High Performance 20 GHz Spectrum Analyzer and Monitoring Receiver

Signal Hound
La Center, Wash.

The newest addition to Signal Hound's family of headless RF spectrum analyzers, the SM200A, provides high dynamic range, ultra-low phase noise, lightning-fast sweep speeds and 160 MHz of real-time bandwidth—performance previously available only in the most expensive spectrum analyzers from the largest companies in the industry. With a U.S. retail price of $11,900, the SM200A is a compelling alternative to expensive, high performance test equipment without compromising performance. It is a cost effective solution that extends precious capital budgets and creates new markets by slashing the cost of entry for high-end spectrum analysis applications, which have been out of reach for many organizations. Manufacturers no longer have to settle for abbreviated production testing, as the analyzer handles the most demanding production line measurements.

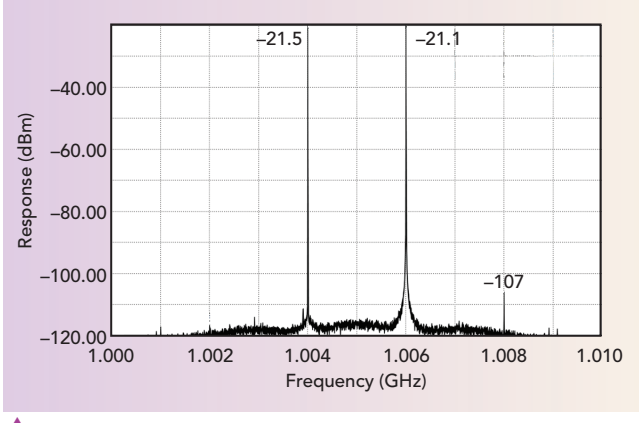

Fig. 1 The SM200A has better than 110 dB dynamic range, defined as third-order intercept less displayed average noise level (DANL) at 1 Hz resolution bandwidth.

The SM200A tunes from 100 kHz to 20 GHz with 160 MHz of instantaneous bandwidth and a continuously sustained 1 THz/sec sweep speed. It has a high intercept point, with 110 dB of dynamic range (see ***Figure 1***), and phase noise performance low enough to contribute less than 0.1 percent error to error vector magnitude (EVM) measurements.

UNIQUE DESIGN

The signal processing functions of the SM200A are distributed between a state-

of-the-art Altera Arria-10 FPGA and an external PC with an Intel Core i5 or i7 processor. This powerhouse combination produces a full-featured spectrum analyzer and monitoring receiver platform that is readily configurable for even the toughest jobs. Unlike conventional spectrum analyzers that integrate dedicated embedded processing in a single box, the distributed processing of the SM200A achieves comparable performance with unmatched flexibility, at a fraction of the cost. The limitations of traditional, standalone systems make it challenging to add storage, upgrade the processor or change the network interface. These problems are eliminated with the SM200A, because it uses a PC and is not locked into proprietary, expensive or outdated processing hardware.

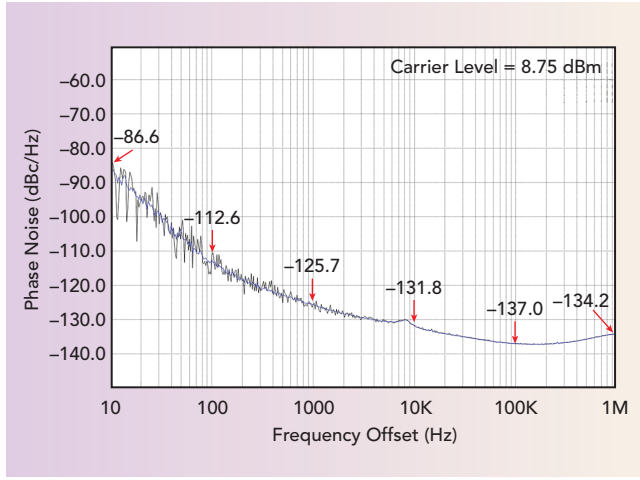

Fig. 2 Measured phase noise of a 1 GHz reference signal from Signal Hound's phase noise clock standard.

The integrated software supports traditional controls such as frequency span/center/start/stop, resolution bandwidth, video bandwidth, reference level, configurable traces and markers. The software provides rich display features such as a 2D waterfall or spectrogram plot and a real-time color persistence display format to enhance and simplify signal identification. There are also digital demodulation tools included for physical layer measurements of many common digital modulation formats, including ASK, FSK, MSK, OOK, PSK and QAM. EMC precompliance tools are also provided.

SM200A connectivity includes a built-in GPS for automatic time and geolocation stamping of the received data. This provides ±50 ns stamping of calibrated streaming I/Q for creating a signals database, as well as improving post-analysis of accumulated data after mobile capture sessions. There is a built-in general purpose expansion port that can be used for a variety of advanced functions, such as switching between multiple antennas with zero latency during a signals monitoring session.

The Signal Hound system may be connected to a network and backend resources through the PC's Ethernet interface, which makes the full range of communications, data transfer, software updates and system management tasks feasible. For specialized applications, the SM200A can be interfaced to automated monitoring systems or automated test equipment (ATE) through its local application program interface (API). The fully documented API, written in C/C++, supports capabilities such as spectrum sweeping, setting record-on-event triggers, real-time analysis and streaming of I/Q data. Programmers can either customize their existing applications or develop targeted applications from scratch, such as inserting custom digital signal processing algorithms into a calibrated stream of I/Q data.

The SM200A weighs less than eight pounds, including the heat sink, and is powered by an external 9 to 15 V_{DC} supply or with the included AC/DC wall adapter.

APPLICATIONS

The high dynamic range and extremely low phase noise of the SM200A are a "dynamic duo," enabling advanced signal measurement techniques.

Many organizations cannot justify spending the money to buy a phase

noise test system, even though it would be very beneficial. The affordable SM200A is well suited to take on all but the most difficult phase noise measurements, with internal phase noise very close to the best standalone, big box spectrum analyzers. Signals that typically hide under the phase noise skirt of a larger signal are easily seen. ***Figure 2*** shows the SM200A's phase noise measurement of the phase noise of a 1 GHz reference signal generated from Signal Hound's 1 GHz phase noise clock standard.

Over-the-Air intermodulation testing of signal quality can be measured at either the output of a cell tower's internal coupler or by receiving a signal from the antenna. Passive intermodulation (PIM) is tested by adding an appropriate high-power duplexer and power amplifier. Those working with difficult third-order intercept requirements will find the SM200A simplifies their measurements.

Signals surveillance technicians and spectrum managers will benefit from a built-in bank of sub-octave preselector filters covering 20 MHz to 20 GHz. Weak or elusive signals, even in the presence of high-power out-of-band signals, are easily identified by the SM200A. It provides 100 percent probability of intercept for on-the-fly targeted signals as short as 10 ms duration anywhere within a 10 GHz span or 20 ms duration over a 20 GHz span. The SM200A also captures radar chirps at a rate of 500 MSPS when dwelling on any given 160 MHz span below 20 GHz.

CONCLUSION

The SM200A, which will be available for purchase in December 2017, offers the highest levels of performance in spectrum analysis and signal monitoring. It supports the most demanding applications across a wide range of lab, production line, portable and field configurations, enabling users to go anywhere. Arguably, the SM200A provides unrivaled value.

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