to handle 160 MHz continuously. This gap-free bandwidth applies not only to real-time spectrum analysis but also to frequency-mask trigger (FMT), gap-free time capture and real-time magnitude calculations for IF magnitude triggering.

To help you detect small signals in the presence of large ones, the PXA provides up to 75 dB SFDR across its full 160 MHz analysis bandwidth. Dynamic range is enhanced by the low noise floor and excellent distortion performance of the PXA. When dealing with very small signals, the PXA can be further enhanced by adding the low noise path (LNP) option, which improves sensitivity while still handling high-level signals.

Capture more with higher POI

The PXA's advanced processing architecture combines with its 160-MHz analysis bandwidth and wide dynamic range to provide 100 percent POI for signals with durations as short as 3.57 µs. Gap-free analysis is just one element of POI. Within the instrument, other contributing factors are processor and analyzer dynamic range (including sensitivity), sampling bandwidth, processing continuity and FFT processing overlap (which compensates for windowing functions).

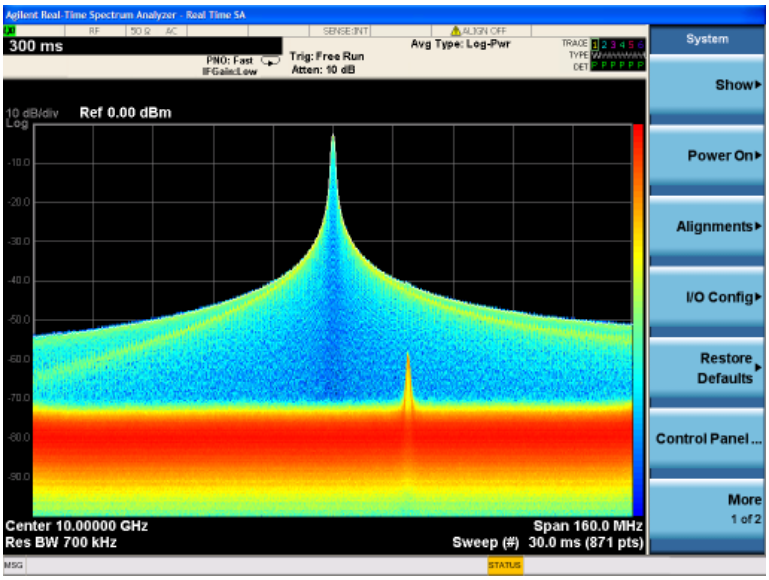


Figure 1. See small signals in the presence of large ones

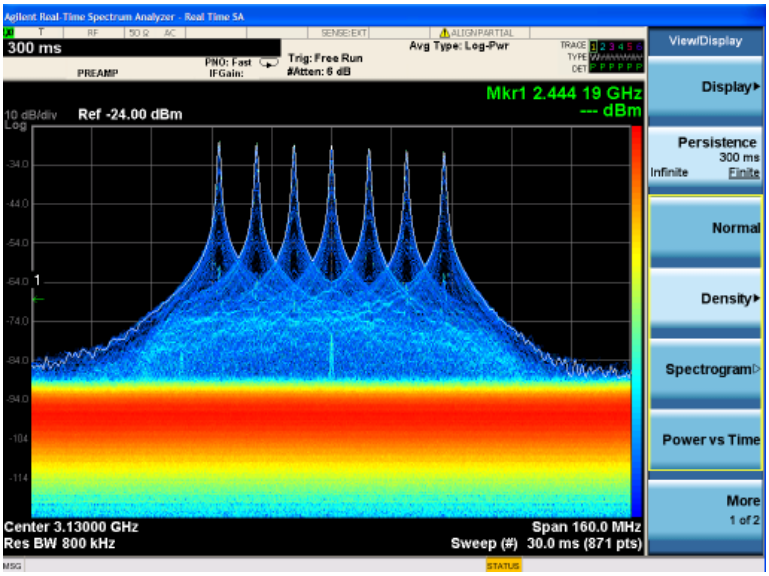


Figure 2. Fast-hopping radar

Understand more with integrated analysis capabilities

In some cases, simply finding an elusive signal is enough. In other situations, finding the signal is just the first step toward a thorough understanding of what's happening. This is when the combination of a real-time PXA, real-time FMT and the 89600 VSA software is especially useful.

The real-time trigger can start any VSA measurement—one or many—in any measurement mode, including demodulation. The trigger can be initiated when a specific spectrum mask is entered or exited, or with more complex sequences such as exit followed by re-entering. Pre- and post-trigger delays are also available, letting you make measurements of signals prior to the trigger event.

These capabilities make the real-time PXA plus VSA a great combination for measuring modulated transients, frequency-hopping signals, frequency settling, and undesired transients in signal sources such as VCOs or YIG oscillators.

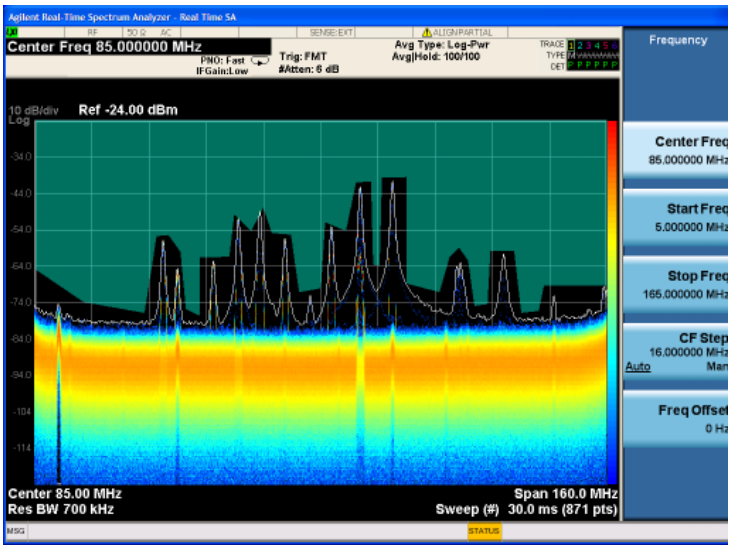


Figure 3. Frequency Mask Trigger of a hopping signal

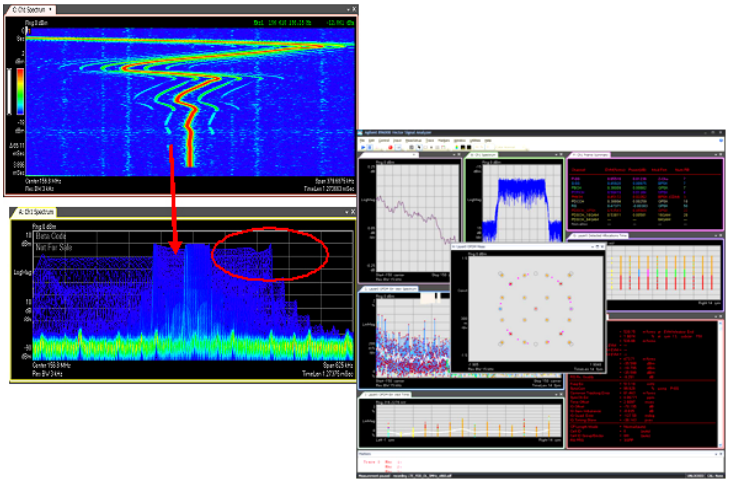


Figure 4. Oscillator settling analysis and demodulation

Go deeper with the 89600 VSA

Our VSA software lets you view virtually every facet of complex signals—simultaneously. You can use it to measure more than 75 modulation types, from custom OFDM or APSK to standard-based signals such as MIL-STD, GSM and LTE.

Its advanced troubleshooting tools will help you find the root cause of signal problems inside a system or in the RF environment. With frequency-mask triggering, you can record culprit signals for detailed characterization, and then use them as stimulus signals by playing them back with an Agilent signal generator or in simulation software such as Agilent SystemVue.

Maximize the Performance of Radar and EW Systems During Development

From the simple to the complex, all radar, EW and ELINT systems pose a variety of challenges when testing components, subsystems and systems. Adding RTSA to the PXA creates a cost-effective solution that combines real-time analysis with traditional spectrum measurements such as noise figure, phase noise and power measurements.

For example, you can use a real-time PXA to identify spurious signals using traditional swept analysis then switch modes to see pulsed spurs using real-time analysis and displays.

The PXA will detect all signals greater than 3.57 µs with full amplitude accuracy -- the best POI currently available. For signals with a large signal-to-noise ratio (> 60 dB), the PXA will detect signals with durations as short as 5 ns.

With the optional pulse measurement application (N9051A), you can quickly characterize pulse width, pulse repetition interval (PRI), and more. When creating or analyzing jamming techniques, you can use FMT with the 89600 VSA software and its record/playback capabilities.

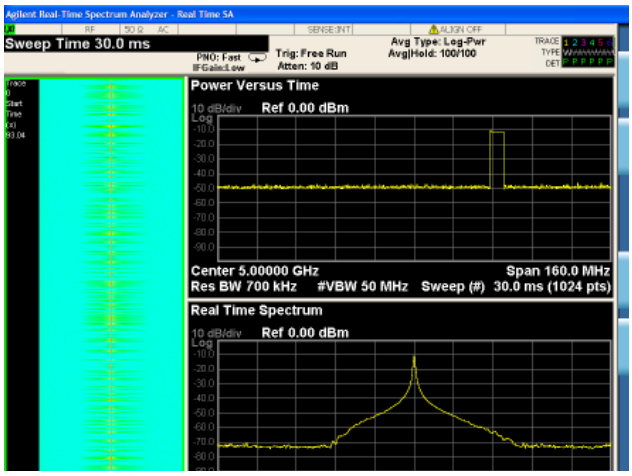


Figure 5. Pulse analysis using power vs. time, RT spectrum and spectrogram

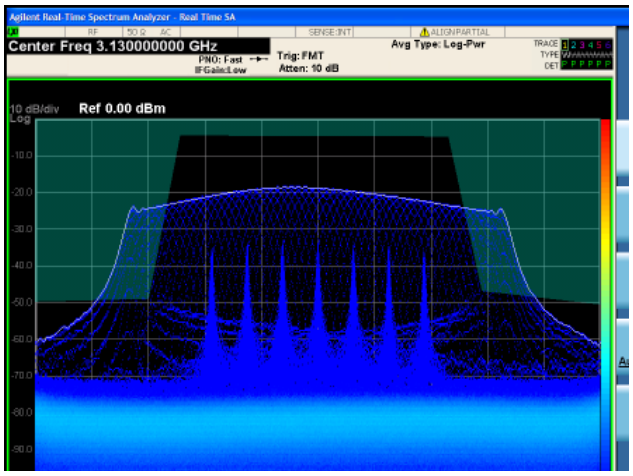


Figure 6. Radar mode switching

Capture, Catalog and Understand Highly Elusive Signals In the Field

Today, radar and EW systems operate in an increasingly cluttered spectral environment. Being able to identify intentional and unintentional interferers requires a variety of powerful signal-analysis tools.

To help you view faint return signals in transient or dynamic antenna scans, the real-time PXA enhances POI with a noise floor of -157 dBm (10 GHz, no preamp). You can more easily discern the lowest-level interference signals versus the background with the use of variable resolution bandwidths within all real-time spans.

Capabilities such as simultaneous display of real-time spectrogram and power-versus-time enable you to capture radar and communication jamming and interference. Observe closely-spaced intermittent signals while retaining high POI integrity with 871 display points, advanced real-time persistence displays and the largest location resolution.

By combining FMT with the 89600 VSA software, you can easily identify, capture and play back portions of EW techniques. The PXA's optional pulse measurement application (N9051A) lets you extract parameters such as PRI, pulse width and pulse statistics.

Accelerate Development of High-Performance Communication Systems

Whether you're focused on transmitters, transceivers or whole radios, today's systems rely on signals that are fast, agile, wide and complex. Adding RTSA to the PXA creates a cost-effective solution that combines traditional spectrum measurements with real-time capabilities, including the highest-performance in transient real-time analysis.

With a real-time PXA, you can capture and analyze complete transmitter-channel characteristics at gap-free bandwidths of up to 160-MHz within a 50-GHz frequency range. Real-time persistence displays let you observe radio function, review cognitive radio algorithms and check dynamic spectrum management scenarios.

FMT capabilities will help you capture a variety of issues and find the rarest of system violations. Characterize frequency switching and perform deeper analysis with the 89600 VSA software: it can demodulate numerous signal types, ranging from standards-based signals to custom waveforms. To reveal greater detail, you can check PLL settling and identify LO issues using FMT, VSA software and real-time spectrogram displays.

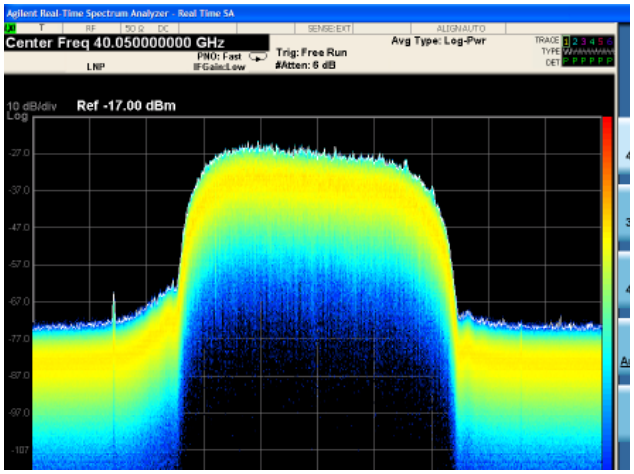


Figure 7. Satellite signal with spurious emission

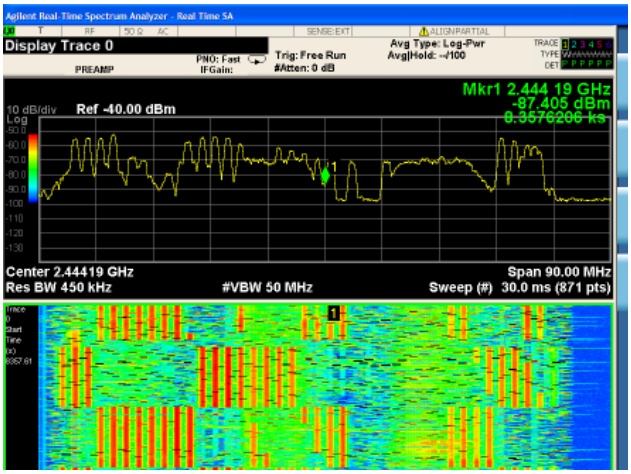


Figure 8. Spectral analysis of ISM band

Characterize Communication System Performance In the Field

In real-world operating conditions, systems face a crowded spectral environment populated by intentional and unintentional sources of interference. As a result, multi-format, high-rate communication systems have a much higher probability of interoperability issues.

With a real-time PXA, you can perform fast pre-scans up to 50 GHz with swept-tuned capabilities then zoom in using real-time mode with up to 75 dB dynamic range. RTSA provides the performance you need to accurately measure small or large signals, even in the presence of powerful transmitters, with industry-leading performance in noise floor and distortion. These capabilities let you sift through a dense environment and easily find previously undetected intermittent interferers or "signals within signals."

You can also verify communication link performance versus background noise and interference, or observe frequency-switching events and analyze cognitive radio performance. To measure true transmitter and receiver performance, explore the time, frequency and modulation domains with RTSA and the 89600 VSA software.

Drive Your Evolution with the PXA Signal Analyzer

The future-ready PXA is the evolutionary replacement for your current high-performance signal analyzer. It helps you sustain your past achievements, enhance current designs and accelerate future innovation with industry-leading performance:

- Reduce measurement uncertainty with ± 0.19 dB absolute amplitude accuracy
- See more with excellent sensitivity: DANL is –157 dBm at 10 GHz (no preamp)
- Detect small signals in the presence of large ones with distortion-free measurements: TOI +23 dBm at 10 GHz
- Characterize high-precision signals with phase noise of –132 dBc at 1 GHz (10 kHz offset)
- Enhance dynamic range with 2-dB variable attenuation in real-time mode and selectable resolution bandwidths
- Utilize integrated applications such as one-button power measurements of spurious emissions, harmonics, and more

With the availability of RTSA as an upgrade option, you can eliminate the need for a specialized or dedicated instrument. A real-time PXA retains all the functionality of a traditional high-performance signal analyzer and, when needed, lets you shift to real-time capabilities in the same unit.

Figure 9. Noise figure measurement

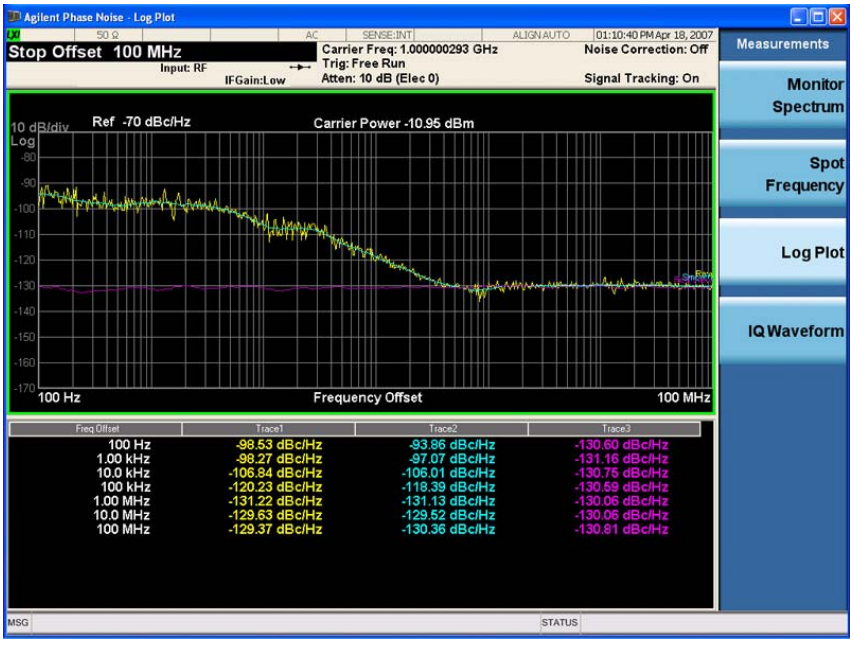


Figure 10. Phase noise plot

Key Specifications

Specifications describe the performance of parameters covered by the product warranty.

Note: Data subject to change

Description	N9030A-RT2		N9030A-RT1	Notes
General frequency domain characterisitics				
Real-time analysis bandwidth	160 MHz		85 MHz	
Minimum signal duration with 100% amplitude accuracy (see also Frequency mask trigger section)	3.57 µs		15 µs	At mask; 160 MHz bandwidth; default window type is Blackmann-Harris
Minimum detectabe signal with > 60 dB SNM	5 ns		9.42 ns	
Supported detectors				Max peak, Min peak, Sample, Average
Traces	6		6	Clear write, Max hold, Min hold, View
Resolution bandwidths	Span	Min BW	Max BW	Kaiser window shown
	160 MHz	400 kHz	12.8 MHz	
	110 MHz	275 kHz	8.8 MHz	
	60 MHz	150 kHz	4.8 MHz	
	50 MHz	125 kHz	4 MHz	
	40 MHz	100 kHz	3.2 MHz	
	20 MHz	50 kHz	1.6 MHz	
	10 MHz	25 kHz	800 kHz	
	1 MHz	2.5 kHz	80 kHz	
	100 kHz	250 kHz	8 kHz	
	Six RBWs available for each window type: Flattop = 6.25 to 200, Gausian, Blackmann-Harris, Kaiser = 12.5 to 400; Rectangular, Hanning 25 to 800			
Window types				Hanning, Blackmann-Harris, Rectangular, Flattop, Rectangular, Kaiser, Gaussian
Maximum sample rate	200 Msa		105 Msa	Complex
FFT rate	292,969/sec		292,969/sec	Constant; not setting dependent
I/Q memory	2 GB		2 GB	
Number of markers	12		12	
Supported markers				Normal, Delta, Noise, Band power
Amplitude resolution	0.01 dB		0.01 dB	
Sweep points	Span/821		Span/821	821 is available horizontal trace points
Minimum slice time	250 µs		100 µs	All displays
Density display				
Aggregate resolution	32 bits		32 bits	Up to 4 billion FFTs; available on export only
Persistance range	0 to 100%		0 to 100%	0.1% steps
Minimum span	100 Hz		450 Hz	
Persistance duration	10 s		10 s	100 µs to 10 s, and infinite
Spectrogram display				
Maxmimum amount of slices stored	10,000		10,000	Not with PvT
Dynamic range covered by colors	200 dB		200 dB	

Description	N9030A-RT2			N9030A-RT1		Notes
Power vs. time						
Supported detectors						Max Peak, Min Peak, Sample, Average
Number of markers	12			12		
Time resolution	5 ns			5 ns		
Maximum time viewable	100 s			100 s		
Minumum time viewable	100 µs			100 µs		
Minumum detectable signal	5 ns			9.42 ns		Not with full amplitude accuracy
Frequency mask trigger						
Displays available						Density, Spectrogram, RT Spec
Trigger resolution	0.5 dB			0.5 dB		
Trigger conditions						Enter, Leave, Inside, Outside, Enter->Leave, Leave->Enter
Available display types						Density, Spectrogram
Minimum duration for 100% trigger with various RBWs Span (MHz)	160	120	80	40	20	
Duration (µs)						
0 dB offset	8.53	10.23	13.65	23.88	44.4	
6 dB offset	3.41	3.41	5.12	10.24	20.48	
12 dB offset	2.43	2.76	4.14	8.18	16.4	
20 dB offset	1.64	2.19	3.28	6.56	13.1	
40 dB offset	0.96	1.28	1.92	3.84	7.68	
60 dB offset	0.54	0.72	1.08	2.16	4.32	
Minimum duration for SNM > 0 dB						Six RBW choices per span; 1024 pt. window corresponds to the smallest RBW and 32 the largest
Span (MHz)	160	120	80	40	20	
Duration (µs)						
for 1024 pt. window	8.53	10.23	13.65	23.88	44.4	
for 512 pt. window	5.97	6.82	8.53	13.6	23.9	
for 256 pt. window	4.69	5.11	5.97	8.52	13.6	
for 128 pt. window	4.05	4.26	4.69	5.96	8.52	
for 64 pt. window	3.73	3.83	4.05	4.68	5.96	
for 32 pt. window	3.57	3.62	3.73	4.04	4.68	

Ordering Information

The real-time spectrum analyzer is available as an option for the N9030A PXA signal analyzer. For complete ordering and configuration information, please refer to the PXA configuration guide, literature number 5990-3953EN.

N6155A ISDB-T/Tmm measurement application

Model-Option	Description	Notes
N9030AK-RT1	Real-time spectrum analyzer up to 85 MHz analysis bandwidth	Includes frequency mask trigger > 15 µs signal duration; requires N9030A-B1X
N9030AK-RT2	Real-time spectrum analyzer up to 160 MHz analysis bandwidth	Includes frequency mask trigger > 3.6 µs signal duration; requires N9030A-B1X

Additional Resources

Related Literature

PXA signal analyzer, Brochure, 5990-3951EN

PXA signal analyzer, Data Sheet, 5990-3952EN

X-Series Measurement Applications, Brochure, 5989-8019EN

X-Series Signal Analysis, Brochure, 5990-7998EN

Web

Real-time spectrum analyzer: **www.agilent.com/find/RTSA**

PXA signal analyzer: **www.agilent.com/find/PXA**

89600 VSA software: **www.agilent.com/find/89600**

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