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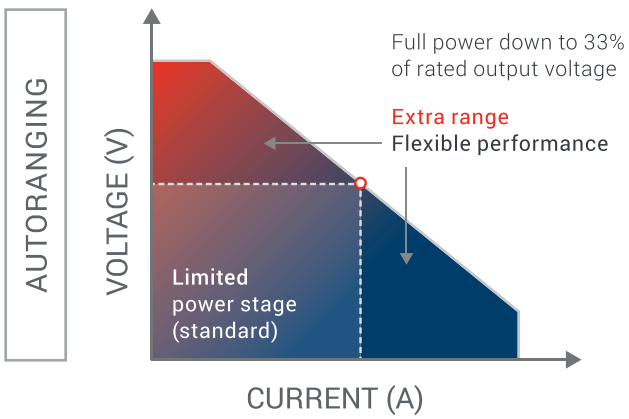

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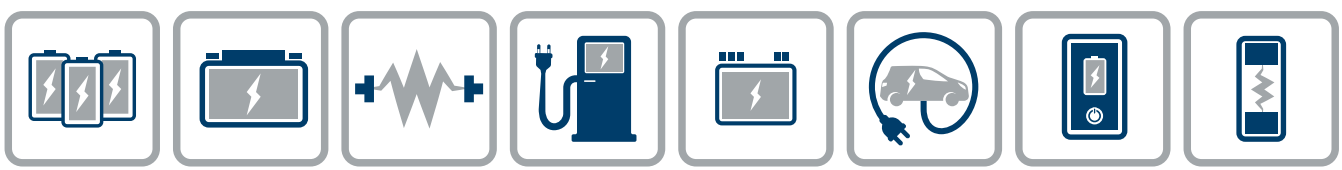

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CONTENTS

SEPTEMBER 2020 | VOL. 59, NO. 8

8

14

30

DEPARTMENTS

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INSTRUMENTATION

APPLICATIONS

TECHNOLOGY INSIGHTS

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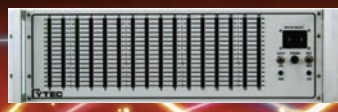

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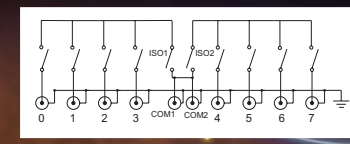

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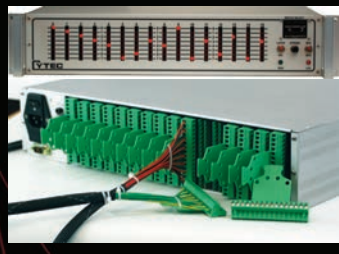

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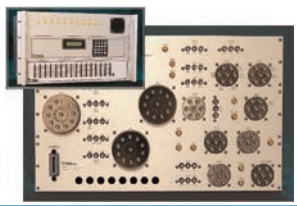

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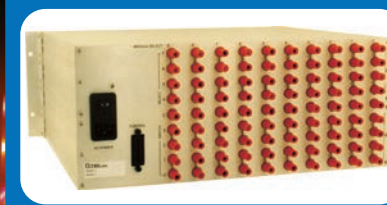

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EDITOR'S NOTE

MONEY! IN! SPACE!

There is a revolution brewing in the space business, and it only begins with reaching orbit. Recent developments in the space business have resulted in more and cheaper access to Low Earth Orbit (LEO) than ever before. Now that near-Earth space has become a real marketplace and environment for development, there is more opportunity and challenge up there than was previously possible.

The challenges range from the issue of space junk rendering the new frontier uninhabitable before it even gets started, to the dangers of militarization in the orbital environment. Opportunities exist in creating the intraorbital systems and infrastructures being deployed as you read this. AI-enabled Edge-Computing satellites, Cloud-enabled aerospace systems, and consumer astronautics will become the norm up there.

The engineering community will be called upon to address them, and the result will be new solutions, which in turn will enable newer applications, requiring better solutions, and so on. Of course, test, measurement, and evaluation systems must rise to that challenge as well. In the case of space businesses, the engineering community will have several interesting aspects to address.

Design engineers will be confronted with a situation where mil/aero specifications must be maintained, but consumer-level functionalities are provided, We've pointed out before that even the most demanding mil/aerospace project doesn't have to worry about their platform having to sync with iTunes, or use V2X infrastructures to order lunch for the astronauts. Consumers will go into space, especially the well-heeled early adopters, expecting to find the same level of digital access they did at home.

This means more RF testing, EMI and EMC qualification, system compatibility, protocol compliance evaluation, power management, multimodal communication solutions, and more. The list of application verticals in the space (no pun intended) is long, and growing longer every day. Just the intraorbital taxi or rideshare business, something that didn't exist a few decades ago, will provide a tremendous opportunity to the engineering industry for solutions.

One of the indicators of the explosion in space business is the recent launch (pun intended) of an online B2B platform that helps match payloads with available launch capacity. Developed by German IT company HOSTmi, the platform will address hosting payloads across a wide range of space platforms around the world, including orbital, suborbital, and deep-space launches.

Every rocket has a certain capacity of payload it can carry to a specific orbit, and the mass of the primary payload will usually be less than the mass that the rocket can lift, leaving spare capacity. Manufacturers and operators try to sell this extra capacity for smaller payloads, which are then added and launched at the same time.

There's even a place for green technologies. Beyond the obvious application vertical of space junk, its tracking, and its clearance, which will also require a lot of slide-rule work, there are a lot of other ways to keep space clean(er). For example, Benchmark Space Systems, developer of green in-space propulsion systems for small satellites, announced an exclusive services agreement with rideshare provider Spaceflight Inc. to provide a range of non-toxic chemical propulsion solutions.

These are designed to accelerate satellite rideshare deployments to prime orbital locations aboard next-generation Sherpa orbital transfer vehicles (OTVs). Benchmark's scalable, launch-vehicle agnostic propulsion product and services offers alternate rideshare options over electric propulsion and other legacy systems.

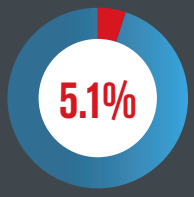
This and other market examples underscore the broad spectrum of application verticals and development opportunities in space today. The intraorbital marketplace has many facets, and each of them require a highly-engineered precision solution. EE

Alix Paultre,
Editor

BY THE NUMBERS

34.5 BILLION $

Global semiconductor sales in June 2020

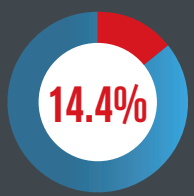


Increase in semiconductor sales over June 2019

Source: SIA

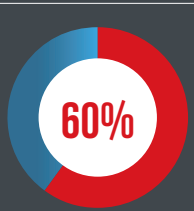
2.32 BILLION $

North American semiconductor equipment bills for June 2020

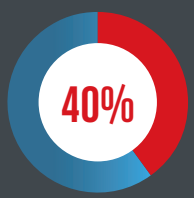


Increase over June 2019

Source: SEMI



Tech enterprises expecting either no change or increase in spending in 2020



Tech enterprises expecting reduced spending this year because of COVID-19

Source: IDC

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SPECIAL REPORT

SOURCES AND LOADS OPTIMIZE POWER ACROSS THE APPLICATIONS GAMUT

By Rick Nelson, Contributing Technical Editor

Whatever project you are working on, power will be a key aspect. Whether you have a battery powering a mobile device or a wind turbine powering a smart grid, you will need the ability to simulate power sources and the systems they power to make sure the two play well together. Fortunately, vendors offer a variety of programmable power supplies and loads—including regenerative loads—to help you achieve an optimal design. They offer a variety of voltage and power levels as well as flexible interface options.

EA Elektro-Automatik serves a variety of applications areas, including conventional and electric vehicles, PV and wind energy generation, and energy storage (batteries and fuel cells), according to Zeke Pietsch, applications and customer care manager. Pietsch said the company leverages SiC high-frequency switching technology as well as the latest FPGAs, microcontrollers, and digital-to-analog converters to develop programmable supplies and loads to serve such applications.

Supplying 10s of kilowatts

EA Elektro-Automatik's products include the EA-PSB 10000 Series bidirectional programmable power supplies. "The PSB 10000, being bidirectional, fully integrates a high-performance autoranging programmable power supply with a regenerative, programmable electronic load capable of 95% energy recovery," said Pietsch, adding that the series delivers 30 kW in a 4U chassis with 40-A to 1,000-A and 60-V to 2,000-V ratings. Furthermore, he said, the PSB 10000 also has a hermetically sealed, water-cooled option that dissipates 95% of heat into the water circuit, with only 5% dissipating into the air (conventional losses).

"In addition to the advanced arbitrary waveform generator included, the PSB 10000 comes with battery-simulation software," Pietsch continued, explaining that many thousands of test data sets for lithium and lead-acid battery testing were created using modeling software to emulate real battery performance in artificial environments for hardware-in-the-loop tests.

Keysight Technologies in June introduced the RP7971A and RP7972A 20-kW regenerative power supplies. "The new bidirectional supplies are ideal for testing energy storage and inverter/converter electronics," said Bill Griffith, power product marketing. "Traditional solutions convert dissipated power to heat. Regeneration eliminates excessive heat by returning energy to the grid."

For testing commercial string inverters, Keysight offers the PV8921A and PV8922A 20-kW photovoltaic array simulators. "The PV8900 Series offers up to 2,000 V and the ability to test up to 12 MPPT inverters,"

▲ Keysight Technologies RP7900 Series regenerative power system.

Griffith said. "Next-generation inverters increase efficiency and reduce installation costs with higher voltages and multiple MPPT inputs. Keysight's test solution includes the DG9100 Series advance inverter test software. Application software makes it easier to download PV curves and track measurements."

Delivering 10s of kilovolt-amperes

Preen AC Power has recently introduced a new AFV+ Series programmable AC power supply, which delivers 10 kVA to 2,000 kVA, said a spokesperson, who added that AFV+ series features low THD, high reliability, multiple programming features, and intuitive operation. "This latest high-power programmable AC power source…can simulate different power-line disturbances and record error logs," the spokesperson said. "The AFV+ Series can support up to an 840-Hz frequency range that can be used for aircraft, defense, and EV test industries." The AFV+ Series can output up to 400-V line to neutral or 690-V line to line or, optionally, 600-V line to neutral or 1,039 V line to line.

The spokesperson cited another feature: "In the factory or laboratory, there is often a certain distance in the configuration of power and load. The Remote Voltage Drop Compensation of the AFV+ Series is able to compensate the voltage drop caused by the cable length, so the user can avoid the inconvenience of adjusting the voltage." The spokesperson also said the AFV+ can test electric motors, which can draw high startup currents. "As a result, users need to purchase a power supply with much higher capacity than the UUT itself," the spokesperson said, explaining that the AFV+ Series has an optional 200% overload capacity.

Pacific Power Source just announced the availability of a new line of advanced regenerative programmable AC and DC power sources, according to Herman vanEijkelenburg, director of marketing at PPST Solutions, the corporate affiliate distribution channel for Pacific Power Source and other power test-equipment manufacturer product lines. "Available at power levels from 30 kVA to 200 kVA, these AZX Series bidirectional AC and DC sources offer four-quadrant operation with the ability to recycle energy from the load back to the utility grid for energy-efficient operation," he said, adding that the sources can be operated using the front-panel color LCD touchscreen or any of the standard remote-control interfaces including LXI, GPIB, and USB; a built-in web server allows operation via any network-connected PC or Wi-Fi tablet.

▶ Pacific Power Source AZX Series bidirectional AC and DC source. Courtesy of Pacific Power Source Inc.

"Key features include dual constant-power-mode voltage ranges up to 360 VAC line to neutral or 624 VAC line to line in three-phase mode and an output frequency range from 15 Hz to 1,000 Hz, which is wider than most regenerative AC source on the market today," vanEijkelenburg continued. "The use of SiC power devices in all power-conversion stages of the AZX results in higher power density."

500 VA to 4 kVA at 5 to 1,200 Hz

Nicholas Piotrowski, product manager at Ikonix USA, said Associated Power Technologies, a division of Ikonix USA, is introducing its 8500 Series AC power sources on Sept. 1. The series includes the 500-VA Model 8505, 1.25-kVA Model 8512, 2-kVA Model 8520, and 4-kVA Model 8540. Output voltage extends to 310 VAC with frequencies from 5 to 1,200 Hz. He said the sources cover a variety of applications, providing, for example, a 310-VAC output for LED ballasts.

Piotrowski cited a trend toward higher power density (smaller, lighter sources per VA output), noting that sources are often part of a larger system where rack space comes at a premium. "The 8505, 8512, and 8520 all are 2U rack-mountable sources," he said. "The 8540 is 4U rack-mountable at 62 lbs. That's a 33% reduction in rack-mount size and 25% reduction in instrument weight from our previous series," he said.

Other features of the series include THD ≤ 0.3% at 50/60 Hz (offering low total harmonic distortion for functional testing); LIST, STEP, and PULSE modes to cover

◀ Associated Power Technologies 8500 Series AC power source.

a variety of testing to introduce the sweep of voltage, frequencies, transients, and DC bias; and 14 built-in custom waveforms to simulate abnormal testing conditions.

"We've also seen a shift towards more automated transient and waveform synthesis testing," Piotrowski said. "With automation, giving flexibility to customize programming is key. We've moved toward not only offering out-of-the-box software (PowerTRAC), but also offering LabVIEW drivers and implementing SCPI protocol on the APT 8500 Series."

Piotrowski said the company "...implemented a unique modular switching-supply approach..." for its APT 8500 Series. "This allows us to not only offer the advanced features we've discussed, but also reduce the size and weight of the sources." He added that the sources can serve in MIL/aerospace, LED, appliance, motor, and medical-test applications and help perform EMC test in accordance with IEC 61000.

Versatile Power has recently released its new 1,500-W RACK programmable power supply, according to Mark C. Brown, manager of sales and marketing. "All Versatile Power supplies come standard with LXI," he said, adding that other standard features include analog, USB, and Ethernet inputs and wireless remote sense.

Brown continued, "Versatile Power's BENCH and RACK Series both offer extended range,[1] which allows the end user to use one power supply to cover a larger range of voltages and currents, thus reducing the number of units that are need to be purchased for their applications or testing and can be used on cross platform projects that our customers are working on currently or that are in the pipeline."

He also noted that BENCH and RACK Series products use the 1U footprint while delivering high power, adding that the products' digital design contributes to the small formfactor. He also commented, "ATE, burn-in, and avionics are a few of the markets Versatile Power serves."

New 5,000-W and 3-kVA products

"Despite unprecedented challenges faced this year, B&K Precision released the new MR Series programmable DC power supplies and 9830B Series programmable AC sources," said Aaron Fernando, product marketing engineer. Both products target system integrators.

"The MR Series features an LXI-compliant LAN interface and delivers 5,000 W in a compact 2U form factor," he said. "Furthermore, these power supplies are B&K Precision's first cTUVus approved instruments, fulfilling equivalent CSA and UL safety standards."

Fernando described the 9830B Series as a high-performance single-phase AC source delivering output power up to 3,000 VA with low harmonic distortion. The frequency range is 45 to 1200 Hz. "In addition to AC, these models can output DC or AC+DC signals," he said. Other features include a power meter with 12 measurement functions, built-in and user-defended THD waveforms, and an amplifier mode with a 1.2-kHz bandwidth.

"The 9830B Series programmable AC sources represent our first 3-phase-capable products, Fernando continued. "3-phase is accomplished by using three AC sources connected to small synchronization adapters. The adapters and connecting cables are included in a convenient kit. The synchronized AC signals

▼ B&K Precision MR Series programmable DC power supply.

result in a 3-phase power system. Most specifications and capabilities are maintained with a usable frequency range up to 600 Hz. Positive or negative DC voltage offsets and individual phase control are still available."

Fernando said B&K Precision's DC loads are used for testing and evaluating DC sources including DC power supplies, DC/DC converters, and batteries. "The latest 8500B Series is uniquely suited for battery testing applications at a value price point," he said. "One specific application involves charge/discharge cycle testing where the primary objective is to determine the usable battery life. B&K Precision offers battery charge/discharge software to meet this specific battery testing method. The software combines source capabilities of our 9115 or 9200 Series DC power supplies with the 8500B Series DC loads to evaluate batteries." Users can log both charge and discharge data, create custom test sequences, and calculate battery capacity using the software, he added.

2-kW supply and 20-kW load

Kikusui offers the PWR-01 Series DC power supplies and PLZ-5WH2 Series electronic loads. A spokesperson said the company developed the PWR-01 as versatile range of power supplies for benchtop applications, adding that the supplies when rack-mounted make it easy to create large synchronized networks. The company recently added a 2-kW model, which can test electronics for 48-V mild hybrid vehicles.

The PLZ-5WH2 is high-voltage (1,000 V) and high-power-capacity (20 kW) load. "Some of the target industries include battery suppliers, high-voltage UPS suppliers, electric-vehicle applications, and any other applications that are in the higher

▼ Kikusui PLZ-5WH2 Series electronic loads.

voltage range, up to 1,000 VDC," the spokesperson said. "We put a lot of work into the built-in measurement capabilities specifically for the use of power-supply test. Integrated measurement, custom sequences, and cutoff settings can all be programmed from the front panel, which make it a very powerful as an electronic load and as a standalone power-supply evaluation tool."

The spokesperson said that in anticipation of its use in battery-testing applications, it features built-in functions to make charge-discharge tests easier for engineers. For example, a cutoff function can automatically shut off the load when meeting a specified Ah, Wh, elapsed-time, or terminal-voltage condition.

400-W and 800-W supply series

Rohde & Schwarz's latest addition is the R&S NGP800 DC power supply series, comprising five models with ratings of 400 W or 800 W, according to Philipp Weigell, director, product management, power products. "The two or four 200-W outputs can each supply up to 64 V or up to 20 A," he said. "Electrically equivalent and galvanically isolated outputs can be wired in series or parallel for up to 250 V or 80 A. Its software features many tools intended to boost the user's efficiency."

Other supplies the company offers, Weigell said, include the R&S NGL200 and R&S NGM200, which enable engineers to analyze and optimize their battery-powered designs, and the R&S NGP800 and the R&S HMP4040, which offer the high channel count and power density to serve applications involving modern high-end FPGAs that demand high power distributed over several lines.

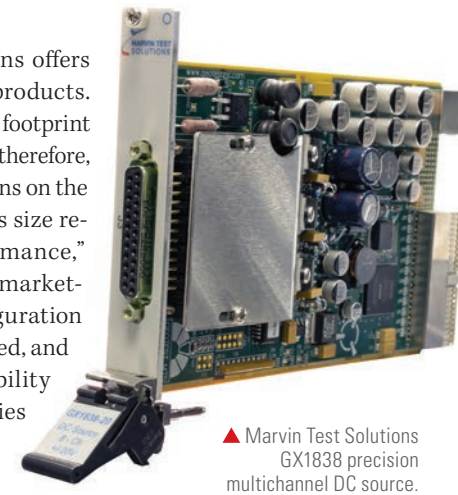
▲ Rohde & Schwarz R&S NGP800 DC power supply.

"The specialty power supplies offer two-quadrant architecture: this feature allows them to function both as a source and a sink and simulate batteries or loads," Weigell said. "The power supply automatically switches from supply mode to load mode. As soon as the externally applied voltage exceeds the set nominal voltage, current flows into the power supply. This is indicated by a negative current reading."

In addition, the supplies offer galvanically isolated, floating channels. "The Rohde & Schwarz power-supply family consists of instruments with up to four channels," Weigell said. "The circuitry of each single channel is completely isolated from the others; there is no connection to chassis ground. This makes it easy to combine the channels to drive bipolar circuitries that might need ±12 V, for example, and avoids any ground problems in complex DUTs."

Power in PXI

Marvin Test Solutions offers several PXI power products. "Test-system size and footprint are always a concern; therefore, implementing solutions on the PXI platform delivers size reduction and performance," said Jon Semancik, marketing director. "Configuration flexibility is also valued, and PXI provides the ability to expand capabilities with minimal impact to overall system layout."



▲ Marvin Test Solutions GX1838 precision multichannel DC source.

Specific products include the GX3104 source-measure unit (SMU) with four isolated, common-ground SMU channels; 4-quadrant operation (±20 V, ±1 A); seven current ranges (±2.5 µA to ±1 A full scale); up to 1-A capability on one channel; and 24-bit ADCs and 18-bit DACs.

The company also offers the GX1838 precision multichannel DC source, which Semancik described as ideal for avionics and high-voltage applications. It features eight high-density discrete outputs, and three programmable voltage rails (14-bit resolution).

It offers two output configurations: -10 V to +32 V (GX1838) or -20 V to +20 V (GX1838-20). Maximum current output is 500 mA.

And finally, MTS offers the GX7404 power interface, which features +3.3 V, +5 V, +12 V, and -12 V outputs; software-controlled on/off switching; remote monitoring of voltage and current; an external power-inhibit line; and an on-board prototyping area.

Distributor offerings

Specific products that Newark offers include the GW Instek ASR-2100 compact programmable AC/DC power source, which provides an output rating of 0 to 350 VRMS AC and 0 to ±500 V DC and output capacity of 1,000 VA. "The ASR-2100 Series provides users with waveform output capabilities to meet the test requirements of different electronic component developments, automotive electrical devices, and home appliances," said Maureen Lipps, product manager, Test & Tools, Newark, adding that the instrument offers three modes: a sequence mode generates waveform fallings, surges, sags, changes, and other abnormal power-line conditions; the arbitrary waveform function allows users to store/upload user-defined waveforms; and the simulate mode imitates power outages, voltage rise and fall, and frequency variations.

Newark also offers the B&K Precision 8514 DC electronic load, which Lipps described as an affordable, laboratory-grade programmable instrument suited for testing and evaluating a variety of DC power sources. "It can operate in CC, CV, CR, or CP mode while voltage/current or resistance/power values are measured and displayed in real time," she said, adding that the unit is fully programmable via the RS-232 or USB interface and operates between 0 and 120 VDC, 1 mA to 240 A at 1,200 W maximum. A battery testing mode provides the Ah rating of battery.

Newark also offers the MP710259 US 300-W programmable DC load from Multicomp Pro, Newark's private label brand. Lipps described the MP710259 US, "It is a versatile instrument for static and dynamic testing of power supplies, batteries, DC/DC converters, and battery chargers," she said. "The MP710259's test modes include automatic test, OPP test, OCP test, and battery-test functions."

Challenges, trends, applications

Several SMEs who provided input for this article elaborated on the challenges customers are facing, industry trends, and applications. EE

The complete version of the Programmable Power Special Report is available on the EE-Evaluation Engineering *website at evaluationengineering.com/21149411*

REFERENCE

1. 4 Reasons Why You Need to Use Extended Range Programmable Power, Versatile Power, October 10, 2017.

Marvin Test Solutions MTS-3060A SmartCan with kit.

SPECIAL REPORT

ENHANCING TEST IN DEFENSE AND AEROSPACE

By Rick Nelson, Contributing Technical Editor

Customers in the military/aerospace test market are looking for a combination of flexibility, sustainability, high performance, and low cost, often achieved through deployment of commercial-off-the-shelf (COTS) products in MIL/aero environments. Specific application areas include upgrading legacy flightline systems to accommodate evolving smart weapons, electronic warfare (EW) and threat detection, and the commercialization of space (NewSpace).

Test sets to systems

Products that Marvin Test Solutions offers to help meet the challenges of military/aerospace test applications include the MTS-3060A SmartCan Universal O-Level Armament Test Set. "Marvin Test Solutions developed, qualified, and deployed an innovative O-Level hand-held test set that supports both legacy and Smart weapon armament systems test on fixed, rotary, manned, and unmanned aircraft," said Stephen T. Sargeant, CEO. "The SmartCan test set combines the power of the big-box test set with the ease of use of a hand-held test set, combining the capabilities of multiple O-Level test sets into a test set that weighs less than 4 lbs."

Sargeant described the MTS-3060A as a battery-operated O-Level test set that provides active test capabilities previously unavailable at the flightline in a hand-held test set. "Designed to functionally test the MIL-STD-1760 Bus that enables Smart munitions, the MTS-3060A SmartCan is deployed today in many countries on F-16, F-15, TA-50, FA-50, Hawk, F-18, F-5, and unmanned aerial vehicles," Sargeant said, with more deployments planned for 2020.

"The MTS-3060A SmartCan provides the capability to actively test legacy and Smart weapons and supports multiple e-load channels," Sargeant said. "The SmartCan generates audio and video signals required to test armament for missiles that produce tones or video for employment."

He explained that the MTS-3060A employs munitions emulation to actively test armament for JDAM, AMRAAM, and other 1760-based weapons systems. "The MTS-3060A SmartCan records test data that is tracked by tail number and can be downloaded for trend analysis and enhanced troubleshooting. Sargeant said the SmartCan has been deployed since 2011, and states that is the only hand-held test set on the flightline to deliver full MIL-STD-1760 Bus functionality testing capabilities (communication, arming, and release), with field-upgradable software.

Sargeant continued, "Advanced cybersecurity features further differentiate the SmartCan. Data encryption, test program set (TPS) development, and a removable hard drive in the form of SD storage all contribute to the cybersecurity of this test set. Our test software, ATEasy, is the most cybersecure test executive on the flightline today and is employed by the SmartCan."

Marvin also offers the MTS-207 Rugged Field Test Set (O-/I-Level). "The MTS-207 is a state-of-the-art portable PXI platform for field testing and data-acquisition systems," Sargeant said. "Its proven architecture has been deployed worldwide on the flightline, in the back shop, and in depot as the MTS-206A Maverick Missile, the MTS-209 Common Armament, the AN/TSM-205B Hellfire System, and the MTS-235A F-35 Armament Test Sets. The MTS-207 combines the capabilities of the versatile and powerful PXI architecture in a compact, ultrarugged, flightline-qualified enclosure."

In addition, Sargeant cited the TS-321/323 GENASYS Aerospace Test System. "The GENASYS platforms are PXI-based, customizable test systems designed to address a broad range of military and aerospace missions requiring high-performance automated functional electronic test," he said. "GENASYS is available with a range of digital, analog, and video instrument options to address both LRU and SRU test as well as supporting depot and production test. The GENASYS switching subsystem supports an 'any resource to any pin,' scalable architecture. From testing avionics

to complete electronic functional test of entire satellites, GENASYS meets the requirements of a plethora of customers."

Strategic test approach

According to Nicholas Butler, chief marketing lead for aerospace, defense, and government at NI, "NI offers modular, PXI-based measurement and control systems that can be customized for each application (and re-used across applications). As a leading supplier of PXI-based chassis, controllers, and instruments, NI provides a wide spectrum of measurement types, channel counts, frequency support, and form-factors to meet the needs of almost any aerospace and defense test application."

In addition, Butler said, "TestStand software allows customers to develop customized test sequences and routines, giving them the ability to automate test systems and thus optimize test times and test cost. Veristand software allows customers to perform embedded software validation through hardware-in-the-loop applications where they can import custom models and simulation routines.

FlexLogger software allows our customers to perform configuration-based data-logging, without the need for complex programming, and SystemLink software allows customers to remotely manage systems and data across their entire enterprise."

Nancy Friedrich, industry solutions marketing for aerospace defense, Keysight Technologies, commented on Keysight's offering for EW applications. "Our solution combines UXG generators and adapters, calibration hardware and software, and application software for prescripted or dynamic threat-generation scenarios," she said.

Specific products include the N5193A UXG X-Series agile signal generator, N5194A UXG X-Series agile vector adapter, N7660C Signal Studio for Multi-Emitter Scenario Generation, Z9500A Keysight EW Threat Simulation View, and the Z2098B threat-simulation system.

"We leverage the commercial off the shelf (COTS) expertise we have from other markets such as communications/fifth-generation (5G) to deliver scalable, high-performance EW test equipment in a faster timeline," Friedrich said. "Our testing equipment provides realism and accuracy for evolving EM spectrum operations with flexible, scalable threat simulation and analysis solutions. We support the detection, identification, and location of RF emitters in the congested EM spectrum to help our customers achieve confidence in their electronic warfare innovations."

Signal-analysis solutions

"Signal-analysis solutions are vital in streamlining today's battle for the electromagnetic spectrum," according to David Summers, market development manager, Federal, Anritsu. "A real-time spectrum analyzer (RTSA), such as the Anritsu Field Master Pro MS2090A, gives military personnel new insights that were very difficult to capture previously. Traditional analyzers are limited to viewing only one segment of the spectrum at a time. With an RTSA, the entire spectrum up to a given span can be viewed continuously. This is extremely beneficial in military and aerospace environments, as it captures transient signals and tracks fast-moving transmissions."

▲ Anritsu Field Master Pro MS2090A real-time spectrum analyzer.

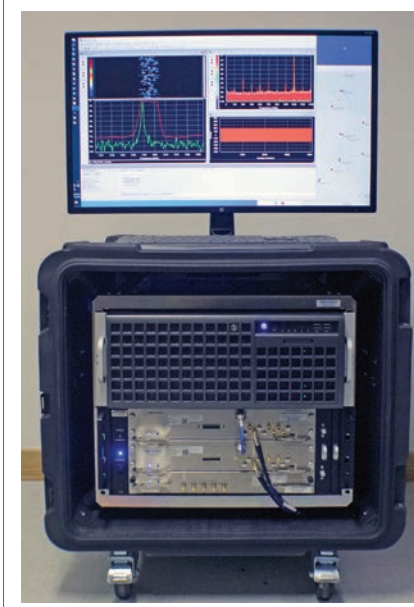
He also described Anritsu EasyTest software, which enables experienced military technicians to generate step-by-step test packages to help less experienced users learn how to test specific systems. "The inclusion of images, button pushes, and limit masks enables measurements to be done correctly each and every time,"

He described Anritsu's 4G and 5G communications network emulators as flexible platforms with modular architecture that also find use in MIL/aero design verification. "Our 5G Radio Communication Test Station MT8000A supports frequency range 1 (FR1) up to 7.125 GHz, including band n41, and frequency range 2 (FR2) mmWave bands used by 5G," he said. "When combined with the Anritsu OTA chamber, the MT8000A enables mmWave band RF measurements and beamforming tests to be made using call connections specified by 3GPP."

Capture and playback

John Regazzi, Giga-tronics CEO and acting director of marketing, said Giga-tronics' products serve three main application areas: coherent electronic attack, development of countermeasure techniques, and open-range air-crew survivability training. Giga-tronics has recently introduced a coherent multichannel capture and playback system.

COMPASS, which stands for Coherent Multichannel Playback and Acquisition Streaming System, offers the capture and playback of signals with up to 1 GHz of instantaneous bandwidth anywhere within the RF spectrum to 20 GHz while maintaining a high signal to noise ratio. Systems can be configured with up to 192 TB of solid-state drives (SSDs), allowing more than five hours of record or playback times of very wide bandwidth signals. The system features a variable sample rate that permits the playback of signals



▲ Giga-tronics COMPASS multichannel capture and playback system.

recorded on different systems and allows the efficient use of the available storage."

Gregory Anderson, area sales manager, and Darren Lingafeldt, vice president, eastern USA and Canada, both at Averna, said, "We are involved in programs that range from software defined radio to virtual headset optics and alignment."

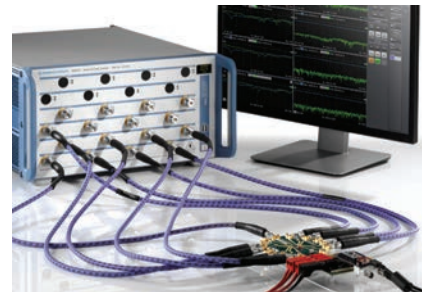
Averna offers custom solutions to serve many MIL/aero applications, according to Anderson and Lingafeldt. "From a test-products point of view, Averna has a specialty in RF test including several off-the-shelf solutions for record and playback," they said. "The RP-6100 Series is available for testing up to four channels while the RP-6500 enables wideband RF record and playback, up to 500 MHz, across frequencies from 9 kHz to 6 GHz. These are in addition to our Iridium solutions for either development or production."

◀ Averna Iridium production-test system.

Satellite communications

According to Darren McCarthy, aerospace and defense technical marketing manager at Rohde & Schwarz America, the company's solutions address development and production testing from the chip level up to final system-level verification.

"At the chip level, the R&S ZNBT40 vector network analyzer can be integrated into a turnkey tester for beamforming ICs," McCarthy said. "The R&S ZNBT is the first multiport vector network analyzer offering up to 24 integrated test ports with the ability to do high-speed simultaneous testing of multiple DUTs such as transmit and receive components."


▲ Rohde & Schwarz R&S ZNBT40 vector network analyzer.

On the benchtop, the R&S NRPM over-the-air (OTA) power-measurement solution can be used for functional integration and testing. "The high-sensitivity, fully calibrated system with low-reflection dual-polarized antenna modules offers reduced system-level measurement uncertainty," McCarthy said. "And it is scalable to customer requirements."

Rohde & Schwarz's R&S AMS OTA performance measurement software and R&S ATS1800C compact antenna test range (CATR) mmWave test chamber is well suited for system-level testing. McCarthy said, "The CATR reflector with optimized edges for uniform power distribution and high-precision surface finishing for minimal deviations in quiet zone, and the near-field to far-field measurement software provide the necessary plane-wave conversion for correlated measurements."

Analyzers and more

Tektronix serves military/aerospace test in spaces like radar and EW, RF spectrum management, communications and embedded systems, and big physics/science, according to Brad Odhner, technical marketing manager, for which the company offers real-time spectrum analyzers, analysis software, and arbitrary waveform generators.

"The new Linux API on the RSA300, RSA500, and RSA600 Series (USB RTSAs) will serve to support applications such as EW spectrum monitoring, deep-data signal analysis, RF sensor SIGINT, high-mix/low-volume manufacturing programmatic control and test, and custom SATCOM transmitter range testing," he said.

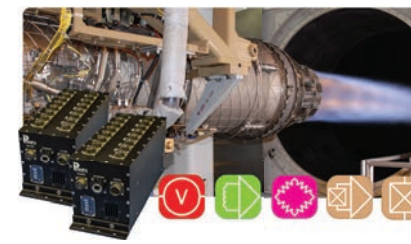
Odhner elaborated on real-time spectrum analysis, saying real-time spectrum analyzers like the RSA7100B have an IQ streaming capability.

He added that the capabilities are tied to Tektronix's SignalVu-PC and SourceXpress software offerings.

Brian Walker, senior RF design engineer at Copper Mountain Technologies said the company offers a range of vector network analyzers from 9 kHz to 110 GHz, with compatibility for use of third-party frequency extenders up to 330 GHz. "Unlike the conventional VNA, with USB instruments, the user can easily upgrade the external PC as needed to keep it up to date and secure." Walker added the company's VNAs find use in materials testing of radome materials, testing of phased array antenna systems, distance to fault measurement of avionics or shipboard RF conduits, antenna VSWR testing, cavity filter tuning, and other RF measurement applications.

Data acquisition

Pacific Instruments offers the Series 7000 16-channel ruggedized Ethernet data-acquisition system, which can handle harsh environmental conditions and wide temperature ranges, according to Patrick Rule, senior sales manager with Pacific Instruments, a VPG brand. "Each 7000 unit has 16 MIL-style inputs and an Ethernet interface for control and data output," Rule said. "IRIG time may be employed to synchronize sampling on multiple 7000s within 10 µs, or a timing pulse may be used to achieve better than 1-µs time alignment."


▲ Pacific Instruments Series 7000 16-channel ruggedized Ethernet data-acquisition system application.

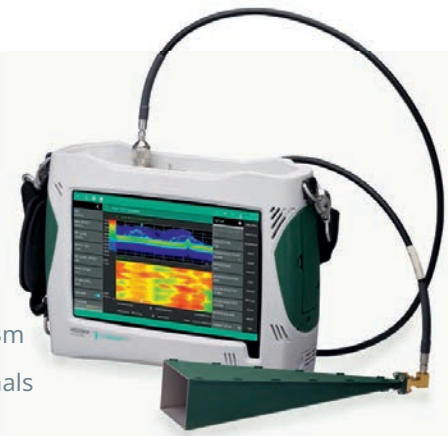
Rule added that multiple 7000 systems (up to 4,096 channels) can be connected on a single Ethernet LAN, and each channel can sample at up to 200 ks/s while maintaining 1-µs synchronized sampling across all channels. "Series 7000 16-channel enclosures are designed for installation in wind tunnels, engine test stands,

See Everything. Miss Nothing.

Capture Transient Signals and Track Fast-Moving Transmissions with Anritsu's Field Master Pro™ RTSA

THE WORLD'S HIGHEST PERFORMANCE HANDHELD SPECTRUM ANALYZER.

Anritsu Field Master Pro™ MS2090A Real Time Spectrum Analyzer gives military personnel new insights previously difficult to capture. Traditional analyzers are limited to viewing only one segment of the spectrum at a time. With an RTSA, the entire real-time bandwidth can be viewed continuously providing great benefits in the military and aerospace environment.



Other features:

- >> Rugged, field-deployable handheld spectrum analyzer
- >> IQ capture and IQ streaming capabilities, capture 110 MHz of IQ data
- >> RTSA option can accurately measure the amplitude of a single spectrum event as short as 2 us
- >> 110 MHz analysis bandwidth and a measurement range from DANL to +30 dBm
- >> SWaP optimized - maintaining an inconspicuous profile while monitoring signals across the spectrum in real time

Get the white paper: Understanding Real-Time Spectrum Analyzers
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envision : ensure

and other facilities where it is desirable to locate the DAS on or near the test article, reducing installation and cable costs while improving signal quality and reliability. Temperature compensation, high gain, and 24-bit A/D provide a high-accuracy and high-resolution DAS that will perform across a wide temperature range at better than 0.05% accuracy."

Weiss Technik offers an array of test chambers including temperature, humidity, altitude, thermal shock, and dust chambers. "Many of these products include safety features such as product temperature control, burst disc, fire detection, emergency stop, interior door release, and visual and audio alarms," said product engineer Michael Stratton. He added that the Weiss Technik WEBSeason controller offers advanced control accuracy, real-time interface, multilanguage support, and connection from any device anywhere in the world."

▲ Weiss Technik drive-in test chamber.

Switching technology

Bob Stasonis, technical product specialist at Pickering Interfaces, emphasized that as FRUs get more complex, higher-density matrix switching becomes more critical, with microwave switching up to 67 GHz becoming the norm, as defense contractors look to 5G communication.[1]

"In terms of addressable markets, defense and aerospace applications tend to be high channel-count," Stasonis said. "For example, our 40-558 matrix, which offers 40% higher switching-density than our competitors, is an attractive product for those applications needing high channel-counts."

Norton W. Alderson, VP of marketing at Universal Switching Corp., commented, "Some military aircraft employ MIL-STD 1553 communication buses to control various functions and controls," he explained. "During the simulation and development portion of an airframe and its control systems, the system-engineering team will

▲ Universal Switching Corp. BS1553F automated patching unit.

want to patch together and simulate various scenarios, configurations and cable lengths." To support these teams, Norton said, "We developed our BS1553F automated patching unit to automate this patching under software or front-panel control."

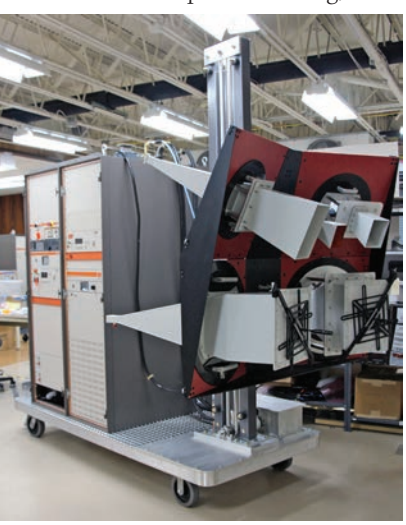
Alderson said that to help control budgets, USC manufacture modular hardware where customers can begin with a smaller configuration and expand as more funding is acquired, an approach taken with the BS1553F, which can be configured from 8x8 to 64x64 in increments of eight ports in symmetrical or asymmetrical configurations."

As for applications, "We serve nearly all Major Range and Test Facility Bases (MRTFB) across the nation as well as satellite ground stations, Amy, Navy and Airforce Research Laboratories," Alderson said. "Also, we serve a large majority of defense contractors and government agencies including NOAA, NASA and the newly formed US Space Force."

Menlo Micro offers a line of MEMS switches, and the company's switch technology has been designed into a new line RF subsystem products, such as a miniaturized UHF tunable filter targeting milcom manpack and handheld radio systems, a phase shifter, and an RF switch matrix, with a roadmap for additional subsystems, according to Jonathan Leitner, senior product marketing engineer."

MIL-STD-461 and MIL-STD-464 testing

AR RF/Microwave Instrumentation focuses on topics such as EMC testing. The company is seeing more effort being focused on MIL-STD-464, which covers entire systems rather than system component testing, according to Dean Landers, applications engineer, adding that the company's products are used worldwide for MIL-STD-461 and MIL-STD-464 testing.

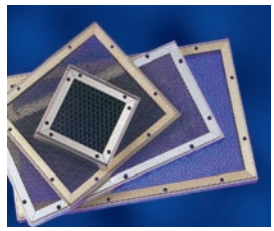


▲ AR RF/Microwave Instrumentation custom system. Courtesy AR RF/Microwave Instrumentation.

"As always, the biggest challenge facing radiated susceptibility testing is the 100-MHz to 200-MHz frequency range, where antennas often have negative gain," Landers said. "This can result in severe impedance mismatches which lead to low delivered power and high reflected power. Fortunately, our amplifiers can withstand the results of these heavy mismatches with no damage to the amplifier output."

Landers said, "We can also incorporate a customer's existing equipment into our system for seamless integration and operation."

Spira Manufacturing offers gaskets and filters for DoD weapon systems in simulated Faraday cages to ensure the systems operate properly in their designated environment without experiencing or adding EMI, according to George Kunkel, CEO

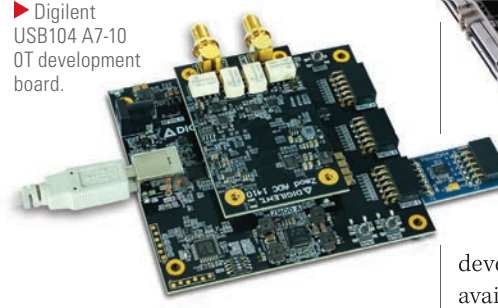


▶ Spira Manufacturing shielded air-vent honeycomb filters.

and chief engineer. To shield air-vent apertures in such systems, Spira has patented a process that can be used to fabricate a blended honeycomb panel (as opposed to basic brass or aluminum honeycomb panels) that can provide up to 40 dB of shielding above that provided by a basic aluminum honeycomb panel, as well as shielding that can exceed 80 dB at 1 GHz for a one-quarter-inch thick panel. The company also offers back- and front-mount EMI and environmental connector-seal gaskets.

Embedded ecosystem

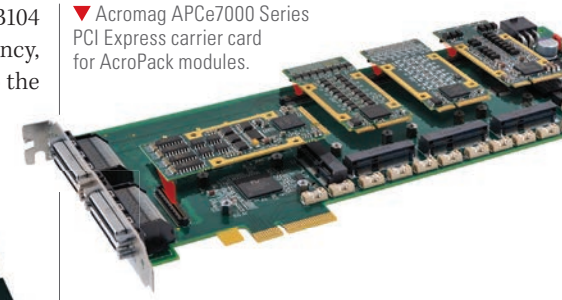
According to William Wadkins, FPGA product manager at Digilent, the company recently introduced the USB104 A7-100T to bring FPGA power, efficiency, and high-speed signal processing to the PC/104 embedded ecosystem.



▶ Digilent USB104 A7-10 0T development board.

Wadkins explained that an onboard USB controller provides interfacing and programming of the FPGA through both JTAG and UART with only a single connection. He added that an onboard QUAD-SPI flash stores the FPGA configuration between power cycles.

"Acromag offers a wide variety of AcroPack I/O modules, which provide a PCIe-based alternative to the older IndustryPack mezzanine technology," said Robert Greenfield, business development manager. "AcroPacks are available for A/D, D/A, digital I/O, counter/timer, CAN bus, serial communication, avionics interfaces, and FPGA computing functions. Carrier cards host any mix of up to four I/O modules on PCIe, 3U/6U VPX, CompactPCI-Serial, and mini-ITX form factors."



▼ Acromag APCe7000 Series PCI Express carrier card for AcroPack modules.

Greenfield continued, "AcroPack I/O modules are a hybrid between the popular but disappearing IndustryPack modules and mini-PCIe cards that often

lack the durability required for mil/aero applications."

Power sources

"Pacific Power Source recently launched a complete new line of linear programmable power sources with a color touch screen user interface aimed at Mil/Aero ATE power test applications," according to Herman vanEijkelenburg, director of marketing at PPST Solutions, the corporate affiliate distribution channel for Pacific Power Source.

"Pacific Power Source's new LMX Series linear AC power sources meet the need for low noise, low distortion, high-quality AC power not available from general-purpose switch-mode AC power sources," vanEijkelenburg said. "With both single- and three-phase models covering a range of power levels from 500 VA to 30 kVA, these linear AC sources offer high-performance programmable power with modern control interfaces like LXI-compliant LAN and USB. Pacific Power also offers a broad library of power test-compliance software suites for airplane equipment, including MIL-STD 704 and RTCA/DO160, as well as manufacturer-specific test standards for Airbus and Boeing."

▲ Pacific Power Source LMX Series linear-technology-based AC power source.

Kikusui offers AC power supplies (PCR-WE Series) that through parallel operation can support outputs to 144 kVA; the frequency can extend to 5 kHz, the spokesperson said, adding that it can also serve as a DC supply that can be used in power-supply fluctuation test. "The high-speed amplifier bipolar power supply (PBZ Series) can simulate a load connected to the DC line of the battery and DC/DC converter using the actual waveform data acquired in the field for evaluation and testing." A built-in waveform generator can be used for noise superposition and low-voltage power supply voltage fluctuation test.

Chassis and connectors

Hartmann Electronic focuses on PXI/PXIe, which Frank Godulla, CEO and director of sales, described as the leading bus technology for modular ATE systems. "Our focus is on extending our line of PXIe chassis for both standalone setups as well as for more complex test applications," he said. "The current 6- and 8-slot hybrid Hartmann Electronic PXIe/PXI bus backplanes were designed in a modular way."

In related news, Justin Moll, vice president of sales and marketing, Pixus Technologies, said the company is offering a new product to address the trend of aerospace apps starting to use SpaceVPX

(VITA 78, etc.). The new product is an OpenVPX chassis platform that supports both 160-mm deep (standard OpenVPX) and 220-mm deep (SpaceVPX) boards. The open-frame chassis features up to four slots at 1.0-in. pitch of each board depth type. The modular enclosure allows various board pitches to be used at 0.2-in. increments. Card guides support both air-cooled boards and conduction-cooled boards, with wider 220-mm-deep card guides to support extra-thick SpaceVPX conduction-cooled boards per VITA 78.

Trends and challenges

"The trend we see is that maintainers are seeking easy to use, sustain, and deploy test sets that overcome the obsolescence and multiple large box test sets found on the flightline today," said Sargeant of Marvin Test Solutions.

According to Sargeant, maintainers face using multiple large-box test sets that take several airmen to carry to the flightline, and consume large amounts of time to set up, tear down, and run tests on the flightline. "These large, slow test sets compound the problem of the reduced number and lower experience levels of maintainers found in squadrons today. All levels of maintainers are faced with an ever-growing number of cyber threats, therefore, they are searching for cybersecure test sets to combat the threat."

Butler at NI cited many trends affecting NI's aerospace and defense customers. "Through digital transformation initiatives, these customers are looking to modernize both their products and their processes. This trend is the result of a convergence of digital technologies, and promises to revolutionize the way companies design, manufacture, and service their products."

McCarthy at Rohde & Schwarz cited the commercialization of space, or NewSpace, as an interesting trend. "It is clear that the military and aerospace industries are attempting to leverage commercial technologies in space," he said. "From a standpoint of RF and microwave communications testing, this also involves the desire to utilize commercial communications standards in NewSpace, for secure and globally-available networks."

McCarthy added that commercial communications standards being developed in parallel include the 3GPP work item on non-terrestrial networks (NTN). "NTNs can provide a tactical battlefield or global coverage of secure networks, and they have three areas of concerted development in the defense industry: low-Earth orbit (LEO) satellite systems, high-altitude platform stations (HAPS), and unmanned aircraft systems (UAS)," he said. "Of these three investments, some of the most promising and popular innovations are the investments in the LEO constellation networks."

Walker at Copper Mountain Technologies commented on security from the perspective of a vector network analyzer manufacturer, calling USB VNAs a better fit than traditional instruments. "Taking traditional network analyzers in and out of secure environments is a lot of work, requiring removable hard drives, data-purging procedures, and oversight over those data-purging procedures. With USB VNAs the computer that stores and processes the data is separate from the measurement module, so, as long as the computer stays in the secure area, all data concerns are eliminated, and the data measurement module can easily move between laboratories and sites. Our measurement module has only volatile memory, so no data is retained, and the separate PC can be made secure following standard security protocols."

Anritsu has noticed two main trends, according to Summers. First, "Deployed systems are continuing to be more technical, along with the tools used to maintain them and technologies, yet are easy to operate," he said.

Summers cited challenges related to signals intelligence (SIGINT) and electronic warfare (EW), which require precise test and measurement equipment, such as spectrum analyzers, to operate according to specification in demanding environments.

Rule at Pacific Instruments identified trends toward large-scale systems and structure testing requiring an integrated data-acquisition system capable of supporting multiple types of sensors, wide range of sample rates, filtering schemes, modularity and expandability. "For smaller scale tests, many military and aerospace facilities are evaluating and moving toward a distributed data-acquisition system architecture. The ability to utilize a network of small data-acquisition systems located as desired and linked together as one large system is advantageous in many applications," he said.

According to Stasonis at Pickering Interfaces, "The advances in AI and machine learning will likely mean more HILS applications to test for all possible circumstances, whether it is hardware, firmware, or software testing to prove that the 'lessons learned' are correct. We are also seeing a drive for smaller test systems to bring better support to the battlefront."

▲ Pickering Interfaces Model 40-558 matrix.

Stasonis emphasized that the product life/availability of test gear should be as long as possible. "For defense applications that are reaching end-of-life—for example, VXI instrumentation—we offer migration paths from VXI switching to PXI. In order to keep our product families supportable in the long haul, we have gone through projects where we design out obsolescence in our products—ensuring that newer designs are form/fit/function the same compared to older models."

Regazzi at Giga-tronics commented on trends from both a business and technology perspective: The demand has finally arrived for test equipment to process signals with instantaneous bandwidths in the GHz range.

Averna over the past year has identified two trends that have stood out in MIL/aero test. "The first is a result of the many acquisitions that have transpired within the industry. Now we are seeing companies investing in streamlining the

inherited source code and multiple platforms." said Anderson and Lingafeldt. "We have also seen increased connectivity testing for Iridium network-based aircraft communication modules. With the contribution Iridium Communications has made towards reliable communications coverage anywhere in the world, the integration of their modems and technology into mil-aero solutions continues to grow."

According to Wadkins at Digilent, "The earlier standards for embedded computing often used in MIL/aero applications, such as PC/104 and VME, required CPU cards, single-board computers (SBCs), and I/O to be specifically compatible with the connectors and mechanical features specified by those standards. The demand for serial buses, particularly USB for its already widespread adoption, has increased within the embedded PC world."

"The US Army has awarded in excess of $3B in contracts for a new generation of manpack and handheld radios with enhanced performance over the existing first-generation software-defined radio technology," said Leitner at Menlo Micro. "These 'second-generation' radios are required to have improved digital modulations, waveforms, and data rates, while supporting existing milcom systems like SINCGARS. The largest share of these new contracts will be for field handheld radios."

According to Greenfield at Acromag, "Many customers continue to migrate from VME-based systems as boards go end-of-life. The alternative is usually a rugged server with PCIe expansion cards, or a rugged small-form-factor embedded computer with mini-PCIe modules."

A Kikusui spokesman said, "There is also a demand for variable frequency, and there is a demand for an AC power supply that can output frequencies of 1 kHz or higher," the spokesperson said, with applications including the evaluation and test of VFAC (variable-frequency AC) generation systems. Consequently, variable-frequency outputs are required in addition to 400-Hz outputs. Also required is bidirectional, regenerative operation for battery discharge test.

vanEijkelenburg at Pacific Power Source commented that trends evolve slowly in aerospace applications due to regulatory and FAA requirements requiring extensive certification cycles. "However, there is a growing trend towards replacing hydraulic systems with electrical systems in an effort to reduce lifetime maintenance costs," he said. EE

The complete version of the Mil/Aero Special Report is available on the EE-Evaluation Engineering *website at evaluationengineering.com/21148800.*

REFERENCE

1. Nelson, Rick, "From the Simulation Environment to the Flightline," *EE-Evaluation Engineering*, February 2020, p. 10.

HOW TO CHOOSE AN ELECTRONIC LOAD

What things do we need to consider before purchasing an electronic load? We discuss what electronic loads are, what points to consider before purchasing, and why reading the specifications just isn't good enough.

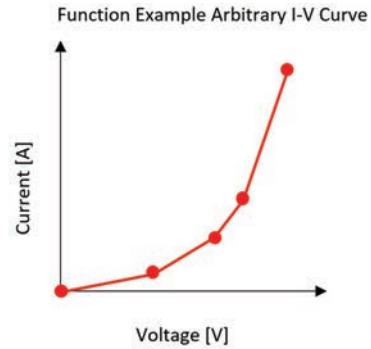
By Tomoaki Mori, Kikusui America

It is a well-known fact that electronic loads are essential in power supply and battery testing applications. However, it can be hard to decide which electronic load is best for an application because of the variety of options in the market today. In this article we explore the key characteristics of electronic loads and what to consider when starting a new application.

When it comes to electronic loads, there are two primary types of power consumption: linear regulator, and regenerative. Linear-regulator types are used in applications that require fast response and low-level noise. Regenerative types feature high power-density and low power losses. In linear regulator types, power is consumed by devices which convert electrical energy to heat. In regenerative types, switching power devices are used to return power to the AC line.

Electronic loads have many functions,such as low-voltage operation, combined operating modes, remote-control interfaces, time-dependent settings, measurement functions and more. There are too many to list here, but it is important to consider which functions will be useful for an application **(see Figure 1)**.

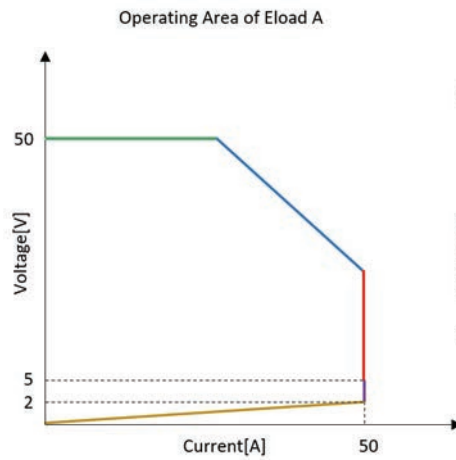
The operating range of electronic loads is often given in terms of power, current and voltage. If our application requires a larger capacity than an electronic load offers, it will not be worth considering. However, if an electronic load has a capacity that is much larger than our application, it may be a waste of resources. In addition to the unnecessary cost and size of an electronic load, a larger capacity may mean poorer performance. It is often the case that the higher the rating, the worse the setting accuracy, setting resolution and response is for lower range applications.



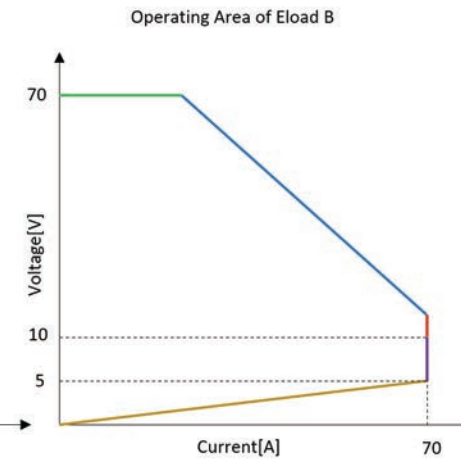
▲ **Figure 1:** An example of the functions electronic loads have is this Arbitrary I-V characteristic profile, which allows users to define an I-V profile to emulate non-linear loads, such as LED's, or PV's.

A Tale of Two Loads

Let's use an example of load A and B, which have similar but different operating



▲ **Figure 2:** A diagram to illustrate the boundaries of theoretical load A.



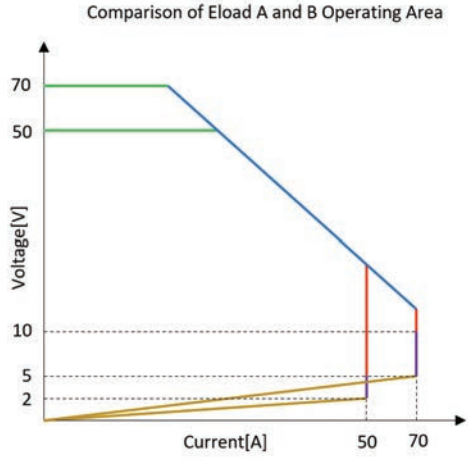
▲ **Figure 3:** A diagram to illustrate the boundaries of theoretical load B.

specifications. A is rated at 50 amps, at an operating voltage range from 5~50 V, minimum 2 V, with a power rating of 1,000 W. B is a 70-A, 70-V, 10~70 V (5 V min) device rated at 1,000 W. At first glance, B looks better than A. The figures below illustrate the operating area of each electronic load **(Figures 2 & 3)**.

Operating areas are traced by the intersection of the upper limits of power, voltage, and current according to the specifications. Green lines show upper voltage limits. Blue lines show upper voltage and current limited by the power rating. Red lines show upper current limits. Purple lines show upper current limits in the area outside of the voltage specifications. Yellow lines show upper current limits in ranges of the minimum operating voltage **(Figure 4).**

It is important to know what operating area will be needed for your application. Choosing an electronic load with a capacity that is not much larger than what your capacity requires may save you from having to pay unnecessary costs. Let us compare the operating areas of Load A and B.

In the range of 30-40V, neither load has the advantage, because both loads have the same power rating. However, load A may be a better choice than B if we need to use lower voltages, because load A has a larger current range for lower voltages, shown by the yellow line. Even though more capacity might be appealing it often comes with more cost. If our application will not require more capacity than load A offers, it is unlikely that load B's larger capacity will offer any advantages. In addition, the higher capacity of load B could result in less resolution and accuracy in measurements and settings.



▲ **Figure 4:** The operating area of both loads are superimposed for a comparison of the respective advantages and disadvantages of each load.

Power Consumption Methods

As mentioned earlier, electronic loads employ two types of power consumption methods, each with their advantages and disadvantages. The linear regulator type tends to have a faster response, because it employs a linear amplifier, which has a faster response than the switching power devices used in regenerative types. The absence of switching devices also leads to linear regulators having lower noise. Another advantage of a linear electronic load is the ability to use common single-phase 120/240 Vac as input power, even for large-capacity loads (20kW or higher).

Regenerative types have the advantage of being more efficient and operating at lower temperatures. The regenerative type uses switching elements to redirect power back to the grid, offering better efficiency but also slower response, with introduced noise. For the regenerative type to put energy back on to the grid, they require 3 phase and higher-voltage AC connections, which may be a limited resource in a lab.

The regenerative type also operates at a lower temperature than the linear type because energy isn't dissipated as heat, saving on costs from air conditioning in the lab. When choosing between the different types of power consumption, one should also consider the facilities available in the lab, as well as energy costs and application requirements.

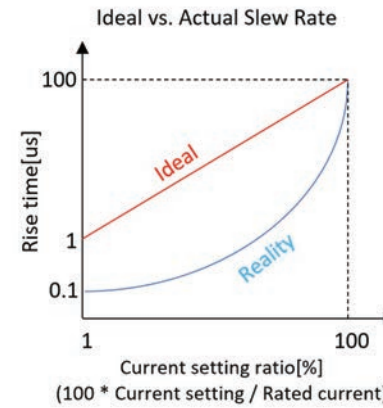
Functionality

As mentioned earlier, the menu of electronic load functions available these days is long, and it's not possible to explain them in detail here. It is good practice to read manufacturer datasheets to find the functions most relevant to your application. If your application requires an electronic load with special functions, it is recommended you check with the manufacturer to be sure the needs of your application will be satisfied. Datasheets and user manuals are helpful to understand the basics of a function, but they cannot explain all the limitations you may experience in practice. If possible, request to demo the load before purchasing.

Response

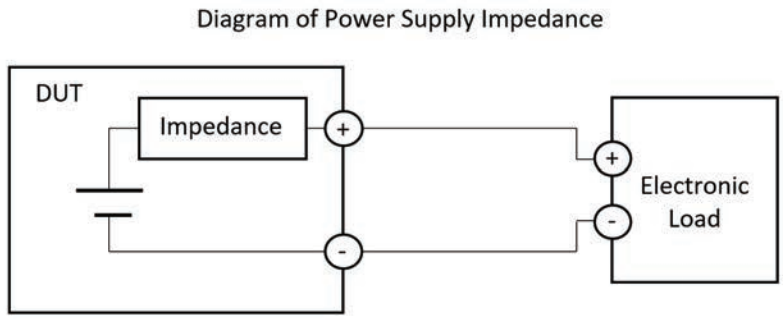
Other specifications of electronic loads we need to consider before purchasing are the slew rate, CR response, and CV response. With regards to the slew rate, what often concerns us is the difference between the ideal slew rate and the actual slew rate. When electronic load suppliers list specifications in their catalog or specifications manual the slew rate value is often written as an ideal value.

When we use the load for our application, we may find that it is not the same as the specification. The main reason for this is that the slew rate is not a constant value but changes depending on the current amplitude. For a larger current we can expect a faster slew rate. If an application requires a smaller current amplitude the slew rate will be slower than ideal value given in the specifications.



▲ **Figure 5:** The ideal rise time, often used in the specification manual, can differ greatly from the actual rise time. It is important to test the rise time at the voltage and current settings in the application.

Figure 5 shows an example, using an electronic load with a 100 µs rise time specification when the CC setting is 100% of the current rating. Ideally, the rise time is 100 µs when the setting value is 100%, and the rise time is 1us when the setting value is 1%. But in reality, the slew rate does not change linearly with



▲ **Figure 6:** A circuit diagram to show the wiring of an electronic load and power supply as DUT. One application of electronic loads is to test the impedance of a power supply.

respect to the current setting. **Figure 5** shows a representation of slew rate and current setting as a percent of the max setting, where the blue line represents the ideal case and the red line represents a realistic case.

When the rise and fall time of our electronic load is important to our application it is important to find out the limitations of the slew rate within the current range we will be using the electronic load and when the load is being used, make sure the appropriate range setting is being used to get the fastest slew rate possible.

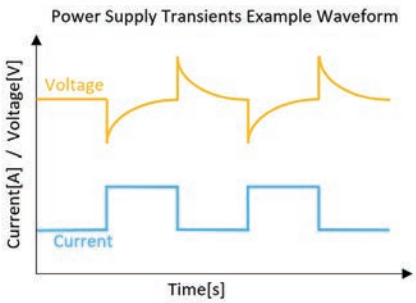
We also need to understand the importance of slew rate in an application. It's important to have a fast slew rate because it helps discover the impedance that a DUT has. An ideal constant voltage source has zero impedance however, real constant voltage sources do have an output impedance, which affects the DUT transient response. For example, **Figure 6** shows the DUT and electronic load connected.

If the electronic load is switching CC level, the waveform will be like the figure below, where the blue line represents the CC level of the load and the yellow line represents the DUT output voltage. As the current rises the voltage level drops by the inductance of the DUT. Next, the DUT tries to restore the output voltage by feedback control and regain the CV setting. When an electronic load with a fast rise/fall time is used with large current fluctuations, it allows the user to observe the transient voltage fluctuations and the associated impedance of the DUT **(Figure 7)**.

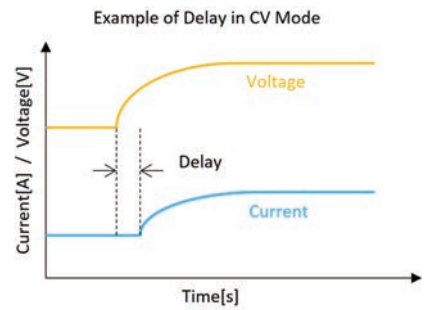
Incidentally, when a large voltage drop is caused by a DUT's impedance, it can sometimes cause malfunction of DC electronic load because the voltage will drop below the operating area of the load and it will be unable to sink current. If we are testing a DUT that we suspect to have voltage drops we should make sure that it will not be below the operating area of the electronic load. We can also look for loads made with built in bias power supplies that are designed to sink current at low or even 0 V.

In regards to CR response, the load current swing lags the voltage swing because of the feedback control in the electronic load. The lag is different for each electronic load. If we need a fast CR response, we should check the CR response listed in the manufacturers specifications and ask suppliers for information on the response within the range we plan to use **(Figure 8)**.

When considering the CV response, the most important thing to be careful of is oscillation. The CV mode is achieved by using feedback control that includes the wire's impedance and DUT's impedance. Since the point at which oscillation occurs differs depending on the test environment, suppliers have a difficult time accurately listing the response specification in their catalog. However, when we don't need a fast response, it is possible to use loop gain by connecting a large capacitor to the electronic load terminal to make the response slower and prevent oscillation.



▲ **Figure 7:** If an electronic load is used with a fast rise/fall time, large current variations can be used to observe the transient voltage fluctuations. It is important to consider whether the voltage drops in the DUT will cause the voltage to be outside the operating area of the electronic load.

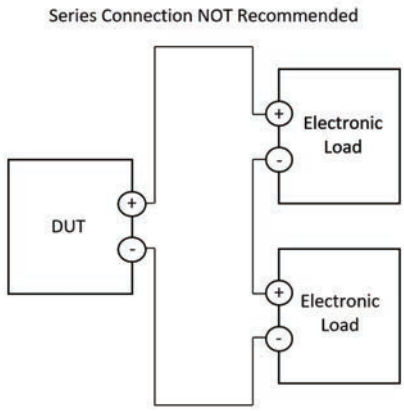


▲ **Figure 8:** In CR mode the current will lag the voltage due to the feedback loop used by the electronic load. Contact the manufacturer for an accurate CR response for the range needed by the application.

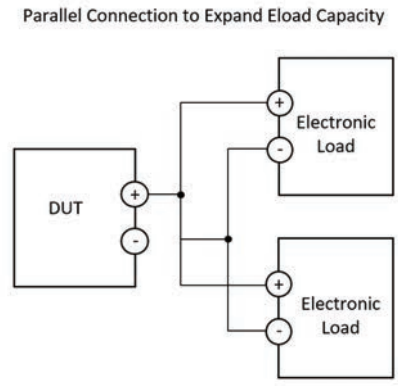
Expanding Operating Area

Another important thing to understand when purchasing electronic loads is how multiple units can be connected to expand the capacity. If you have experience using power supplies, you may be used to connecting them in series or parallel to expand respectively the operating voltage or current range. It is not as straightforward with electronic loads.

Electronic loads cannot be connected in series to expand the voltage capacity because of the methods electronic loads use to control current to achieve the CC/CR/CV/CP operating modes. If two loads are connected in series it will cause erratic operation such as oscillation, corruption, and test failure. If an application needs a higher voltage it is necessary to purchase an electronic load with a larger voltage operating area **(Figure 9)**.



▲ **Figure 9:** Connecting electronic loads in series to expand voltage capacity is not recommended.



▲ **Figure 10:** Most electronic loads can be connected in parallel to expand the current capacity. An example connection diagram is shown.

If there is an application that requires a larger operating current it is possible to connect electronic loads in parallel to expand their current capacity. When considering electronic loads for a new application find out the parallel connection capacity of the load. It may be necessary to purchase several units that meet the voltage requirement and connect them in parallel to meet the current requirements of the application **(Figure 10)**.

Looking forward

From the examples shown above, we have seen that electronic loads in the market today have a wide range of functions that make testing DUTs more efficient and more effective. The capabilities of electronic loads allow them to be used in more demanding applications, but it also makes it more difficult for manufacturers to accurately represent the limitations of their products within the specification documentation.

As a buyer, it is important to consider how an electronic load will meet the demands of your application and how easily it can be integrated into your lab as well as the operational costs of using the load. It is a good idea to use the manufacturers specification to narrow your search and then request to demo the remaining devices so you can be sure the load you choose will be suitable for your application.

SOFTWARE-DEFINED RADIO ENTERS THE LIMELIGHT

by **Alix Paultre**, Editor

Software-Defined Radio is an example of how software-driven virtualization to replace hardware-oriented functionality can enhance system performance.

Recent advances in both software and the hardware to run it on have given software-driven functionality a big boost in cost-effectiveness and capability, enabling more and more application spaces to take advantage of software virtualization and related methodologies. This movement is most notable in data centers, where virtualization divides a physical server into multiple individual and isolated virtual devices. This enables each virtual server to run its own operating system(s) independently, providing higher server ability, lower operating costs, reduced server complexity, and increased application performance.

System consolidation by replacing subsystems with software can optimize resource utilization while improving overall system flexibility and responsiveness. Such a solution enables power in a system to be reallocated on-demand to wherever needed to react quickly and effectively to sudden shifts and surges in power usage patterns. Even AI and machine learning is now being used to predict and respond to changes in power capacity and demand.

In the case of software-defined radio (SDR), components that used to be implemented in hardware, like mixers, filters, amplifiers, modulators/demodulators, and such are instead implemented in software in an embedded system. The rapidly evolving capabilities of digital electronics enable many processes in software which were at one point only theoretically possible. This comes at the perfect time to address our rapidly-growing RF management issues in the Cloud.

A Multimodal World

The Cloud and Internet of Things (IoT) have created a multi-modal and -nodal world, with the associated massively-burgeoning RF infrastructure. Once upon a time, it was believed that the IoT would migrate to a common protocol and bandwidth, but the reality today is that there is and will always be a plethora of solutions, and for good reason.

The massive numbers of devices and the huge amount of data and communications traffic they generate have forced the industry to address power, latency, and bandwidth issues (which are also all related to cost).

Using a variety of RF solutions to address latency, bandwidth, and cost issues is a smart solution (no pun intended). Having the ability to switch from a low-bandwidth, long range, low-speed portion of the spectrum to a high-bandwidth, high-speed, short-range protocol is very useful. For example, the latest iteration of the WiFi protocol allows devices to use LoRaWAN for normal telemetry, with the ability to switch to WiFi-6 for big data transfers like software updates.

Using traditional analog RF technology to accomplish this would require multiple costly radio modules, or some kind of auto-tuning system to enable changing from one RF solution to the next on the fly. A digital system using SDR can perform all the radio gymnastics needed to use any RF solution it has an antenna able to access. An SDR-based design will also save significantly more power, footprint, and parts count over legacy RF designs.

Flexibility in test

In addition to addressing the plethora of RF opportunities available to IoT devices and systems, SDR can also perform as a powerful and flexible (and cost-effective) test methodology. To get a handle on some of the ways engineers are using SDR in RF testing and monitoring applications, we reached out to Kenneth Wyatt of Wyatt Technical Services.


Wyatt

EE: **So now, Ken, you were just starting to tell me about your involvement with software-defined radio in creating and developing cost-effective solutions.**

Kenneth Wyatt: That's right. My involvement up to now has been more in the realm of radio and shortwave reception. Some people are using these very affordable USB-based SDR modules for surveillance, for example. There are also companies like Tektronix and Signal Hound, who are basically using SDR technology for spectrum analyzers. For the most part, these are USB-connected instruments that rely on a laptop for the display and all the number crunching.

EE: **I think it's a good idea that you brought up USB-driven devices. Because there are going to be a lot of people, even those going to be eventually working at higher levels with it, who are going to play around with USB devices to get a handle on the tech.**

KW: Right. There's probably a dozen different companies making very affordable SDR-based receivers and even transceivers, like Airspy, who makes a number of SDR modules. Some of these can tune up to a 1.8 GHz, and so there's a hobbyist aspect where they're monitoring military communications and other two-way radio government communications even.

For me, I'm more interested in the electromagnetic compatibility uses of these modules. So there's definitely a hobbyist aspect, just those who are interested in shortwave listening or other two-way radio communications, or even digital television and aircraft tracking. There's a number of different applications. A good friend of mine uses these for radio astronomy purposes, using SDR to track solar emissions, hydrogen lines, and all that stuff using an SDR-based receiver and special microwave antennas on his roof.

The Magnetopause-to-Aurora Global Exploration Satellite

He was even able to locate a "lost" satellite of NASA's. He was able to pick up the downlink signal from it. Apparently, it had been lost for a decade or so. NASA had lost track of it. He found it and contacted NASA, and it was quite an interesting news story a year and a half ago. According to The Independent, Scott Tilley was scanning the skies in search of a secret US government spy satellite launched by Elon Musk's SpaceX, when he found signals from the long-lost satellite called the Imager for Magnetopause-to-Aurora Global Exploration.

EE: **Wow, that's very cool, Kent. This whole maker-hobbyist ham aspect, hacker aspect, emphasizes the flexibility and utility of software-defined radio, and how it really can be a Swiss Army knife in the RF space.**

KW: Yes, definitely. I've got probably a half a dozen of these little SDR-based receivers designed for various purposes. Mainly for shortwave listening. I spent most of my career with Hewlett Packard and Agilent Technologies in the field of EMC engineering, and now, in the last 10 years, I've been consulting in that same field. Whenever I can get my hands on a low cost, affordable tool for analyzing EMC issues for my clients, I'll do it. A lot of my clients don't have big budgets for expensive test equipment, so they appreciate the lower-cost alternatives.

EE: **Well, and that's one of the things that I really appreciate talking to you about because it's opened my eyes to the test and measurement aspects of software-defined radio. List some of the ways software-defined radio, you had mentioned spectrum analysis and such, but just rattle off, off the top of your head, the various ways you can use the software-defined radio in RF test.**

KW: Oh, sure. Okay. As far as SDR usage in spectrum analysis, there's a couple of interesting ways of using them. The first is, obviously, characterizing the spectrum of a product because that's really what the big challenge is for most electronic manufacturers is. They've got to keep the emissions down below certain levels in order to ensure their product complies.

Troubleshooting is a big aspect of spectrum analysis. The SDR, especially these affordable modules, gives manufacturers a low-cost way to assess, or at least identify red flags in their products. You can attach near-field probes to these modules and a program on your circuit board or cabling, to see where there might be quite a lot of emission coupling from the board to the cable, for example.

EE: **The beautiful part about what you're telling me is that it could apply to any software-defined radio solution at, frankly, any level, for any manufacturing situation. Because what you just described is a scalable situation.**

KW: In fact, companies like Tektronix have their RSA306B, which is USB-connected module that requires a high-performance laptop to be useful, but you can take this product, this analyzer, and use it for both troubleshooting and pre-compliance testing. Tektronix has some software that will do a compliance test or a pre-compliance test in a matter of seconds, and show you where you're compliant and where you're not compliant based on programmable limits, dependent on what standard you're testing to. This has been very useful for me, as an EMC consultant, helping my clients.

The other big use for the SDR is, and this has become more and more important in recent years, is interference hunting. We have so many wireless devices, and it's just proliferating exponentially. For example, so many devices are programmed to work in the 2.4 GHz ISM band, and there's a possibility of a one device interfering with your Wi-Fi and decreasing the data rate and things like that. But not only that, but all the mobile

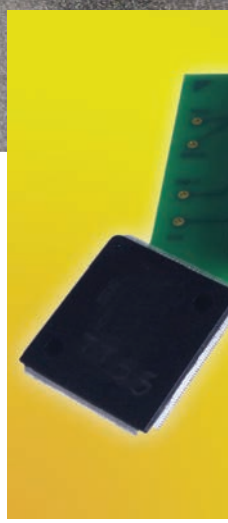
The Tektronix RSA306B

devices, mobile phones, and 5G, and all this, there's just more and more cell towers being built and interference between one and its neighbor can be an issue.

These portable spectrum analyzers based on SDR technology can be used now for locating sources of these interfering signals. You put a directional antenna on these spectrum analyzers, and you can help triangulate where the noise sources are and so forth. EE

EVALUATION ENGINEERING'S

FEATURED TECH



1. nProber IV for Semiconductor Fabs

The nProber IV nanoprober platform by Thermo Fisher Scientific is a fault-isolation system for semiconductor fabs, to precisely locate and characterize nanometer-scale electrical faults impacting device performance and reliability. The system extends nanoprobing to more users, while giving them the data required for a fast and efficient fault-analysis process. The nProber IV provides specific localization and accurate electrical characterization of parametric faults in advanced FinFET transistors, by combining an ultra-stable, temperature control probing platform and low-energy electrostatic nanoprobing LEEN2 SEM column, enabling probing at 100eV to support the latest technologies.

Thermo Fisher Scientific

2. Optical sensor modules

Yokogawa has launched updated versions of its AQ2200 optical sensor modules. The AQ2200-212 single-channel optical sensor module offers an analog output port, and the AQ2200-222 has two channels. Designed to work with the AQ2200 series frame controllers, both modules have improved measurement performance and low uncertainty. The AQ2200-212 and the AQ2200-222 both offer a power range from +15 to -90 dBm. The modules can also achieve a seamless measurement of approximately 30 dB without switching the measurement range. The modules also have an improved uncertainty of ±2.5%, compared to their predecessor's figure of ±3%.

Yokogawa

3. Snap Action Switch

CIT Relay & Switch's VM3 Series Snap-Action Switches offer 0.187" or 0.250" termination. The VM3 Series is available in SPST NO, SPST NC or SPDT versions, with operating forces from 80gF up to 180gF. This customizable switch also offers actuator-lever options of pin-plunger, roller levers, hinge levers, and simulated rollers. Common applications for the VM3 Series include lighting, security, automation, industrial controls, gaming, among others. Specifications and materials vary with choices of options in this customizable product. Lead-time averages 6 to 8 weeks

CIT Relay & Switch

4. Open top Socket for QFP216

Ironwood Electronics recently introduced a stamped spring-pin socket addressing high-performance requirements for testing 216-lead Quad flat-pack, the CBT-QFE-3021. The contactor used in the stamped spring-pin CBT-QFE-3021 socket has a 14-gram actuation force per lead, and a cycle life of 125,000+ insertions. The self-inductance of the contactor is 0.88 nH, insertion loss is <1 dB at 31.7 GHz, with a capacitance 0.03pF. The current capacity of each contactor is 2.9 amps. WIth a temperature range from -55C to +180C, the socket also features a top lid with double-sided latch for ease of operation.

Ironwood Electronics

5. Digital Differential Measuring Systems

The KD-5600 family of eddy current measurement systems is suitable for use in COTS applications for fast steering mirrors, magnetic bearing active control, shaft vibration, image stabilization, and adaptive optics. Customers in the small satellite, semi-conductors, military/aerospace, high precision metal working and UAV/drone sectors can benefit from the KD-5600 system's host of features. Designed for noncontact linear position displacement sensing applications, Kaman released three configurations for tailored use. The KD-5656 (digital system), KD-5640 (analog system) and KD-5690 (FE system) are equipped with custom sensors, signal processing, analog to digital converter and a custom calibration system.

Kaman Precision Products

6. Small Power-Saving 3D Magnetic Sensor

Infineon Technologies has expanded its XENSIV 3D magnetic sensor family TLx493D with the TLI493D-W2BW, which uses the latest 3D Hall generation, and is housed in a WLB-5 package measuring 1.13 mm x 0.93 mm x 0.59 mm wafer-level package. It has an 87 percent smaller footprint and 46 percent lower height than legacy products. With a current consumption of 7 nA in power-down mode, the magnetic sensor is also suitable for use in applications than previously used resistor-based or optical solutions. The low height of the TLI493D-W2BW is helpful in extremely space-critical applications.

Infineon

7. DPM Leverages Multicolor LED Tech

OTEK's New Technology Series (NTM) of efficient multicolor LED-based displays leverage ASIC nanotechnology to provide ±0.5% accuracy across all 22 models. Features common to all models of the NTM series include Auto Tri-Color bar and digital display, input-signal failure detection and alarm, isolated serial I/O, remote display for SCADA/DCS, self-diagnostics, math functions (Polynomials and X-Y tables), as well as customizable options. First in the series is the NTM-0 model, a 3.8" x1.9" horizontal digital panel meter that replaces any 1/8th-DIN analog or digital meter.

OTEK

8. Anritsu Launches Portable 400G Network Tester

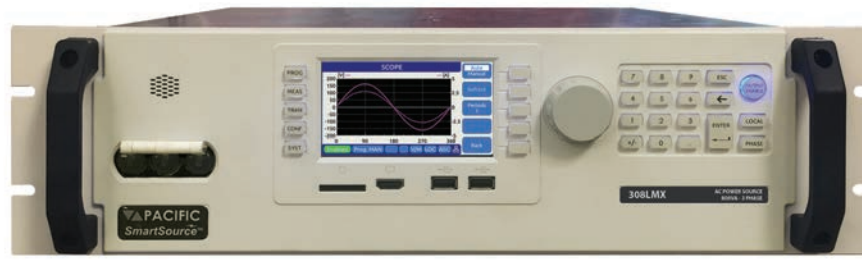
Anritsu released its Network Master Pro MT1040A for 400G networks, a battery-powered tester with directly-mounted QFSP-DD optical modules. The tester also has a simultaneously installable 10M-to-100G interface for access, metro, mobile fronthaul/backhaul, and data-center transmission quality tests, such as BER, throughput, frame loss, and latency measurements. Features include a GUI, a remote-control-over-network option, and auto-test functions. Anritsu claims that the MT1040A is the smallest B5-size 400G Ethernet tester available, and offers added functions for efficient testing, installation, and maintenance of faster networks up to 400G speeds.

Anritsu

TECH FOCUS

POWER SUPPLIES

Power sources, from benchtop units to floor-standing cabinets, are critical tools in the test of products from communications ICs to automotive drivetrain and battery systems. Here are some recent offerings of that ilk.



Programmable linear AC power sources

Pacific Power Source introduced a range of precision programmable linear AC power sources for a wide range of AC power test applications. The LMX Series consists of over 20 different models ranging in power from 500VA to 30,000VA. Compared to legacy switching AC power sources, the LMX Series uses linear technology to offer high performance with respect to output noise, voltage distortion, output impedance, and peak current capability. The LMX Series also offers a 15Hz to 5,000Hz output frequency range, which is higher than most switchmode AC power sources.

Pacific Power Source

Programmable Bi-Directional Power Supply

Elektro-Automatik, a supplier of automated test equipment for power electronics products and systems, announced the EA-PSB 10000 30KW Programmable Bi-directional Power Supply. The 4U rack-mounted PSB 10000, engineered with advanced SiC power conversion devices switching at 150 kHz, boasts the industry's best power density—requiring as little as half the rack space for the same power output as competing programmable supplies. The PSB 10000 combines an auto-ranging programmable power source and programmable load providing a single-chassis solution for simulating source and load for a wide range of applications, including battery chargers and batteries, electric vehicle power trains, solar inverters, and other power conversion devices and systems. The energy utilized in the test is then returned to the ac source via the programmable load's regenerative output. The result is up to 95% reduction in the energy consumed in the test. The PSB 10000 features a wide range 3-phase input voltage 342-528V, 45-66 Hz, with output voltage ratings of 60V – 2,000V and current ratings from 40A-1000A. Pricing from $32,035.

Elektro Automatik

240 W DIN rail power supplies for harsh environments

TRACO POWER has released its TIB 240-EX family of 240 Watt DIN rail power supplies that are designed for harsh environments & hazardous locations with certifications for ATEX II3G and UL HazLoc Class I/Div 2 standards. These products feature: 24/48Vdc outputs (-2% ~ +17% VADJ Range); high efficiency operation of 95%; 150% peak power for four seconds; and packaged in a ruggedized metal enclosure that is EN61373 qualified to the rigorous railway shock and vibration standards. Protection circuits include back power immunity, short-circuit/overload protection, and a DC OK dry signal contact.

TRACO Power

ADVERTISER INDEX

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THERE IS LESS 'UNDER THE RADAR' THESE DAYS

By Ken Cormier, Managing Editor

When a German scientist discovered in 1886 that radio waves could be reflected off solid objects, he probably did not foresee how that technology would revolutionize commerce, warfare, space exploration, weather forecasting, transportation, law enforcement, and more. The advent of autonomous vehicles is very likely about to widen radar's use in the near future, to ubiquitous levels. LiDAR, sometimes called 3D laser scanning, uses mostly infrared light. The technology has been used to make high-resolution maps, and has been used in surveying, geomatics, archaeology, geology, seismology, and more. Here are some recent news items on the subjects.

LiDAR leads Way to Lost Worlds

Though it is widely known for its use in advanced driver-assistance systems (ADAS) in autonomous vehicles, LiDAR's pulsed-laser measuring system is being used to spearhead searches for the vestiges of lost civilizations by archaeologists. In this use, the laser light illuminates the forest floor and measures the reflection with special sensors, gauging the time it takes for the pulses to return to the instrument. They then plot the data with GPS and computers to construct a 3D map of the search area.

According to National Geographic, LiDAR's strength lies in its ability to discern miniscule surface disparities that can indicate small sites like graves, or grand-scale edifices like a recently-discovered Mayan ceremonial ground. Its limitation is that it sometimes fails to reach the ground, often due to dense foliage.

In a recent airborne LiDAR survey, archaeologists discovered tremendous architecture at Aquada Fenix (Tabasco, Mexico). The site was "hidden in plain sight". Even locals were oblivious to its large presence, more than 30 feet high, but its immense horizontal dimensions allowed it to escape detection for centuries. According to Colorado State University anthropology professor Christopher Fisher, "In 45 minutes of flying, the LiDAR team accomplished a decade's worth of archaeological survey".[1]

Lockheed Builds Radar Detection Systems for U.S. Navy

Under terms of a $13.2 million order, submarine combat systems experts at Lockheed Martin are building additional AN/BLQ-10 EW systems for U.S. Navy submarines. The system automatically detects, classifies, pinpoints, and identifies potentially hostile radar and communications signals at sea. The AN/BLQ-10 is for Virginia-, Los Angeles-, and Seawolf-class fast-attack submarines, Ohio-class conventional guided-missile submarines, and future Columbia-class ballistic-missile submarines.

The AN/BLQ-10 processes signals from the submarine's imaging mast, or periscope when the boat is at periscope depth. It provides threat warning to avoid counter-detection and collision; determines the number and location of targets for subsequent prosecution; and conducts intelligence, surveillance, and reconnaissance (ISR) to support a fleet or battle group.[2]

Ground-Penetrating radar system detects hidden IEDs

Officials of the Army Contracting Command at Aberdeen Proving Ground, Md., announced a $200.2 million order to Chemring Sensors and Electronics Systems (CSES) in Dulles, Va. in May to develop and build Husky Mounted Detection System (HMDS) kits, spare parts, maintenance and training. The system will be employed to detect improvised explosive devices (IEDs) such as underbelly IEDs and antitank landmines in primary and secondary roadways.

The system is a combination of the CSES VISOR 2500 ground-penetrating radar and the Husky vehicle from Critical Solutions International in Carrollton, Texas. The CSES VISOR 2500 detects metallic and non-metallic explosive hazards, pressure plates, and antitank mines. It combines advanced real-time automatic-target-recognition algorithms, integrated metallic and non-metallic threat detection, automatic precision marking, and software.[3] EE

References

1. All About Circuits, "Archaeologists Employ LiDAR to Uncover the Secrets of Long-Lost Empires," June 9, 2020
2. Military & Aerospace Electronics, "Navy wants more AN/BLQ-10 submarine electronic warfare (EW) systems to detect hostile radar signals at sea," May 1, 2020
3. Military & Aerospace Electronics, "Army orders ground-penetrating radar system from CSES for detecting hidden IEDs in $200.2 million deal," May 13, 2020

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