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TEST & MEASUREMENT ISSUE

ANALYZERS

Ease PIM Measurements

JACK BROWNE | Technical Contributor

Portable Analyzers

Find PIM At Cell Sites

These portable, battery-powered analyzers both generate test tones and measure PIM levels at indoor and outdoor remote sites, with models for specific wireless frequency ranges.

1. The MW82119A family of PIM Master portable instruments can locate PIM sources at cellular and other remote wireless communications sites.

PASSIVE INTERMODULATION (PIM), once relatively unknown in the RF/microwave industry, has become almost a household term when describing the performance of modern wireless communications systems. As its name suggests, PIM is signal distortion that results from the mixing of multiple signals, often in a loose connector or in a rusty termination within the wiring of a cellular communications tower. And because so many modern wireless communications formats are based on multiple carriers, PIM can plague the infrastructure of cellular towers and repeaters.

Fortunately, the latest additions to the PIM Master™ line of portable analyzers from Anritsu Co. (www.anritsu.com) make remote, on-site PIM testing not only possible but practical. They provide all of the measurement capability needed for PIM measurements in portable units that fit into a backpack and operate for several hours on a single battery charge.

The MW82119A line of PIM Master portable analyzers **(Figs. 1-3)** are small, battery-powered instruments with a highly visible, 8.4-in. (213-mm) touchscreen display for ease of use and visibility under a host of operating conditions. The product family includes different models for specific communications bands, such as 700 MHz for testing Fourth-Generation (4G) Long-Term-Evolution (LTE) cellular systems and 1900 MHz for checking PIM in Personal Communications Services (PCS) wireless equipment **(see table)**.

2. The battery-powered MW82119A PIM Master analyzers are small and lightweight enough to bring to the top of a cellular communications tower.

These new, lightweight portable test instruments build on the firm foundation established by the company's Site Masters—first introduced in 1997—and more recently its Spectrum Masters™ handheld spectrum analyzers, with as much as 95-dB dynamic range from 100 kHz to 6 GHz. In addition, the models MW8208A, MW8209A, and MW8219A PIM Master analyzers introduced last year were also aimed at specific wireless/cellular bands, such as 869 to 894 MHz and 1930 to 1990 MHz.

These battery-powered analyzers easily bring PIM test capability to remote locations, such as the top of cellular towers where RF/microwave transmit/receive electronics are often found. The new MW82119A PIM Master measures just 13.8 x 12.4 x 6.0 in. (350 x 314 x 152 mm) and will run for as long as 2.5 hours on a single battery charge. Depending upon model, they weigh between 20 and 27 lbs (9 to 12 kg) for ease of transport to a wireless communications site and even up a tower. Since there is typically no AC power available at the top of a cellular tower, the completely self-powered, self-contained operation of the MW82119A PIM Master analyzers makes them ideal for such remote measurements.

Characterizing a communications system and its cables and connectors for PIM requires multiple test signals at sufficient power levels. The MW82119A PIM Master

3. The MW82119A series of PIM Masters includes models for testing wireless frequency bands from 700 to 2100 MHz (see table).

delivers, boasting a pair of test tones that can each be set at levels from +25 to +46 dBm output power (0.3 to 40.0 W output power). And as cellular/wireless services expand, the number of towers and wireless sites increases. Having multiple service providers operating from one site often requires the use of distributed antenna systems (DAS) with multiple coaxial connections that can serve as PIM generation points.

The battery-operated MW82119A PIM Master is a self-contained test system that does not require an additional external controller. Each model generates two continuous-wave (CW) test tones in a specific wireless transmit band for injection to an antenna feed network and then measures the magnitude of the third-, fifth-, or seventh-order PIM products that fall into the corresponding receive band. They can produce test tones at levels from +25 to +46 dBm in 0.1-dB steps and feature a PIM measurement range of –130 to –70 dBm.

The MW82119A PIM Master features a host of useful automated measurements, including the firm's patented Distance-to-PIM™ measurement capability which helps to isolate the source of PIM in a communications tower or system, as well as in lower-power DAS equipment. A user simply sets a handful of starting parameters, including the two carrier frequencies (F1 and F2); the intermodulation order; the output test power level; the test duration; and lower and upper limit lines. For analyzers equipped with the Global-Positioning-System (GPS) option, that feature can also be turned on or off. For Distance-to-PIM measurements, the distance and the velocity of propagation for the cable under test must also be entered.

Additional automated tests include PIM-versus-time and swept PIM measurements. For PIM-versus-time measurements, the two carrier frequencies F1 and F2 are fixed while the PIM magnitude is measured as a function of time. This measurement, which provides a visual indication of PIM stability with time, is ideal for dynamic PIM testing and for peak PIM measurements for pass/fail testing. When performing swept PIM measurements, carrier frequency F1 can be fixed and frequency F2 swept, or carrier frequency F2 can be fixed and frequency F1 swept, with the results showing PIM magnitude as a function of frequency. The MW82119A PIM Masters feature a front-panel keypad, menu button, arrow keys, and a flash memory drive for data storage. A built-in lithium-ion rechargeable battery provides at least 2.5 hours running time per charge. In addition, each analyzer has an input port for an external power supply, an AC/DC adapter with +12-VDC output, and an automotive power adapter. Each analyzer includes an Ethernet port, two standard USB ports, a mini USB port, and a female SMA connector for a GPS antenna. The MW82119A PIM Masters can be equipped with a GPS receiver as an option. The analyzers can also be shipped with a built-in power meter as an option.

The MW82119A PIM Master can be used with Anritsu's Line Sweep Tools (LST) software to compare main and diversity path performance levels, evaluate changes over time, and compare performance levels before and after making adjustments to an antenna system. The LST software can be used with each analyzer to create a single-site report showing PIM levels, VSWR, distance-to-fault results, and distance-to-PIM results. Each analyzer can save and recall test setups for standardized testing, and limit lines can be set for visual and/or audible pass/fail criteria.

The new PIM Master series is built for outdoor use, undergoing a 50-hour burn-in period and two-hour thermal cycling. They are designed for operating temperatures from –10 to +55°C, for operating and nonoperating altitudes to 4600 m, and meet MIL-PRF-28800F Class 2 requirements for shock. P&A: 4 to 6 wks. MWRF

Selecting a PIM Master™

Model	Application	Transmit range (MHz)	Receive range (MHz)
MW82119A-0700	LTE	734.0 to 734.5 745 to 766	698 to 722 779.5 to 804.5
MW82119A-0850	Cellular	869 to 871.5 881.5 to 894	824 to 849
MW82119A-0900	E-GSM	927.0 to 937.5 951.5 to 960.0	880 to 915
MW82119A-0180	DCS	1805.0 to 1837.5 1857.5 to 1880	1710 to 1785
MW82119A-0190	PCS	1930.0 to 1932.5 1950 to 1990	1870 to 1910
MW82119A-0192	PCS/AWS	1930 to 1935 2110 to 2155	1710 to 1750

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This site has PIM.

Good thing you've got the PIM Master™ from Anritsu.

The new PIM Master goes where you do, up the tower or onto the rooftop. No bulky boxes to lug, no extension cords to drag along. It's battery-operated, compact and weighs as little as 9 kg (20 lb) for true portability. New outdoor-readable touch screen makes it easy to use. And with patented Distance-to-PIM™ technology, you find the source of PIM faster — inside the feed system or beyond the antenna.

Call 1-800-ANRITSU to place an order or schedule a demo, or visit **www.anritsu.com.**

Download our free technical guide,* Understanding PIM, *at www.anritsu-offer.com/PIMUC

- **40 Watts, battery-operated**
- **Six frequency options:**
  - **700 MHz • 850 MHz • 900 MHz**
  - **1800 MHz • 1900 MHz**
  - **1900/2100 MHz**

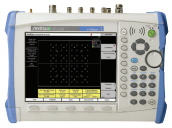
PIM Master is built with the rugged reliability and precision you expect from Anritsu. It's one more way we make your job easier, along with our complete lineup of base station testers.


Site Master™


Spectrum Master™


LMR Master®


Cell Master™


BTS Master™


Designed and Manufactured in America

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