Solutions for

Modernizing Demanding Aerospace/ Defense Applications

Easing the Pain and Risk Associated with Migrating Legacy Analyzers to Modern, Higher-Performance Solutions

Application Note

Overview

The aerospace/defense market is a demanding industry that is today being driven by a fundamental change in the nature of warfare and homeland security. It is characterized by stringent requirements and continually changing standards. While the changes often enable engineers working in this arena to realize productivity gains, better manage complexity and cut cost, it often comes at the price of increased measurement challenges. As technologies become more complex, measuring and analyzing signals simply becomes more difficult.

Handling this complexity in current and future aerospace/defense applications requires an evolution in signal analysis, one that necessitates a migration from traditional legacy analyzers to newer variants capable of supporting current performance and functionality, while also being able to respond to new requirements and offer improved measurement performance and speed wherever possible. Such modern signal analyzers combine analog and digital technologies to provide tangible improvements in analyzer performance like reduced effective noise floor and wider measurement bandwidths with low distortion. These capabilities are critical to enabling today's aerospace/defense engineers to take full advantage of the industry's advancing technologies and processes.

Problem

Migrating from a legacy analyzer to its more modern variant is a risky undertaking, posing multifaceted challenges with regard to compatibility. These challenges may be virtually insurmountable in some cases, placing the engineer in a difficult predicament. They can avoid migrating altogether in an effort to ensure compatibility, but this means keeping existing solutions running, many of which may be out of official support. The other option—migrating to the modern signal analyzer—provides access to the advanced features, functionality and host of benefits that the engineer wants, but compatibility issues create significant risk. Further complicating matters, these issues are not limited to code (software) and performance compatibility. Hardware compatibility (e.g., the number and types of inputs and outputs, their locations and function) is also a significant concern. This dilemma has left many engineers with only one real choice: to keep their legacy equipment running through third-party support and/or by buying spares, and in either case forgoing access to the performance, functionality and speed improvements available from more modern analyzers.

Agilent Technologies

Solution

The answer to this dilemma lies with migrating to a modern, high-performance signal analyzer that has been specifically designed with a multifaceted level of built-in compatibility features. Utilizing such a solution allows aerospace/defense engineers to replace their legacy analyzers without facing a range of hardware and software compatibility issues, while still being able to access the advanced measurement features and performance (e.g., improved system speed and reduced system complexity) that comes with modern high-performance analyzers. The result for the engineer is clear: compatibility and significantly reduced risk.

While many modern analyzers make claims of software compatibility, adequate compatibility for practical migration demands much more. Multifaceted compatibility features extend beyond conventional code and performance compatibility, making migration easier and much less risky. Fast switching between compatibility and native modes, for example, provides ready access to both high compatibility and important new functionality. Another example is an attenuator offset mode to take advantage of dynamic range improvements by adding transparent attenuation to any manually- or automatically-selected input attenuation; this allows the analyzer to respond to overloads in a manner similar to (but more linear than) that of an analyzer with an analog IF. Additional compatibility features include a flexible compatibility mode with customizable settings, sweep time minimum limits and multiple, configurable IF outputs and video outputs.

The PXA signal analyzer from Agilent Technologies offers the multifaceted compatibility features and outstanding RF and microwave performance necessary to enable both new and legacy analyzer replacement applications in the aerospace/defense industry. As a high-performance RF and microwave signal analyzer, it provides frequency coverage up to 26.5 GHz (Figure 1). Advanced features include a standard noise floor extension (NSE) feature and variable frequency IF output. Using the PXA, engineers no longer have to choose between the guaranteed compatibility and supportability of a legacy solution and the benefits of a modern signal analyzer.

The features which enable the PXA to deliver multifaceted compatibility include:

- Fast switching between compatibility and native modes, eliminating the need to choose between high compatibility and access to important new features,
- A flexible compatibility mode that allows parameters to be individually set to compatible values or to values optimized for new measurement capabilities (e.g., traditional 1/3/10 RBW/VBW step vs. fine 10 percent steps available with a modern digital IF and span/RBW VBW/sweep time coupling rules for analog filters vs. coupling optimized for digital filters),
- Sweep times to 1 ms or faster, with the ability to automatically limit it to a 20 ms minimum,
- A user-programmable IF output (programmable in frequency from 10 to 75 MHz, in 500 kHz increments providing full compatibility with 21.4 MHz and 70 MHz IF outputs), a wide-bandwidth log video output (>140 MHz, nominal) to closely approximate multiple special IF options, and a narrow-band video output that includes the affects of RBW and VBW settings; and
- An attenuator offset mode that adds 12 dB of transparent attenuation to any input attenuation. A low DANL ensures that despite the extra attenuation, the PXA offers better performance for high-level signals and similar appearance of signal level relative to the baseline noise, promoting measurement equivalence.

Additionally, the PXA offers an advanced compatibility mode that allows engineers to constrain the analyzer to a certain setup or configuration to match their legacy analyzer. A mode enabling the duplication of legacy couplings or setup connections is also provided. Engineers can even opt to deviate selectively from their setup connections to improve the measurements without messing up their test system. Such features enable the PXA to deliver compatibility without limitations.

FIGURE 1: *The PXA features super-wide IF technology and outstanding measurement accuracy, ±0.19-dB accuracy and a low noise floor DANL of -172 dBm with preamp (–160 dBm with no preamp) at 2 GHz for superior useable dynamic range. Compatibility is enhanced with a flexible analog output and a selectable-frequency IF output.*

Example: Phase-Noise Measurement Application

Phase noise is one of the most important characteristics engineers need to be concerned with when evaluating the short-term stability of a signal. While dedicated phase-noise systems or programs are often used to compile measurements from legacy analyzers, phase-noise measurement routines in modern spectrum analyzers can speed up and even simplify this challenging measurement.

Fast, accurate and easy to use one-button phase-noise measurements can be made using the PXA signal analyzer running the phase-noise measurement application (Figure 2). Using it, the engineer is able to analyze the phase noise of their device via four different measurements: log plot (phase noise in a desired frequency range), spot frequency (phase noise in the time domain), monitor spectrum (spectrum view for a quick check of the signal) and IQ waveform (time-domain view).

Accessing this functionality does not require the physical switching of equipment. Rather, the engineer needs only switch between the PXA's normal or compatibility mode of operation and the phase-noise measurement application. In other words, engineers can operate in compatibility mode when they need compatibility with their analyzers and then switch to one of the PXA's many supported measurement applications to get the benefits of the fast and accurate measurements they enable.

Another measurement application that's critical to the aerospace/defense industry is pulse analysis. Engineers can access this measurement on the PXA to characterize their pulsed-RF signals in the time domain. It automatically finds pulse edges in time and then measures parameters such as rise time, fall time, pulse width, PRI (interval), PRF, duty cycle, and peak-to-average ratio, along with several others.

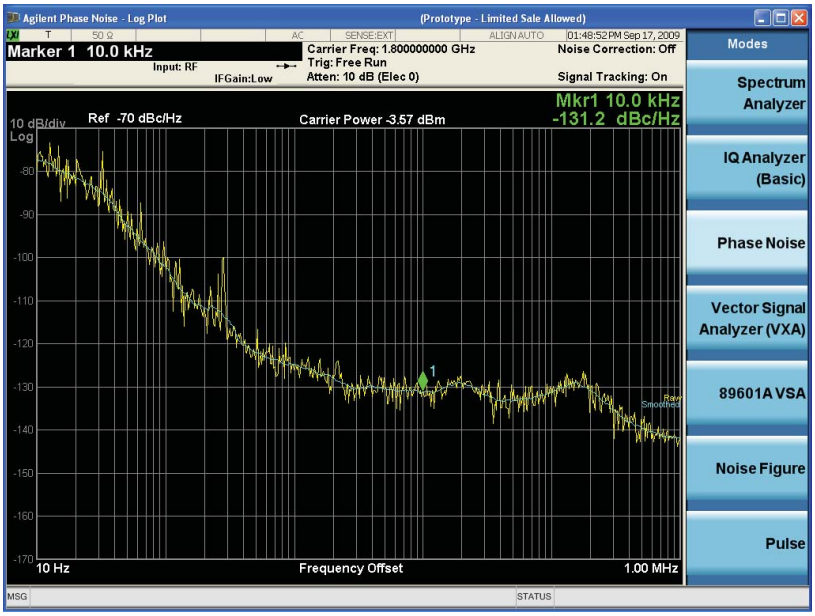

FIGURE 2: *This measurement reflects the built-in functionality and the performance of the Agilent PXA (using an external reference), where a fast and automatic phase noise measurement yields -131 dBc/Hz at 10 kHz and -77 dBc at 10 Hz, at a carrier frequency of 1.8 GHz.*

Summary of Results

Migrating legacy analyzers to their modern, higher-performance variants is a risky and challenging task. Doing so without encountering insurmountable compatibility issues requires that the modern analyzer feature a multifaceted level of compatibility. The PXA signal analyzer from Agilent Technologies offers the range of compatibility features, coupled with the highest levels of signal analysis performance and speed, that today's aerospace/defense engineers demand. It not only provides them with a viable, less risky replacement for their legacy analyzers, but also ensures that they gain access to critical benefits like improved system speed and performance and reduced system expense and complexity, all of which are essential to maintaining an edge in today's highly competitive marketplace.

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The Power of X

The Agilent PXA Signal Analyzer is a key product in Agilent's comprehensive Power of X suite of products. These products grant engineers the power to gain greater design insight, speed manufacturing processes, solve tough measurement problems, and get to market ahead of the competition.

Offering the best combination of speed and scalability, and created and supported by renowned worldwide measurement experts, Agilent's X products are helping engineers bring innovative, higher performing products to emerging markets around the globe.

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Related Applications

- Digital and analog transmitter testing
- Noise figure measurement
- Amplifier testing

Related Agilent Products

- PSG and MXG signal generators
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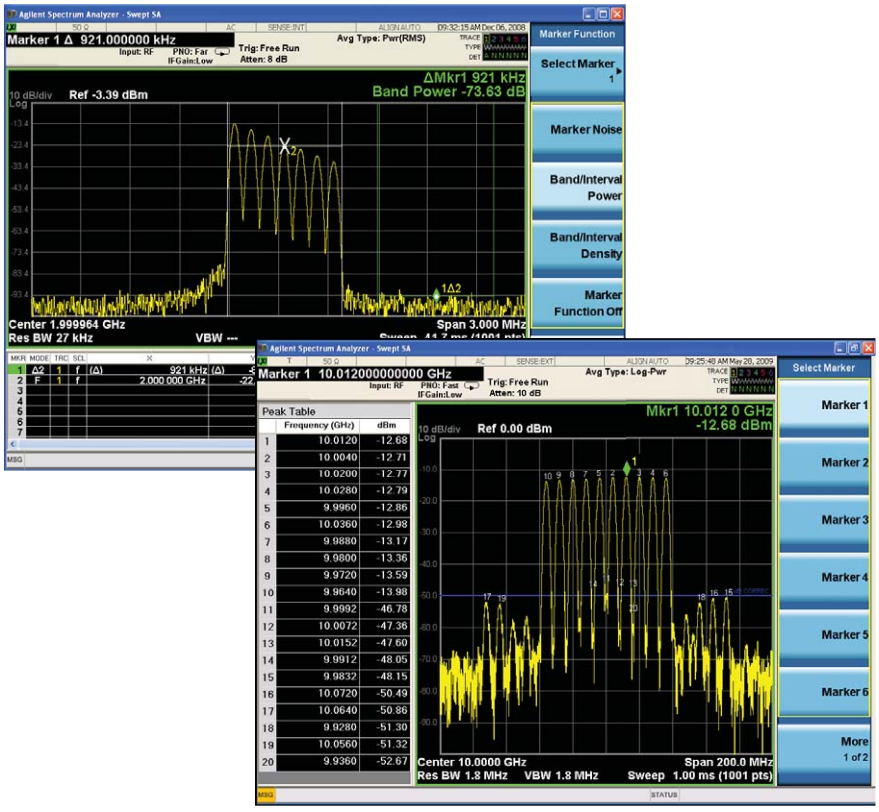

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