Product Feature

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TOP PRODUCTS of 2015

Innovations in RF/microwave product areas continue as manufacturers prepare for higher-volume applications in mobile wireless-communications products and wearable devices.

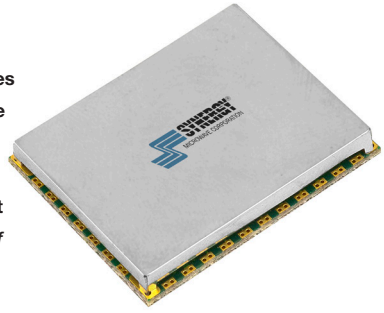
WIRELESS COMMUNICATIONS CONTINUED to steer new product innovation and development in the high-frequency industry in 2015, as products from components and devices through test equipment were developed to enable improved communications capabilities. With the coming of the Internet of Things (IoT)—and potentially billions of wireless sensors contributing data to a huge "cloud" of computer networks and memory—wireless systems developers are searching for bandwidth and ways to move large amounts of data from one location to another.

In support of an increasingly wireless future, RF/microwave product developers demonstrated innovation without extravagance, achieving new performance levels that are affordable and reliable. The dozen products detailed here represent just a small sampling of the many excellent RF/microwave products introduced in 2015.

Interest in gallium-nitride (GaN) technology continued to grow in 2015 for both commercial and military users, as this high-power-density semiconductor substrate is helping to reach high output-power levels in smaller packages. To make those packages more affordable, Qorvo (www.qorvo.com) introduced a line of plastic-packaged GaN power transistors at 2015's International Microwave Symposium (IMS), including the model TGF3015-SM with 11-W output power at 2.4 GHz. Housed in 3- × 3-mm plastic packages, the discrete transistors are usable from 30 MHz to 3 GHz *(see p. 55 for more on power transistors)*.

Certainly deserving of a "honorable mention" for a Top Product, Freescale Semiconductor (www.freescale.com) introduced its model OM-270 plastic package at the same IMS event. It features GaN compatibility for commercial and military use.

Cree (now Wolfspeed) continued to challenge old-guard traveling-wave-tube (TWT) technology with its own GaN device introductions, including its model CMPA1D1E025 and CMPA1D1E030D Ku-band devices for satellite-communications (satcom) applications. The former is an impedance-matched GaN-on-SiC monolithic-microwave-integrated-circuit (MMIC) amplifier in a metal/ceramic package for use from 13.75 to 14.50 GHz (25-W output power), while the latter is a MMIC amplifier capable of 30-W output power from 13.5 to 14.5 GHz.



1. A proprietary ASIC guides the low-noise performance of a line of phase-locked frequency synthesizers in coaxial and surface-mount formats. *(Photo courtesy of Synergy Microwave Corp.)*

For systems in which noise is a concern, Synergy Microwave Corp. (www.synergymwave.com) introduced several versions of a phase-locked-oscillator (PLO) and frequency-synthesizer combination in coaxial and surface-mount-technology (SMT) packages *(Fig. 1)*. It uses a proprietary application-specific integrated circuit (ASIC) for wideband frequency tuning from 100 MHz to 15 GHz. The architecture has been used with different tunable oscillators, including dielectric resonator oscillators (DROs) and voltage-controlled oscillators (VCOs), with excellent results. These include spurious levels of −65 dBc or better and phase noise of −118 dBc/Hz offset 1 kHz from the carrier, and −123 dBc/Hz offset 10 kHz from the carrier.

Noise was also a key parameter in the design and development of the model PMA3-83LN+ low-noise amplifier (LNA) from Mini-Circuits (www.minicircuits.com), achieving low noise figures from 500 MHz to 8 GHz. It has a noise figure of about 1.5 dB at the lower-frequency end of the frequency range and slightly more than 2 dB at the upper-frequency bandedge. The MMIC amplifier maintains flat gain of better than 21 dB across a wide operating-temperature range (−40 to +85°C).

In helping to evolve microelectromechanical-systems (MEMS) technology for use in such applications as the IoT, SiTime (www.sitime.com) developed its model SiT8021 MEMS-based clock oscillator for frequencies from 1 to 26 MHz. The source is a fraction of the size and power consumption of traditional quartz-crystal clock oscillators, and is well-suited for mobile applications and wearable devices.

2. These USB power sensors are among the smallest RF/microwave test instruments, relying on a PC for control and display functions. *(Photo courtesy of Anritsu Corp.)*

SMALLER TEST GEAR

Test and measurement solutions continued to shrink in size and grow in capability in 2015, with the MA24208A and MA24218A USB power sensors from Anritsu (www.anritsu.com) among the smallest of RF/microwave instruments—literally fitting in a pocket at 110 × 46 × 25.6 mm, excluding the Type-N connector *(Fig. 2)*. The instruments cover 10 MHz to 8 GHz and 10 MHz to 18 GHz, respectively.

Power measurements for land-mobile radios (LMRs) are the specialty of the Channel Power Monitor introduced by Bird Technologies (www.birdrf.com) in 2015. The instrument monitors the transmission path of LMR systems from 144 to 960 MHz in real time, with versions capable of handling power levels as high as 500 W CW. Standard units feature 16 channels, but can be expanded.

In test, as in 2014, manufacturers pursued the design and development of compact modular measurement instruments, such as the 50-GHz extension of the model PXIe vector signal analyzer (VSA) by Keysight Technologies (www.keysight.com) detailed on p. 35. The frequency range of the M9393A VSA, a Top Product of 2014, was nearly doubled with the new frequency extension.

Support for a growing number of millimeter-wave applications was also provided by National Instruments (www.ni.com) with its QuickSyn Lite frequency-synth-esizer modules. The product line includes units with frequency coverage of 27 to 40 GHz, 50 to 67 GHz, and 76 to 82 GHz. The synthesizer modules are equipped with Serial Peripheral Interface (SPI) and Universal Serial Bus (USB) control connections.

TOP PRODUCTS OF 2015 (LISTED ALPHABETICALLY)
Anritsu's USB power sensors (July, p. 72)
Bird Technologies' Channel Power Monitor (July, p. 64)
Cambridge Instruments' SWaP PXIe frequency synthesizers (April *Defense Electronics*, p. S26)
Cree's GaN HEMT amplifiers (June, p. 78)
Keysight Technologies' 50-GHz PXIe vector signal analyzer (December, p. 63)
Mini-Circuits' low-noise SMT amplifier (September, p. 72)
National Instruments' 82-GHz frequency synthesizers (July, p. 70)
Qorvo's plastic-packaged GaN MMIC amplifiers (July, p. 68)
SiTime's MEMS-based clock oscillators (June, p. 72)
Synergy Microwaves']ASIC-based frequency synthesizers (March, p. 87)
Tektronix's portable spectrum analyzer (January, p. 87)
Tektronix's 70-GHz oscilloscope (April, p. 120)

Cambridge Instruments (www.cambridgeinstruments.com) aimed at excellent spectral purity from 6 to 12 GHz in its QuantumWave 4000 line of PXIe frequency synthesizers. These synthesizers are suitable for a variety of military and aerospace applications.

Tektronix contributed to the trend of smaller, more powerful test instruments with its model DPO70000SX 70-GHz real-time oscilloscope *(Fig. 3)*. It packs sampling rates to 200 Gsamples/s into an instrument housing only 5.25 in. high. The versatile oscilloscope can be used for single- or dual-channel measurements, and offers one or two 70-GHz-wide channels or four 33-GHz-wide channels. Tektronix also brought the small theme to its RSA306 spectrum analyzer, a near pocket-sized instrument at 5.0 × 7.5 × 1.2 in. with a full-sized frequency range of 9 kHz to 6.2 GHz. mw

3. The model DPO70000SX 70-GHz real-time oscilloscope fits in a compact housing. *(Photo courtesy of Tektronix)*