

Signal Analyzer Extends to 110 GHz

This powerful yet simple-to-use wideband signal analyzer provides the features and functions needed to bring millimeter-wave measurements to the masses.

Millimeter-wave frequencies are now in play for applications well beyond traditional military and scientific purposes, moving steadily into commercial communications and automotive radar. The expected big push for millimeter-wave applications will involve backhaul connections in Fifth-Generation (5G) cellular communications systems.

To make it all possible, flexible and capable test equipment will be needed—and that equipment may have just arrived in the form of the N9014B UXA X-Series signal analyzer from Keysight Technologies (www.keysight.com). It boasts an amazing frequency range of 3 Hz to 110 GHz and analysis bandwidths to 5 GHz, for measurements on audio electronics and millimeter-wave circuits and components, as well as everything in between.

The N9014B UXA (Fig. 1) is the flagship of the company's X-Series signal-analyzer line. Different versions provide continuous sweeps from 3 Hz to 90 GHz or 3 Hz to 110 GHz (Fig. 2), depending on the choice of options, using a 1-mm coaxial test port input connector. Internal instantaneous analysis bandwidth is as wide as 1 GHz, and can be extended to 5 GHz by connecting the analyzer's intermediate-frequency (IF) output to a suitable digital sampling oscilloscope (DSO) from Keysight. The UXA benefits from the company's advanced front-end circuitry and high-frequency indium phosphide (InP) semiconductor technology.

TAKING ON TODAY'S WIDE BANDWIDTHS

To handle signal analysis of the wide bandwidths required for modern modulation formats, the UXA comes with internal analysis bandwidths of 25, 40, 255, and 1000 MHz, depending on option. These bandwidths achieve spurious-free dynamic ranges (SFDRs) of -100 , -80 , -78 , and -56 dBc, respectively.

The instrument's amplitude flatness is ± 1.8 dB from 50 to 75 GHz and ± 2.0 dB from 75 to 110 GHz, with absolute amplitude accuracy of 0.12 dB at a reference frequency of 50 GHz. It is designed for studying the low-level signals that typify millimeter-wave frequencies, but includes input attenuation to safely handle input power levels just above 0.25 W.

The maximum safe input power level with 20-dB input



1. The N9014B UXA X-Series signal analyzer packs a great deal of measurement power into a rack-mount case with large, multi-touch screen, pushbuttons, and remote-control capability for flexibility and ease of use.

attenuation is +25 dBm, while the maximum safe input power level with 0-dB input attenuation is +5 dBm. The analyzer achieves a 1-dB compression (P1dB) point of +20 dBm with 20-dB input attenuation of a single continuous-wave (CW) test tone and +5 dBm with 0-dB input attenuation of a single CW tone.

Input preamplification can extend to 50 GHz. The analyzer also achieves a displayed average noise level (DANL) of -150 dBm/Hz at frequencies higher than 50 GHz with 0-dB input attenuation and without preamplification. From the P1dB point to the DANL, the dynamic range extends as wide as 150 dB (Fig. 3).

FLEXIBILITY

The N9014B UXA actually provides a pair of different front-panel male input connectors. A rugged, 2.4-mm coaxial connector is used for measurements from 3 Hz to 50 GHz. Due to the smaller dimensions required for smaller wavelengths at millimeter-wave frequencies, a 1-mm coaxial connector is employed for continuous frequency coverage from 3 Hz to 110

GHz, although it lacks the durability of the 2.4-mm connector and coupling and decoupling must be performed with care.

A programmable IF output with variable center frequency is included for use with an external oscilloscope. This enables analysis of bandwidths beyond the UXB's internal 1-GHz bandwidth limit.

For clarity of analysis and ease of use, the millimeter-wave signal analyzer features a 14.1-in. (357-mm) diagonal multi-touch display screen with 1280- × 800-pixel resolution. Front-panel pushbuttons provide straightforward control, as does a remote connection via Ethernet local-area network (LAN).

The analyzer can also be programmed via the firm's many test software tools running on a PC connected to the instrument. The internal software applications include tools for performing phase-noise, pulse, and noise-figure measurements, as well as for analyzing signals with several of the candidate advanced modulation formats for 5G wireless-communications systems. These include the Long-Term Evolution (LTE) frequency-division-duplex (FDD) and orthogonal-frequency-division-multiplex (OFDM) formats.

Millimeter-wave devices and components have long represented a somewhat esoteric corner of this industry, with their minute dimensions and small wavelengths, not to mention the difficulty of generating test signals and analyzing a device under test (DUT) at millimeter-wave frequencies. With the N9014B UXA X-Series signal analyzer, however, the task of evaluating a DUT at those high frequencies just got much easier.



2. This screenshot shows the extremely wide span (10 MHz to 110 GHz in this case) that is possible with the N9014B UXA.



3. The wideband signal analyzer features impressive DANL, even for frequencies above 50 GHz.

KEYSIGHT TECHNOLOGIES INC., 1400 Fountaingrove Pkwy., Santa Rosa, CA 95403; (707) 577-2663, www.keysight.com