THINK DEEPLY ABOUT PIM SOURCES AND SAFEGUARDS

HIGH PEAK POWERS and new digital-modulation methods have increased in speed as demand rises. As a result, passive-intermodulation distortion (PIM) becomes a more significant concern. Due to expanding channel density and data rates, nonlinear distortions may dramatically reduce loading speeds and even block calls. The reliability and capacity of modern telecommunication arrays can be damaged by even moderate changes in PIM level, such as those corresponding to aging equipment, co-locating new carriers, or installing new equipment. Anritsu offers a white paper to guide engineers into understanding and testing for the PIM phenomenon, "Understanding PIM."

Traditional transmission-line quality tests, such as impedance tests, measure the linear quality of a system. PIM testing, in contrast, measures the nonlinear quality of a transmission line. A combination of linear and nonlinear quality tests is recommended for effective testing, as this approach paints a more complete picture of the transmission line's health. For example, return loss or voltage-standing-wave-ratio (VSWR) testing could reveal bent cabling where PIM testing would not. The days in which channels could be selected to avoid PIM production have passed. Today, the growth of spread-spectrum modulation techniques has led to a channel-dense system that often generates significant levels of nonlinear distortion.

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In a system, common generators of PIM include metallic contacts, oxide build-up, ferromagnetism, surface abrasion, damaged cables, antenna faults, time-domain events, and connector design faults. While testing PIM systems, a common figure of 2 × 20 W is applied when the component undergoes dynamic stressing. This method has also been adopted in the field, as no standard exists for PIM testing. To perform testing that advances beyond the use of two fixed power frequencies, one of the frequencies can be swept to potentially reveal more PIM generators. This method requires a low-PIM termination to prevent high-power-level PIM broadcasting.

Generally, the limits for older systems that are not designed for low PIM are approximately –80 dBm/123 dBc. New antenna systems with PIM considerations in the design generally go by a guideline of a maximum of –107 dBm/–150 dBc. Traditionally, manipulating the suspect PIM-generating component, visual inspection, or repetitive part replacement have been the common methods of PIM identification and correction. Anritsu offers another option in a distance-to-PIM (DTP) technology with in-field PIM detectors, which is detailed in the white paper.

LEVERAGE RF POWER METERS FOR EM COMPATIBILITY TESTING

AS THE COMPLEXITY of modern telecommunications equipment increases, the related standards and methods of testing this equipment grow as well. Recent changes to electromagnetic-interference (EMI) and electromagnetic-compatibility (EMC) testing standards have added an impulse RF spike of either 5 or 100 kHz. This impulse is used to emulate the effects of a high-powered base-station communications amplifier or a ground-based-radar antenna burst. To improve repeatability, increase dynamic range, and more accurately measure pulse power, an engineer may consider using a peak power sensor in place of a traditional diode detector. Bob Muro of Boonton (a Wireless Telecom Group company) provides insight into this topic in the four-page white paper, "Using RF Power Meters for EMC Testing."

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As an electrical science, EMC studies the susceptibility of electronic devices to compromised operation in response to EMI signals. A device is considered to have achieved EMC when its design addresses both the emission and susceptibility aspects of its operation. Immunity testing is critical for a variety of electrical systems that could be negatively impacted by significant radiation, such as the CANBUS system for intercommunication of vehicular subsystems. In an EMI/EMC test, a radiative source generates an RF impulse and the victim device is subjected to the radiation while operating. This testing is often done in an anechoic test chamber to avoid misreading the measurements caused by reflections.

The single-step closed-loop method and two-step substitution method are both commonly used for such testing. The closed-loop method has the detector and device-under-test (DUT) in the same test chamber. The substitution method uses the detector as a calibration of the radiative source prior to testing the DUT. For both methods, a peak power sensor that can correctly calculate the power values of a signal (when it is either pulsed or under modulation) would provide a more dynamic and accurate measurement of power levels. This improvement over a diode detector could give engineers a better understanding of a device's EMC while showing whether it complies with the necessary standards.