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Model	Freq(GHz)	Gain(dB)	P1dB(dBm)	Psat(dBm)	Vd(V)
AM050WN-CU-R	DC-6	16.5	41.7	43	28
AM100WN-CU-R	DC-6	14	44.5	46	28
AM025WN-BI-R	DC-8	16	38.9	40	28
AM012WN-BI-R	DC-10	17	36.1	37	28
AM005WN-BI-R	DC-12	15	32	33.5	28
AM050WN-00-R	DC-15	20	41.7	43.3	28
AM100WN-00-R	DC-15	19	44.5	46.1	28
AM025WN-00-R	DC-15	21	38.9	40.5	28
AM012WN-00-R	DC-15	22	36.1	37.7	28
AM005WN-00-R	DC-18	23	32	33.4	28

GaAs FETs (good linearity at back-off)

Model	Freq(GHz)	Gain(dB)	P1dB(dBm)	IP3(dBm)	Vd(V)
AM006MX-QG-R	DC-6	13	22	34	5
AM012MX-QG-R	DC-6	13.5	25	37	5
AM024MX-QG-R	DC-6	13	28	39	5
AM036MX-QG-R	DC-6	12	29.5	42	5
AM048MX-QG-R	DC-6	11	31	43	5
AM072MX-CU-R	DC-6	11	34	46	7
AM100MX-CU-R	DC-6	10	35	48	7
AM150MX-CU-R	DC-6	10	36.5	50	7
AM200MX-CU-R	DC-6	10	38	48	7
AM300MX-CU-R	DC-6	9	39.5	51	7
AM005MH2-BI-R	DC-6	15	25	40	14
AM010MH2-BI-R	DC-6	15	28	43	14
AM010MH4-BI-R	DC-3	19	31	46	28

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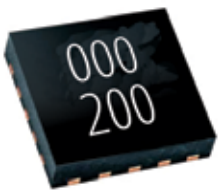

AMCOM's AM00020026WM-QN5-R is a broadband GaAs MMIC Distributed Power Amplifier which operates between DC and 20 GHz. This amplifier has 13 dB gain, and 26 dBm output power. The Amplifier Input and output are internally matched to 50 Ohms. The amplifier is packaged in a 5x5 mm 20-pins QFN package which suits automated assembly techniques.

AMCOM's AM02018026WM-QN5-R is a broadband GaAs MMIC Distributed Power Amplifier which operates between 2 and 18 GHz. This amplifier has 23 dB gain, and 26 dBm output power. The Amplifier Input and output are internally matched to 50 Ohms. The amplifier is packaged in a 5x5 mm 20-pins QFN package which suits automated assembly techniques.

AMCOM's AM06013033WM-QN5-R is a broadband GaAs MMIC which operates between 6 and 13 GHz with 28 dB gain and 33 dBm output power. The Amplifier Input and output are internally matched to 50 Ohms. The amplifier is packaged in a 5x5 mm 20-pins QFN package which suits automated assembly techniques.

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LadyBug Technologies designs, develops, and manufactures a broad range of first tier NIST traceable USB power sensors. Our power sensors do not require a separate power meter; they instead function as a complete power measurement solution using s software application on a PC, instrument or ATE (Automated Test Equipment) system.

As such they are referred to as Power Meters or Power Sensors. We manufacture sensors with capability of measuring average, peak and pulse power. Our sensors are used for general purpose RF power testing, ATE, defense, portable and compact applications. They are widely used in the microwave and RF test industry. Our LB5900 series power sensors have an exceptionally flexible interface including optional I2C and SPI connectivity, and the sensors are Linux-compatible.

> "Unlike traditional power meter & power sensor systems, LadyBug power meters are self-contained"

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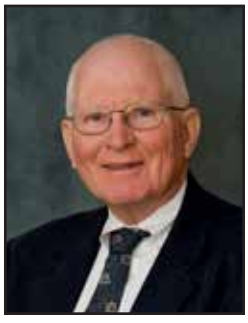
SUMMIT Technical Media LLC

Editorial

Disappearing Cell Towers

Tom Perkins
Senior Technical Editor



Tunnels provide a shortcut under waterways and through mountains for transportation and commerce, enabling goods and passengers to reach their end destination faster and fuel efficiently via direct point-to-point routing. This can often be safer and more comfortable than conventional over-ground or water transportation.

In tunnel environments, reliable wireless connectivity for the public, government entities, and even mining industries is essential. As for RF propagation, I think of a tunnel as an inferior waveguide no more than 25 meters in width, well beyond cut-off for the ≈300-meter wavelength AM broadcast band, but being able to support FM VHF signals if a plane wave could enter from an antenna at one end or within. This would then be extended to microwaves and cellular signals with the caveat that an antenna would need to be focused into the mouth of the tunnel. Keep in mind that the tunnel is generally not a perfect metal-bounded waveguide, so curves can present problems, also. Alternatively, distributed repeaters along the tunnel's ceiling would function adequately. This challenge could be thought of as a special or extreme case of propagation in building structures, such as a long hallway.

The Need

Robust cellular coverage in tunnels must be available to automobile and rail passengers, regardless of their network operator or service. For entertainment and content delivery, a fundamental part of the driving experience, FM and Digital Audio Broadcasting (DAB) broadcast services are highly desirable to maintain continuity from end-to-end. For public safety services, for events like accidents, vehicle breakdowns, fire, or other emergencies, FM/DAB break-in provisions are becoming essential to ensuring a safe in-tunnel experience for both drivers and passengers alike. In Europe, break-in functionality is already mandatory for tunnels longer than 500 meters. (See Directive 2004/54/EC on minimum safety requirements for road tunnels in the Trans-European network). There are many such long tunnels, particularly in Italy, Norway, Austria, and Spain.

Meeting these requirements while ensuring seamless in-tunnel wireless connectivity requires a proven solution without glitches that enables all different technologies, bands, and services to be delivered seamlessly, with excellent performance, preferably from a single unit.

Solutions

Leaky-line coax is one method to deal with the problem. A long single run of coax can allow signals to be distributed much like a water "soaker" hose with pinholes for irrigation. Interestingly, this leaky coax technique has been used in places like elevator shafts for some time.

One company providing a solution is Bird Technologies, founded in 1942. Many of my amateur radio friends know this company for their venerable Model 43 directional wattmeters. With "slugs" covering various frequency ranges, it's the *de facto* standard for measuring transmitter power. Bird is currently involved in much more: broadly, communications, security, military, medical and more. They offer an active Distributed Antenna System (DAS) that delivers multiple technologies, bands and services over a single strand of fiber with very good uplink and downlink network performance. They claim the system can handle up to 15 dBo optical loss with noise figure of 3 dB. This allows great flexibility in fiber distribution design.

The system allows for many combinations of band and power configurations. Cellular, FM, DAB, and public safety services are delivered from a single unit, while various amplifier types can be mixed in a single remote housing, taking advantage of the varying propagation properties in different bands. They claim that this reduces capital expenditure investment and the equipment footprint, which is a crucial factor in tunnel environments.

The Distributed Antenna System offers FM/DAB and break-in functionality over long tunnels by distributing signals over multiple DAS remote units. In shorter tunnels, advanced technology off-air channelized repeaters offer DAB enhancement where there is no base station availability. The DAS can also be equipped with break-in modules, which allow live or recorded emergency messages to be distributed along the tunnel to drivers and passengers.

For monitoring, DAS can be controlled, operated, and maintained from virtually anywhere in the world by authorized system operators. No special software is required. Operators can use a standard web browser to configure and manage the system. Designated operators are notified of any abnormal system conditions via Simple Network Management Protocol (SNMP) traps sent to upper-level management systems. This is an application-layer protocol used to manage and monitor network devices and their functions. The Bird DAS supports several levels of redundancy, both for head-end and remote unit modules. A typical public safety configuration comprises remote units fed from two geographically separated master units to ensure that coverage is provided should one unit fail. Connectivity and safety systems remain fully operative, even if the tunnel is partially damaged, collapsed, or perhaps flooded.

Meetings and Events

2020 IEEE 21st Annual Wireless and Microwave Technology Conference (WAMICON)
15 - 17 April 2020 | Sand Key, Florida, USA
Field of Interest: Aerospace; Bioengineering; Communication, Networking and Broadcast Technologies; Components, Circuits, Devices and Systems; Engineered Materials, Dielectrics and Plasmas; Fields, Waves and Electromagnetics; Power, Energy and Industry Applications; Signal Processing and Analysis.

2020 IEEE/MTT-S International Microwave Symposium (IMS)
21 - 26 June 2020 | Los Angeles, California, USA
Field of Interest: Components, Circuits, Devices and Systems; Computing and Processing; Engineering Profession; Fields, Waves and Electromagnetics; Photonics and Electrooptics.

2020 45th International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz)
13 - 18 September 2020 | Buffalo, New York, USA
Field of Interest: Aerospace; Bioengineering; Communication, Networking and Broadcast Technologies; Components, Circuits, Devices and Systems; Engineered Materials, Dielectrics and Plasmas; Fields, Waves and Electromagnetics; Photonics and Electrooptics; Signal Processing and Analysis

2020 50th European Microwave Conference (EuMC)
15 - 17 September 2020 | Utrecht, Netherlands
Field of Interest: Communication, Networking and Broadcast Technologies; Components, Circuits, Devices and Systems; Fields, Waves and Electromagnetics; Photonics and Electrooptics

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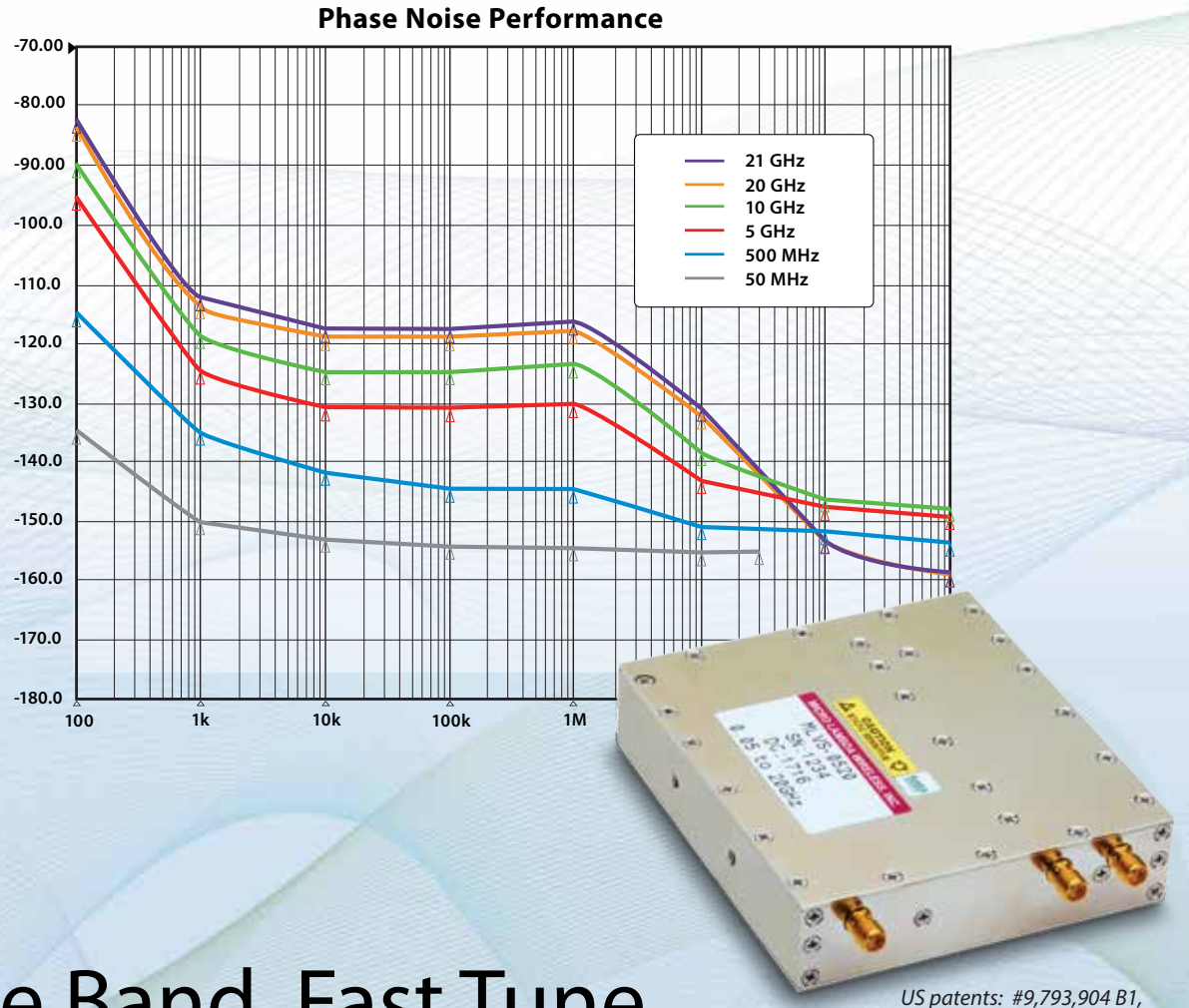

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2020 Will See Wi-Fi 6 Chipset Shipments Triple vs. 2019

"In 2020, Wi-Fi 6 will be increasingly adopted across numerous device categories, including smartphones, tablets, PCs, networking products and some premium tier home entertainment devices," says Andrew Zignani at ABI Research.

The technology was first deployed last year in several high-profile and high-volume smartphones, including the Samsung Galaxy S10, Note10, iPhone 11, and iPhone 11 Pro series of devices. This was compounded by numerous access point and networking product announcements over the course of the year, alongside some traction in notebook PCs. In 2019, the Wi-Fi Alliance launched its Wi-Fi 6 certification program with certified chipsets now readily available from Broadcom, Cypress, Intel, Marvell, and Qualcomm, removing a further barrier to adoption.

This early client adoption from companies like Samsung and Apple will help incentivize others to adopt the technology. At the same time, companies like MediaTek have also recently unveiled their 5G Systems-on-Chips (SoCs) with integrated Wi-Fi 6 support, adding to Broadcom and Qualcomm's mobile Wi-Fi offerings. In the computing space, Intel's promotion of Wi-Fi 6 as a fundamental technology in premium laptop solutions through its Project Athena program will also help boost adoption over the next 12 months. Alongside this, the next generation of flagship tablets is likely to follow the lead of smartphones, while in higher-end connected home devices, Wi-Fi 6 technology may be used as a differentiator by leading OEMs.

What won't happen in 2020: The transition from 802.11n to Wi-Fi 6 in IoT applications

"ABI Research believes that **2021 will see the first real ramp-up of Wi-Fi 6 for IoT applications**, as more and more chipset providers begin to provide low-power IoT-centric Wi-Fi 6 SoCs over the course of the next 12 months. As these Wi-Fi 6 IoT chipsets fall in price, and the cost and availability become comparable to 802.11n, the enormous benefits that these solutions can provide versus existing technologies will help scale up Wi-Fi 6 adoption across a number of IoT verticals over the next few years," Zignani concludes.

—ABI Research
abiresearch.com

Border Control Biometrics Revenues to Reach $3.5 Billion By 2025

The demands for higher levels of security, authentication, and passenger processing speed in border control have caused identity management to evolve rapidly, forcing an influx of new biometric technologies. Biometric kiosks, e-gates, surveillance cameras and fingerprint, iris and face recognition devices will combine to create total revenues of $3.5 billion by 2025, according to global tech market advisory firm, ABI Research.

"Not only are these new technologies bringing forth a wide spectrum of monetization strategies for service integrators and stakeholders, they also are creating a new set of challenges," explains Dimitrios Pavlakis, Industry Analyst at ABI Research

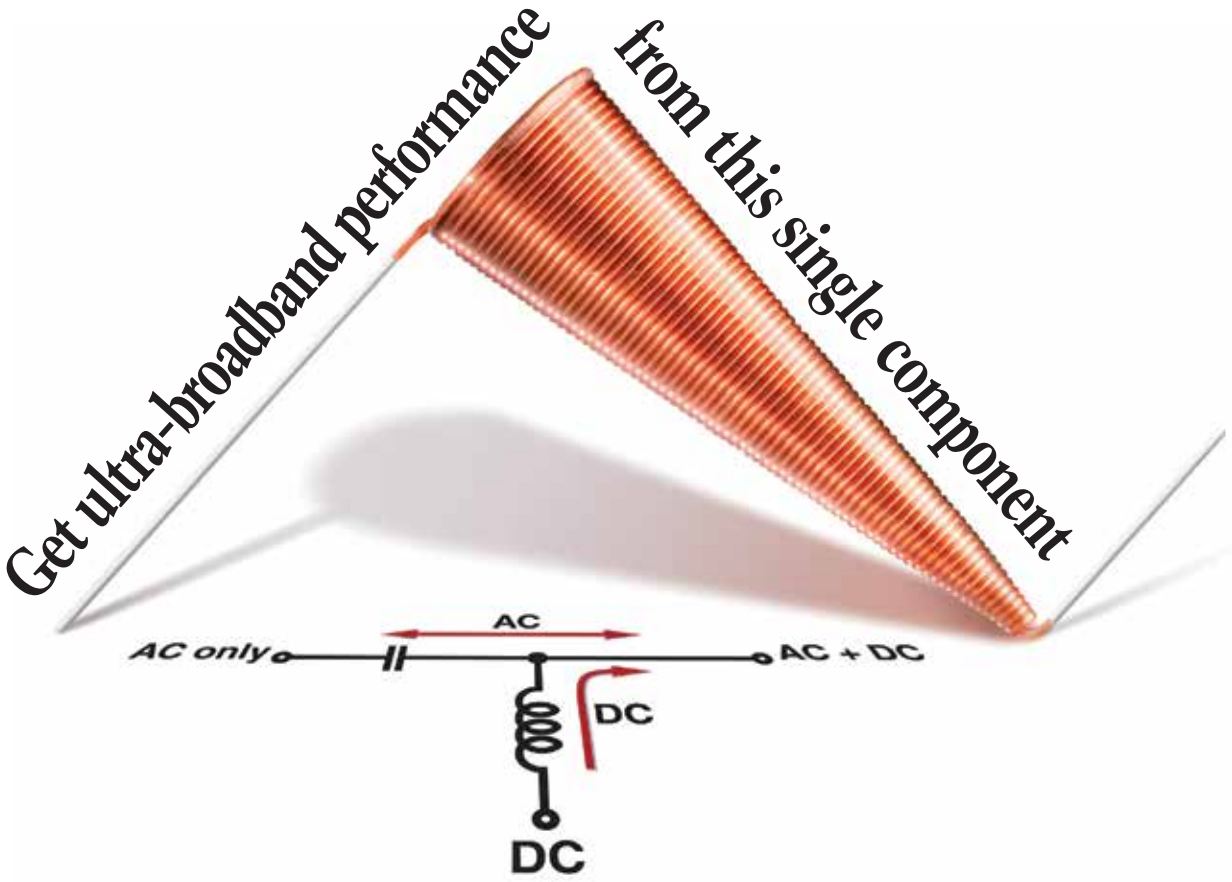
Border control authorities are heavily investing in biometrically enhanced authentication and security measures. These investments are increasing Return-On-Investment (ROI) and helping stakeholders develop better-honed monetization strategies. These include streamlining identity management and passenger flow, decreasing processing time, automating passenger authentication, improving the overall experience, and developing new interoperable platforms and services.

"However, this is predicated on the assumption that new infrastructure investments for Automated Border Control (ABC) management, new devices, and software services will be in place. ABC is greatly dependent upon biometric e-gates and passenger registration self-service kiosks using face, fingerprint, and iris recognition," Pavlakis says. New biometric hardware devices like handheld, immigration ID/authentication biometric device add-ons, access control, and workforce management have also found their way into border control. Total revenues of biometric devices as well as e-gates, kiosks will reach US$1.6 billion by 2025, including passenger registration and authentication, immigration, access control and workforce management.

Additionally, new biometric services allow governments and law enforcement to cooperate with international agencies through shared interoperable platforms and enhance their surveillance and counter-terrorism operation intelligence options across all land, air, and sea borders. Global surveillance camera shipment revenues for border control will reach US$1.9 billion by 2025 due to the push to strengthen border security via new video analytics, behavioral analytics, machine learning and machine vision technologies.

New challenges around infrastructure upgrades, technology adoption, and interoperability have arisen, which may create additional hurdles for stakeholders and hinder future projects. "Integrating biometrics into border control is not an easy task – at least not if one is planning on maximizing their ROI," Pavlakis points out. While biometric technologies are currently enjoying an increased penetration rate, border authorities and stakeholders must balance several conflicting variables.

—ABI Research
abiresearch.com



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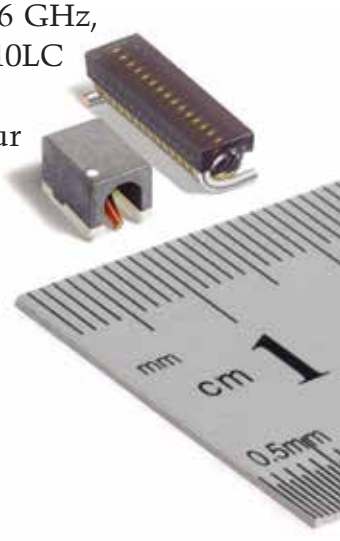

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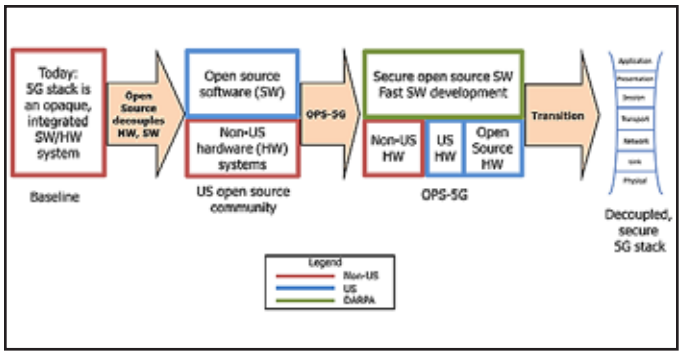

Improving 5G Network Security

Emerging 5G mobile wireless networking technologies are slated to dramatically increase in both scale and speed, enabling much faster access to data collected from billions of connected devices. This supercharged information highway is envisioned to play an important role across several industries, ranging from medicine to manufacturing. Major advances in 5G, including new core network features will make it easier to customize the network at a wide variety of locations. This new flexibility offers many benefits, but at the same time introduces novel security challenges. Today's proprietary 5G technologies make it difficult to achieve the transparency necessary for security-related risk analysis and mitigation. This lack of security assurance makes it harder to deploy these technologies for defense capabilities.

"As networks are simultaneously critical infrastructure and the means used for cyberespionage and cyberwarfare, finding ways to bolster their security is critically important," said DARPA program manager, Dr. Jonathan Smith. "The rapid increase in the scale of 5G networks, as well as issues from unmanaged or forgotten Internet of Things (IoT) devices and unwanted interactions between network slices, create security risks that must be addressed."

DARPA created the Open, Programmable, Secure 5G (OPS-5G) program to tackle many of the security challenges facing future wireless networks. OPS-5G will explore the development of a portable, standards-compliant network stack for 5G mobile networks that is open source, and secure by design. The program seeks to enable a "plug-and-play" approach to various network software and hardware components, which reduces reliance on untrusted technology sources. The goal of OPS-5G is to develop open source software and systems that can enable more secure 5G as well as future generations of networks beyond 5G.

The signature security advantage of open source (OS) software is increased code visibility, meaning that code can be examined, analyzed, and audited manually and, more fruitfully, with automated tools by multiple parties. Another benefit is open source software's portability, which allows the software to run on both OS and proprietary hardware. This decoupling of the hardware and software ecosystems makes it easier to introduce innovations while raising the difficulty of some malicious attacks. Further, it helps open the 5G market to smaller players and innovators. However, creating open source software elements typically requires the collaborative development of well-defined standards. The standards creation process can be slow and arduous – one that a rapidly-progressing technology such as 5G can't afford. To help accelerate the development of 5G-relevant open source software from standards, OPS-5G will explore the use of machine translation to increase code development velocity and help make standards easier to understand.

One of the many benefits of 5G is powering a vast and growing ecosystem of IoT devices. The security across these devices, however, is disparate, as is their size, weight, and power (SWaP). Today, IoT security features are viewed as optional, which does not bode well for their use within defense systems. To bolster security around this growing mesh of technologies, OPS-5G will explore the development of cost-effective SWaP-conscious cryptography with scalable security protocols. The program will look to existing technologies to support this process, like the many-to-many end-to-end encryption protocol developed by researchers at the University of California, Berkeley, called Joining Encryption and Delegation for IoT.

Network elements used to support virtualization and the 5G network concept of application-customized "slices" share resources to achieve cost-effective performance. Amongst other risks, this resource sharing creates potential timing channel vulnerabilities. Opaque system ownership, operator policies, and software provenance also present security issues for 5G networks. Currently, a multitude of large vendors provide carrier hardware, software, node provisioning, and more to enable 5G technologies. OPS-5G will explore breakthrough approaches for the enablement of secure network slices to provide security across the network resources provided by and shared with unknown entities. The program will explore novel ways to make trusted networks out of infrastructures with untrusted components.

—DARPA

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In the News

The Atmosphere as Global Sensor

Sensors are usually thought of in terms of physical devices that receive and respond to electromagnetic signals – from everyday sensors in our smartphones and connected home appliances to more advanced sensors in buildings, cars, airplanes and spacecraft. No physical sensor or aggregation of electronic sensors, however, can continuously and globally detect disturbances that take place on or above the earth's surface. But the physical atmosphere itself may offer such a sensing capability, if it can be understood and tapped into.

To that end, DARPA recently announced its Atmosphere as a Sensor (AtmoSense) program, whose goal is to understand the fundamentals of energy propagation from the ground to the ionosphere to determine if the atmosphere can be used as a sensor.

It's well known that energy propagates from the Earth's surface to the ionosphere, but the specifics of how that happens is not currently known enough to use the atmosphere as a sensor. Scientific literature has clearly documented that events like thunderstorms, tornadoes, volcanos, and tsunamis make big "three-dimensional wakes" that propagate to the upper reaches of the ionosphere and leave a mark there. Since that energy traverses several other layers of atmosphere – the troposphere, stratosphere, and mesosphere – on its way up to the ionosphere, the idea is to try and identify the disturbances the "wake" is making along its way to see if researchers can capture information to indicate what type of event caused it.

"Maybe I don't have to directly observe events like an earthquake or tsunami," said Air Force Major C. David Lewis who is the AtmoSense program manager in DARPA's Defense Sciences Office. "Perhaps I can learn what occurred from information in the atmosphere. I want to find out how much information is available, and if I can disaggregate the signal I'm interested in from other natural phenomena creating noise in the background."

The AtmoSense program seeks proposers from the atmospheric science community, who have extensive experience in atmospheric modeling and simulation. Also of interest are experts offering very unique ways to measure atmospheric properties, such as the basic PV=nRT variables – pressure, volume, density, temperature, or derivatives of such. Beyond these basic atmospheric variables, the mesosphere and lower ionosphere provide electromagnetic opportunities for measurement due to their charged nature.

"We typically model, simulate, and measure properties in the troposphere, which is where terrestrial weather happens," Lewis said. "But we don't really make those measurements in the stratosphere or the mesosphere, or the bottom part of the ionosphere, because no one has really been keenly interested in it and it's hard to get up there. Sometimes the mesosphere is even called the 'ignorosphere,' but we know that information traverses it, so we're really looking for scientists and engineers with unique ways of potentially measuring different aspects of the atmosphere."

—DARPA

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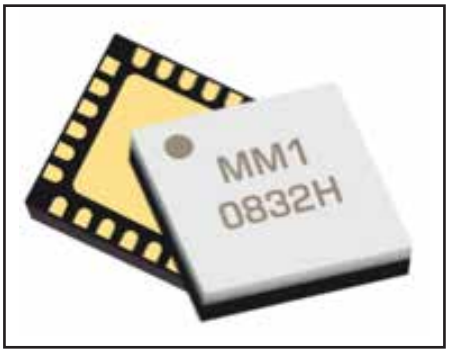
Planar Monolithics Industries
pmi-rf.com



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microlambdawireless.com

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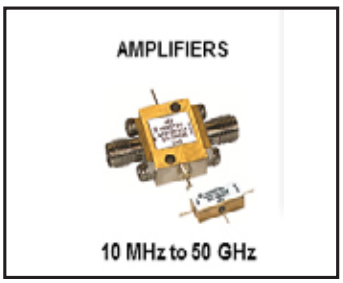
KP Performance Antennas
kpperformance.com



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KRYTAR's Model 510050010 offers superior performance ratings including Nominal Coupling (with respect to output) of 10 dB, ±1.8 dB, and Frequency Sensitivity of ±1.0 dB. The dual-directional coupler exhibits Insertion Loss (including coupled power) of less than 3.0 dB, Directivity of greater than 10 dB, Maximum VSWR (any port) is 1.80. Input Power Rating is 20 W average and 3 kW peak. The directional coupler comes with industry-standard 2.4-mm Female Connectors. The compact package measures just 2.24 inches (L) x 0.40 inches (W) x 0.62 inches (H), and weighs just 2.0 ounces. Operating temperature is -54° to 85° C. The dual directional coupler can also be manufactured to meet ridged military specifications.

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590 Rev A_P

Educational Requirements Must Keep Pace to Enable Technology Expansion

By William Cave and Vladimir Gelnovatch

Being able to expand current technology requires knowledge beyond the current technology.

Organizations that depend upon technology in a competitive environment, e.g., those building chips, satellites, rockets, etc., must improve their technology to remain competitive. In a fair market, those who are the winners are generally the most competitive. To win, they must expand their technology to provide improvements for their buyers and beat the competition.

Occasionally, to meet expectations, the leap must be big and the expansion becomes stalled - until someone sees a new approach that makes the leap. Invariably, this requires substantial knowledge of the underlying factors affecting the existing technology, as well as a more general understanding of approaches to dealing with the problem. This requires being able to handle the truth about the shortcomings of the current technology.

But this is what real science is all about - seeking the truth about the underpinnings of the physics and mathematics underlying the technology. As stated by Lord Kelvin and quoted by Anselmo and Ledgard, [1], "When you can measure what you are speaking about, … you know something about it; but when you cannot measure it, … your knowledge is of a meager and unsatisfactory kind …" This implies taking careful measurements of the current approach and exposing the shortcomings.

In some technologies, it is difficult to get people to define - let alone take - measures. In others, measures are taken on a regular schedule. In the latter case, the technology is likely to expand rapidly. Rapid technology expansion leads to the next problem, keeping up with the expansion.

In complex engineering areas, e.g., aeronautical, mechanical and electrical, technology expansion depends upon special people who understand the principles required to expand the current technology. This implies familiarity with measures and tests that demonstrate potential changes to the underlying technology. This goes beyond understanding principles that underlie the current technology.

Those who have been directly involved in expanding a technology to where it currently resides are typically scarce. When they retire, they are hard to replace. Without people behind them - ready to take over, it is likely that further expansion will not occur until others are brought up to speed. And, it is not unusual for such technology to remain unchanged for very long periods, or even deteriorate – see the microwave radio example below. Most important, this depends heavily on continuous measurement just to ensure the desired properties do not deteriorate.

Expanding Education Requirements

As indicated above, being able to expand current technology requires knowledge beyond the current technology. In many high technology areas, this knowledge is scarce - even among those involved with the original technology expansion. When the expansion is due to a major leap, the knowledge requirement expands accordingly. This leads to the dilemma: How does one keep up with the educational requirements necessary for further expansion.

Computer technology is one of the most rapidly expanding technologies today, and has been for many decades. As witnessed by the need for speed and parallel processing technology, it is clearly leveling off. When observing the changes, one sees the need for improved measures and corresponding testing. This lack of understanding has been true in the software field for many decades, [2] and [3]. And because software requirements drive those of hardware, it is becoming true in hardware. A recent article, [4], quoted statements by Hennessy and Patterson, 2017 Turing Award Winners, that the equivalent of Von Neumann's Instruction Set Architecture (ISA) is needed for parallel processors, see also [5] and [6]. Like many other experts, they stated the need for a totally new approach to software, see 'Resistance' papers, [2]. And here, the need for expanded education is obvious and critical in both technologies.

The field of chip design provides an example of meeting educational requirements. Upon receiving a PhD, either in Electrical Engineering or Computer Science, graduates are not prepared to contribute directly to complex computer chip design. This is because the level of complexity that one must deal with takes a considerable amount of time to learn - just to understand what a knowledgeable designer might consider basic. Chip designers are brought up to speed through on-the-job training. Even professors take sabbaticals with major corporations to learn some of the basics that may be taught in a lab, or in a classroom or over the internet. The most significant underlying principle is understanding the testing that must be performed to achieve the ability to meet design constraints, especially under conditions that cause variations in component parameters. This has been referred to as "Worst Case Design."

Application to Microwave Technology

Recent articles describe military radios being jammed by simple jammers from lesser countries, see [7] and [8]. These jammers do not match the real threats to our communication systems, threats that were beat by radios designed in the 1970s-1980s. How could this be?

The software radio was introduced at the turn of the century and presented as a totally new and revolutionary technology. It was supported by major investments in large radio companies doing business with the US DoD. During the next decade, radios were built to minimize the use of non-software approaches. Unfortunately, their designers did not understand key underlying principles, such as the Receiver Operating Characteristic (ROC), a measure of a radio's ability to overcome jamming. These principles are based on microwave theories that provide the ability to overcome complex jamming threats from advanced nations. Lack of this basic knowledge has opened the door to simple threats. Software was interfaced to simple microwave chips and shown to work. But the ROC was not used to test against simple - let alone complex - threats.

The Bottom Line

Of all the principles that must be followed to support expanding technology, the most important is defining the measures to be met and the testing that must be performed to produce the desired measured outcomes. To successfully achieve such technology expansion, one must have people who understand the underlying principles sufficiently to define both the expanded measures and corresponding testing of those measures. This implies having people with a sufficiently expanded knowledge of the underlying principles with which they must deal in order to perform these functions. Unfortunately, as technology expands, it has become difficult for the educational environment to keep up with such high levels of expansion. This issue must be addressed, at least to the extent that the underlying problem is better understood.

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BS Electrical Engineering (computer option), 1960, Penn State University

MS Electrical Engineering/Computer Science, 1963, New York University

PhD Fellowship - Electrical Engineering, 1965-66, Polytechnic Institute of Brooklyn

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Worked on one of the first digital computers - PENNSTAC, Penn State, 1958-1960

Worked on the U.S. Army BASICPAC, First transistor computer, built by Philco, 1960-1962

Project Leader, U.S. Army MINIPAC Computer, One of first transistor computers, 1962-1965

Chairman & CEO: Optimal Systems Research, Inc., 1967-1974

Chairman & CEO: Prediction Systems, Inc., 1974-present;

U.S. Representative, NATO Panel XIII, Data Communications, Brussels, Belgium., 1976-1978

Chairman, U.S. DoD Panel on Software Life-Cycle Management, 1976-1978

Chairman & CEO: Visual Software International, Inc., 2004-present;

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PhD Electrical Engineering Fellowship -, 1967New York University, NY - (Dissertation "DEMON" - An Optimization Algorithm for Microwave Networks)

Various Positions - Electronic Devices / Technology Lab, Army R&D Labs, NJ, - Retired as Lab Director, 1963-1997,

Visiting Professor of Electrical Engineering at the University of Virginia

General Technical Services, Wall, NJ, Program Manager/ Sr. Engineer, 1997-2005

Expert Consultant, TriQuint Semiconductor Corp, Dallas, TX, 2005-2008

Expert Consultant, Prediction Systems, Inc., Spring Lake, NJ

Various Army & U.S. Awards for Outstanding Performance, 1972-1997

Institute of Electrical & Electronic Engineers Fellow Award (1981).

President of Microwave Theory & Techniques Society, IEEE (1989).

Associate Editor of "Microwave Journal" Magazine (1975 - 1995).

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The Urgent Need for a United States Space Force

By Steven L. Kwast

The following is adapted from a speech delivered on November 20, 2019, at Hillsdale College's Allan P. Kirby, Jr. Center for Constitutional Studies and Citizenship in Washington, D.C., as part of the AWC Family Foundation lecture series.

If we do not master space, our nation will become indefensible.

In June 2018, President Trump directed the Department of Defense to "begin the process necessary to establish a space force as the sixth branch of the armed forces." The reason for a space force is simple: space is the strategic high ground from which all future wars will be fought. If we do not master space, our nation will become indefensible.

Since that time, entrenched bureaucrats and military leaders across the Department of Defense, especially in the Air Force, have been resisting the President's directive in every way they can. And this December, although Congress voted to approve a Space Force, it did so while placing restrictions on it—such as that the Space Force be built with existing forces—that will render it largely useless in any future conflicts.

At the heart of the problem is a disagreement about the mission of a Space Force. The Department of Defense envisions a Space Force that continues to perform the task that current space assets perform—supporting wars on the surface of the Earth. The Air Force especially is mired in an outmoded industrial-age mindset. It sees the Space Force as projecting power through air, space, and cyberspace, understood in a way that precludes space beyond our geocentric orbit.

Correspondingly, the Defense Department and Congress think that the Air Force should build the Space Force. So far, this has amounted to the Air Force planning to improve the current Satellite Command incrementally and call it a Space Force. It is not planning to accelerate the new space economy with dual-use technologies. It is not planning to protect the Moon or travel corridors in space to and from resource locations—raw materials worth trillions of dollars are available within a few days' travel from Earth—and other strategic high grounds. It is not planning to place human beings in space to build and protect innovative solutions to the challenges posed by the physical environment. It is not developing means to rescue Americans who may get stranded or lost in space.

In short, the Air Force does not plan to build a Space Force of the kind America needs. In its lack of farsightedness, the Air Force fails to envision landmasses or cities in space to be monitored and defended. Nor does it envision Americans in space whose rights need defending—despite the fact that in the coming years, the number of Americans in space will grow exponentially.

This lack of forward thinking can be put down to human nature and organizational behavior: people in bureaucratic settings tend to build what they have built in the past and defend what they have defended in the past.

We have seen this kind of shortsightedness before. In the 1920s, the airplane and the tank were developed by the Army. Even the most respected military leaders at the time, Generals John J. Pershing and Douglas MacArthur, opposed independent development of the airplane and the tank because they saw them as subservient to the infantry. Infantry had always been the key to military success, and the generals' reputations were built on that fact. For them, slow and cautious steps were prudent, and revolutionary steps were reckless.

These generals defended the status quo even to the point of court-martialing General Billy Mitchell, who had the audacity to say that the airplane was going to change the character of war and needed to be developed independently in order to achieve its full potential.

This type of status quo thinking in the 1920s resulted in needless loss of life during World War II. More airmen were lost in the European theater alone than were marines in the entire war. And countless soldiers died in America's Sherman tanks, whose shells would bounce off Germany's Panzer and Tiger tanks. Frontal infantry attacks were launched in order to get Sherman tanks behind the German tanks to fire at close range—the only range at which they could be effective. Many more of our fighting men would have come home and the war would have been shorter if American generals had taken a revolutionary approach to tanks and planes from the beginning.

On the other side, consider that a major reason we won World War II when we did was the revolutionary—not slow and cautious—approach we took to developing nuclear weapons with the Manhattan Project. Likewise today, instead of blindly following the bureaucrats and generals in the Defense Department, we need a Manhattan-type project in order to develop the kind of Space Force needed to meet future military challenges.

* * *

America's greatest competitor for the high ground of space is Communist China, which is already fully engaged in building effective space capabilities. America is not, and unless it gets off the mark soon, China will dominate the economy and domain of space.

Our Air Force today can be compared to a race car that has been winning every race for the last 70 years by averaging 100 miles an hour. We are still in the lead, but China is gaining and averaging 150 miles an hour. The Chinese will quickly surpass us if we do nothing—and when they do, they will set up roadblocks that will make catching up difficult if not impossible.

Today, while America is building lighthouses and listening stations that can see and hear what is happening in space, China is building battleships and destroyers that can move fast and strike hard—the equivalent of a Navy in space. China is winning the space race not because it makes better equipment, but because it has a superior strategy. The Chinese are open about their plan to become the dominant power in space by 2049, the centennial of the end of the Communist Chinese Revolution and of the founding of the People's Republic of China under Mao Zedong.

If China stays on its current path, it will deploy nuclear propulsion technology and solar power stations in space within ten years. This will give it the ability to beam clean energy to anyone on Earth—and the power to disable any portion of the American power grid and paralyze our military anywhere on the planet. America is developing no tools to defeat such a strategy, despite the fact that we are spending billions of dollars on exquisite 20th century military equipment.

Over the past two centuries, we have seen that technology drives economic prosperity and that economic prosperity is essential to sustaining national security. China's plan is to profit from the multi-trillion dollar space marketplace while simultaneously acquiring global domination. We are capable of forestalling China's plan, but only if we begin to build a Space Force soon and on the right plan. To do this, we must first understand China's strategic goal, which is to dominate the sectors of economic growth that historically have held the key to

world power: transportation, energy, information, and manufacturing.

Space presents unique economic opportunities because space technology operates on network principles. A network can deliver power, information, or goods from one node to many nodes at a fraction of the increase in cost per customer, as compared to the linear system on which most of our land-based economies are modeled. Compare the cost of sending 100 letters to the cost of sending 100 emails. A space infrastructure, by its nature, is a network system—and these types of systems will always translate to economic advantage. The first nation to build such an infrastructure will dominate the global economy of the 21st century and beyond.

China is developing the kind of technologies required to do so: hypersonic missiles and aircraft, 5G telecommunications, artificial intelligence, 3D printing, quantum computing, and robotics. Last January, China landed the Chang'e 4 spacecraft on the far side of the Moon. The mission provided valuable knowledge in terms of commercial and military applications. At one time this sort of mission was not beyond U.S. capabilities, but it is today, and it shows a commitment to space that we lack. To be sure, China has yet to achieve the ability to launch a manned spacecraft, but this is also a capability that we no longer possess—the U.S. relies on Russian rocketry to man and resupply the International Space Station.

China's goal is to have the capability to shut down America's computer systems and electrical grids at any time or place of its choosing, using directed energy and 5G technologies from space. Space is the strategic high ground from which China will seek to gain control of our media, businesses, land, debt, and markets. Although American companies are working on these new technologies, they are doing so in separate silos. Real power lies in tethering or combining the technologies together in space to achieve a dominant economic advantage.

If we choose to compete with China in space, we have a cultural advantage. We are more creative and innovative than China, because we have an open society and a free market. But we must be ambitious and act soon.

With the right vision and strategy for space, America can develop the means to:

- Deliver unlimited, clean, affordable energy to every human on the planet without power lines or terrestrial power plants.
- Provide fresh water for every human without the need for aquifers or pipes.
- Build a new low-cost internet that is designed to be secure so that every human can connect, share, and learn with assured privacy and data safety.
- Defend Earth against small asteroids like the one that hit Russia in 2013.
- Develop a deterrence capability that will render ICBMs and nuclear weapons useless relics of the past.
- Revolutionize manufacturing by acquiring and deploying resources from space and in space.
- Provide a shelter in space where we can protect and preserve people, seeds, and life-saving medicines, so humanity can recover from any unexpected contamination, illness, or disaster.
- Design defense capabilities to preserve our economy, our people, and our sovereignty, and to allow

our allies to defend themselves instead of sacrificing American lives.
- Reduce the loss of life and property due to natural disasters by managing the eyes of hurricanes and the funnels of tornados with energy from space.

Some of this may sound like science fiction, but technologies exist to achieve these goals if we can summon the will to act. Status quo thinkers in the Defense Department say that these goals are futuristic and unaffordable. But recall that The New York Times, relying on the opinions of leading scientists and engineers, predicted that airplanes were "one million to ten million years" off—a prediction made less than three months before the Wright Brothers made history at Kitty Hawk.

Engineers at countless private companies outside the military-industrial complex will assure you that we can achieve these goals, and soon. As for those who say it's unaffordable, look to the automotive, aerospace, and tech industries, all of whose capabilities were built from profits earned in markets that valued their usefulness. The same will hold true with the marketplace of space.

* * *

Why the urgency? Because being first in space is imperative. Space will be a multi-trillion dollar market that will disproportionately benefit the first nation to build a vibrant space infrastructure and define the principles and rules of the marketplace of space. If America is first, its principles—the rule of law and the protection of liberty—will be in a position to prevail. If Communist China is first, the marketplace will look much different.

Americans must not allow themselves to be lulled into a false sense of security by reassurance from the military-industrial complex that we have the best military in the world, with the finest equipment ever made. At present this is accurate, but a superior strategy in space will render our fine equipment obsolete in short order.

To develop a proper and winning Space Force, the President and Congress should immediately enact four simple measures:

- Congress should assign the Space Force the mission to defend commerce in space and define Cis-Lunar space (Earth to Moon) as an area of responsibility in the Unified Command Plan.
- Congress should give the Space Force complete independence from the U.S. Air Force so that funds are not diverted from the former to the latter, and so that the Space Force isn't developed as a mere support function for air power.
- The President should issue an executive order protecting the space industry from China's predatory practices.
- The President should promote policies and strategies to maximize the contribution of the private sector, such as directing the Space Development Agency to partner with private companies to develop new space capabilities.

If development of the Space Force continues along the lines of what is currently planned, America will lose the strategic space race to China. This must not be allowed to happen. Our elected leaders must take action now.

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Steven L. Kwast is a retired Air Force general and former commander of the Air Education and Training Command at Joint Base San Antonio-Randolph. A graduate of the United States Air Force Academy with a degree in astronautical engineering, he holds a master's degree in public policy from Harvard's Kennedy School of Government. He is a past president of the Air Force's Air University in Montgomery, Alabama, and a former fighter pilot with extensive combat and command experience. He is the author of the study, "Fast Space: Leveraging Ultra Low-Cost Space Access for 21st Century Challenges."

Software-Defined Radio: Over 50 MHz of Bandwidth

Avid Systems, Inc. announced the AVS-4000 Software Defined Radio. The AVS-4000 is a USB type C radio that has independent transmit and receive capability from 1 MHz to 6 GHz with over 50 MHz of bandwidth. The AVS-4000 uses Vita 49 transport and includes accurate time stamping. The AVS-4000 is packaged into a rugged 2.5"X3.5" aluminum chassis, draws 2.5 Watts typical and weighs 4.5 ounces. The AVS-4000 has an integrated GPS receiver that is used to discipline the local oscillator, provide timing and location. In addition, the AVS-4000 has an external 1PPS and 10 MHz inputs. The AVS-4000 has 5 selectable RX and TX preselection filters.

Avid Systems, Inc. is a leading designer and manufacturer of high speed signal processing, communications and electronic warfare systems. Utilizing its core competencies in the areas of high speed printed circuit board design, FPGA based signal processing, embedded software development, communications algorithm development and RF expertise; Avid Systems has been able to bring many innovative products to both the military and commercial markets.

Avid specializes in the design of software radio demodulators and high speed interfaces that span from the antenna to digital bit streams. Avid also provides some of the most innovative signal processing platforms for the electronic warfare and electronic counter measures markets.

The multi-disciplined team of engineers at Avid applies their extensive experience to develop complete systems for our customers. From the custom hardware and FPGA firmware to the software that controls it all the way to the graphical user interface that brings a system to life. Avid System has all the ingredients to bring unparalleled performance to the next generation of communication and signal processing systems.

Avid Systems designs state of the art integrated systems for a variety of markets including:

- Cellular Infrastructure
- Wireless Communications
- Signals Intelligence SIGINT
- Electronic Warfare
- Electronic Counter Measures

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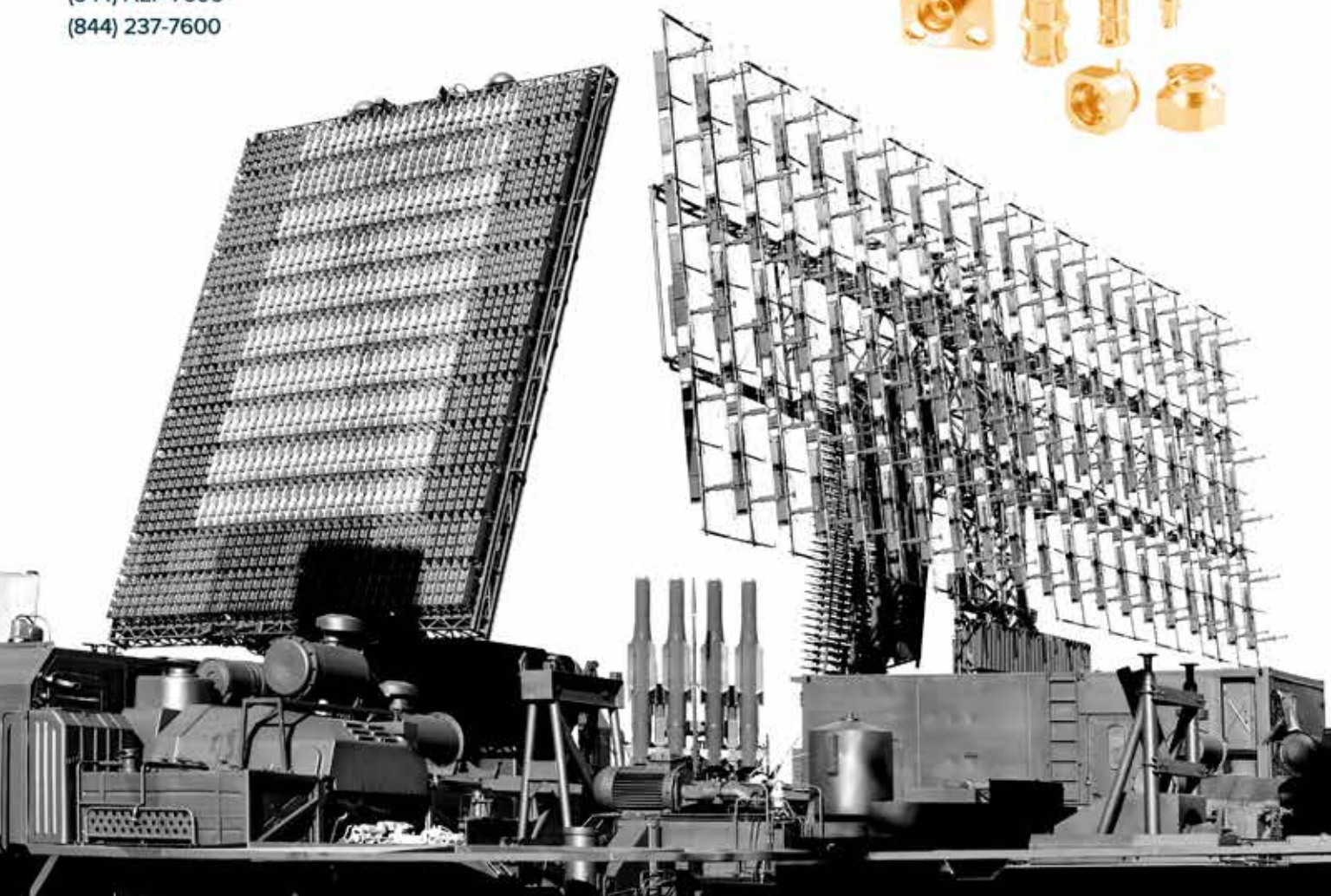


18 GHz Low-Loss Cables Well Suited for Test Environments

L-com, an Infinite Electronics brand and a preferred manufacturer of wired and wireless connectivity products, announced today that it has launched a new series of flexible 18 GHz LL142 and LL335i low-loss cables. These new cable assemblies are terminated with durable stainless steel connectors and are well suited for test environments where a rugged, phase stable cable assembly is required.

The new low-loss cables utilize a 0.195 & 0.300 inch diameter coax with an expanded dielectric which results in 80% and 83% Velocity of Propagation (VoP) performance up to 18 GHz. These coaxial cable assemblies feature LL142 and LL335i coax cable, which operates at higher power with improved phase stability. The triple shielded flexible coax provides excellent shielding effectiveness greater than 95 dB and VSWR of less than 1.35:1. A heavy duty boot and FEP jacket improve strain relief and allow for a minimum bend radius of .945 and 1.5 inches which adds to the durability of these cable assemblies.

The LL142 and LL335i test cables are offered with male-straight and right-angle versions of Type-N, SMA, and TNC connectors as well as female bulkhead versions for each connector series. These new cables can be ordered in custom lengths and are also available in standard lengths from 1 Ft to 10 Ft. Each assembly is 100% continuity, Hi-Pot and RF tested prior to shipment.

"These new cables offer our customers a high performance solution when requiring a low-loss cable assembly. The smaller diameter of these new 18 GHz coax cables provides a tighter bend radius while offering low loss and higher power when compared to solid dielectric cables," said Steve Ellis, Product Line Manager.

L-com, a leading manufacturer of wired and wireless connectivity products, offers a wide range of solutions and unrivaled customer service for the electronics and data communications industries. The company's product portfolio includes cable assemblies, connectors, adapters, antennas, enclosures, surge protectors and more. L-com is headquartered in North Andover, Mass., is ISO 9001: 2015 certified and many of its products are UL® recognized. L-com is an Infinite Electronics brand.

L-com
l-com.com

Product Highlights

Continuing Education: Your Key to Success

Studies reveal that within each 3-5 year period, one-half of an engineer's technical knowledge becomes obsolete. New graduates soon discover that university education provides only the foundation of knowledge that is realistically needed to perform well in the industry. Continued education is a must for survival in today's competitive market. Application of modern computer-aided engineering to RF and microwave circuit and system design is vital to manufacturing products with high quality and yield. Modernization of the design laboratory and production floor is critical to maintaining a competitive edge.

A well-planned continuing education program will enable your company to meet these goals. As a recognized international leader in continuing education, Besser Associates is dedicated to serving the needs of RF and wireless professionals.

Besser Associates
The Worldwide Leader in RF and Wireless Training

The Latest Tools and Techniques are Featured

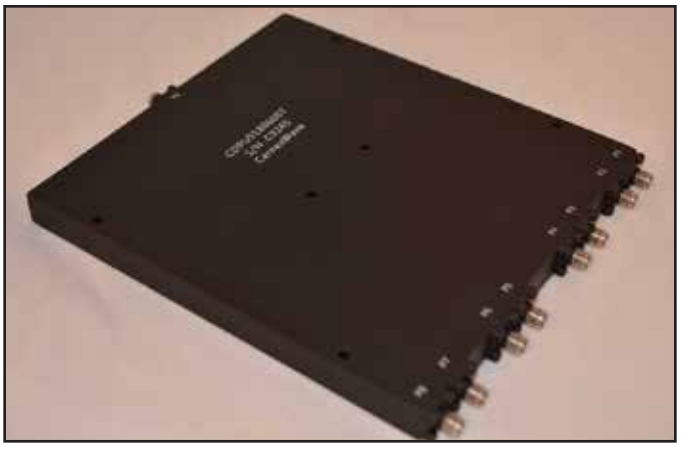
Our instruction combines theory and practice into one complete and "user-friendly" package that attendees may apply on the job immediately. Whether it's reviewing basics for the inexperienced, or the latest CAD techniques for more seasoned designers, Besser Associates' courses offer meaningful education for every participant.

Our Instructors

Besser Associates instructors are recognized experts in their field. They are top-notch design engineers, skilled in both technology and the art of instructing. With an average of more than 20 years of education and practical first-hand experience, our instructors bring a wealth of training and information to the courses they present. Equally important, our trainers communicate effectively; they know how to reach both novice and veteran professionals.

Besser Associates
besserassociates.com

Product Highlights



Power Divider/Combiner

Cernexwave's CDP series of coaxial power dividers/combiners are offered in a multitude of different bands to cover frequencies from DC to 110 GHz. They feature low insertion loss, low VSWR, and high isolation in 2-way to 32-way configurations.

CernexWave designs, develops and produces high quality, reliable products up to 1000Ghz for both active and passive components, waveguides products, ferrite products, antenna products, sub-systems for the commercial markets to the requirements of the ISO9001:2015 international standards with no exclusions taken.

The markets in which CernexWave participate include wireless telecommunications, aerospace, defense and the fiber optic communications industry.

Cernexwave
cernexwave.com

Power Divider/Combiner

Cernexwave's CDPW series waveguide power dividers/combiners are offered in more than a dozen waveguide bands to cover frequencies from 8 to 110 GHz. They feature low insertion loss, low VSWR, and high isolation in 2-way, 4-way, and 8-way configurations.

CernexWave designs, develops and produces high quality, reliable products up to 1000Ghz for both active and passive components, waveguides products, ferrite products, antenna products, sub-systems for the commercial markets to the requirements of the ISO9001:2015 international standards with no exclusions taken.

The markets in which CernexWave participate include wireless telecommunications, aerospace, defense and the fiber optic communications industry.

Cernexwave
cernexwave.com

Keeping it down *above 30 GHz...*

Loss is critical in millimeter wave applications, and **IW** manufactures the range of **lowest attenuation/phase stable** coax to maintain your signal's integrity. From **K-band** to **E-band**, our family of coax was developed using **IW's proprietary EPTFE lamination** process to ensure the lowest cable loss across the mmWave spectrum:

Cable Type	Operating Freq. (GHz)	Atten. (max) dB/ft. dB/m
1801	30	0.49 / 1.62
1701	38	0.57 / 1.88
1571	40	0.64 / 2.09
1501	40	0.75 / 2.46
1401	50	1.02 / 3.34
1251	70	2.14 / 7.02
0471	110	4.95 / 16.23

With a broad selection of interconnects including **3.5mm**, **2.92mm**, **2.4mm**, **1.85mm, SMP and SMPM interfaces**, plus jacketing and armoring options, **IW Microwave** delivers reliable **custom cable assembly solutions** to suit a diverse range of applications from **satellite communications systems** to **5G test**.

Talk to us or your local representative about how you can ***get connected*** at **millimeter wave frequencies** with the **lowest attenuation cable** available!

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Product Highlights

Type N Female Bulkhead Precision Adapters

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- VSWR: 1.15:1 Max @ 18 GHz (Typical VSWR 1.05:1 through 18 GHz)
- O-Ring seal captivated within the flange body groove
- Materials: Passivated 303 Stainless Steel or Nickel Plated Brass available
- Dielectrics Fluorocarbon (PTFE)
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SGMC Microwave
sgmcmicrowave.com

Custom Capacitor Assemblies

Passive Plus, Inc. (PPI) offers Custom Capacitor Assemblies for high power requirements. Typical assemblies are configured in series and/or parallel combinations, producing higher voltage/current handling capabilities, extended capacitance range and tighter tolerances. PPI works with requesting engineers to determine best assembly for their applications.

Passive Plus
passiveplus.com

Product Highlights

VNA Test Cables

Eravant released a new line of cost effective, instrumentation grade, flexible, armored VNA test cables in either 1.85 mm, 2.4 mm, 2.92 mm, or 3.5 mm with an NMD female and a female or NMD male connector. The coaxial cables are especially designed and manufactured for VNA applications with greater than 10,000 connections. The cable utilizes the highest quality test instrumentation grade cable and a precision manufacturing process to guarantee superior microwave performance and mechanical durability. Impedance: 50 ohms. The models offered can form a VNA test cable pair for custom test set applications.

Eravant
eravant.com

Pocket Signal Source

Saelig Company, Inc. announces the availability of Triarchy Technologies' VSG2G5C RF Vector Signal Generator - a cost-effective pocketable USB-connected RF signal source with capabilities that provide standalone and PC-controlled functions comparable to full-size analog RF signal generators. Offering frequencies from 100Hz to 1MHz (low-band) and 100MHz to 2.5GHz (RF Band) with a frequency resolution of 1Hz, this handy unit's features include frequency sweep, frequency hopping using I&Q modulation, and arbitrary signal generation.

Saelig
saelig.com

Product Highlights

6 dB Coupler

Werbel Microwave model C-0218-06-001 is a 6 dB coupler covering 2 - 18GHz with SMA female connectors. Made in USA.

Werbel Microwave LLC designs and manufactures power dividers, directional couplers and other assemblies for use in communications and measurement applications. The products offered by Werbel Microwave LLC are of our own design, so we may support our projects indefinitely.

Werbel Microwave
werbelmicrowave.com

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Product Highlights

Parabolic Antenna

KP Performance Antennas released a new series of ProLine 11 GHz parabolic antennas that are ideal for high-density, point-to-point backhaul applications or client-premises.

KP's new high-performance ProLine parabolic antennas operate in the 10.7 GHz to 11.7 GHz frequency range. They are offered in 2-foot and 3-foot diameters and deliver gain performance of 34.4 dBi and 39 dBi respectively. These antennas are engineered to suppress side-lobes and back-lobes and are excellent at rejecting interference. They feature rugged construction with a patented 6-point mounting connection for set-and-forget installation.

KP Performance Antennas
kpperformance.com

Monopulse Cassegrain Antenna

Model SAY-3433632750-28-U5-MP is a Monopulse Cassegrain antenna that operates from 34 to 36 GHz, and has a half power beamwidth of 5.0 degrees. The antenna offers a nominal gain of 27 dBi in the Sum Port, and 21 dBi in the H-Port and V-Port. The antenna has three WR-28 waveguides with UG-599/U compatible flanges, which are designated as Sum Port, V-Port, and H-Port. The antenna can support linear polarized waveforms and is designed and manufactured for indoor applications.

Eravant
eravant.com

Product Highlights

VNA Extension Modules

OML offers three configurations of the VNA Frequency Extension Module to expand your existing Keysight or Anritsu vector network analyzer to millimeter frequencies: T/R, T, and S. Depending on your S-parameter needs, refer to the following block diagrams to configure our module(s) with your existing VNA test port(s). With flexible ordering configurations, we can satisfy your preferences for economical and high performance needs.

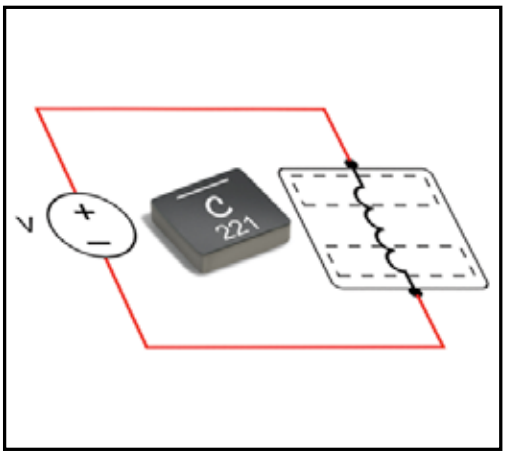
OML
omlinc.com

mmWave Solution

Analog Devices introduced a solution for millimeter wave (mmWave) 5G with the highest available level of integration to reduce design requirements and complexity in the next generation of cellular network infrastructure. The new mmWave 5G chipset includes the 16-channel ADMV4821 dual/single polarization beamformer IC, 16-channel ADMV4801 single-polarization beamformer IC and the ADMV1017 mmWave UDC.

Analog Devices
analog.com

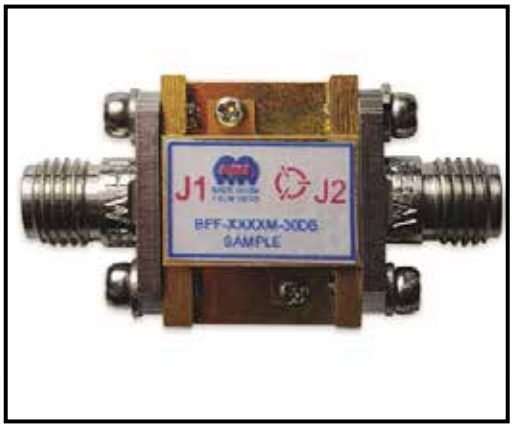
Product Highlights



High Voltage Molded Power Inductors

Coilcraft has expanded its market-proven XEL Family of high-performance, molded power inductors to include three new higher-voltage series: the XEL401xV, XEL4020V and XEL4030V. All three offer operating voltage ratings of 120 V, 50% higher than the standard versions. They also offer exceptionally low DC resistance and ultra-low AC losses for greater power converter efficiency at high frequencies (2 to 5+ MHz) and high ripple current.

Coilcraft
coilcraft.com

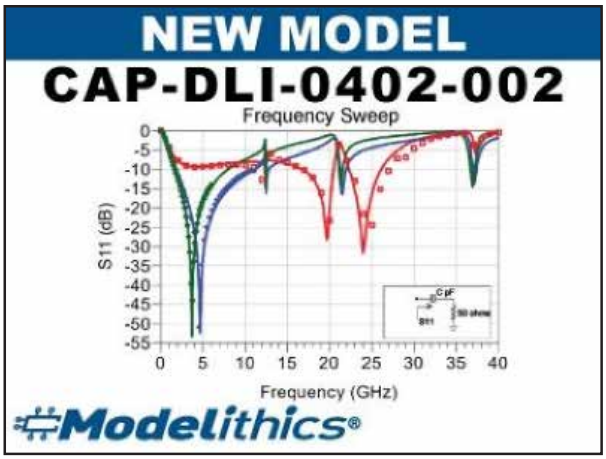


Bandpass Filter

PMI Model No. BPF-4829M-30DB is a 4829 MHz Band Pass Filter and specifications include 3 dB Bandwidth of 210 MHz Typ, Rejection -30 dBc Min. @ <4429 MHz & >5229 MHz, VSWR Over 90% of the Passband of 2.0:1 Max and 3 dB Passband Insertion Loss of 8 dB Max. Unit is ~1.0" x 0.7' x 0.29" and has SMA female connectors.

Planar Monolithics Industries
pmi-rf.com

Product Highlights



New Modelithics Microwave Global Model

Modelithics has introduced a new equivalent circuit-based scalable Microwave Global Model for Knowles DLI C04UL surface mount chip capacitor series. The model is validated up to 40 GHz and features substrate, pad and part value scaling over the full range of the capacitor series, 0.3 to 10 pF. Knowles is a Cooperative MVP, and information about available Modelithics models for Knowles parts can be found on the MVP landing page: Modelithics.com/MVP/Knowles.

Modelithics
modelithics.com

TEMPEST PC: Secure Operation

Equipto Electronics' new TEMPEST PC concept allows customers to choose an up-to-date ATX motherboard, or an HP or Dell i7 PC repackaged for the ultimate in secure operation. The system delivered will be certified to the strictest standard in the industry for devices operating in NATO Zone 0 environment, the NATO SDIP-27 Level A. And because the base PC is a commercial product, the package is very cost-effective.

Each system is fully customizable and typical features include (but not limited to) an Intel i7 processor, ATX motherboard to your specifications, 32 GB memory, storage options, latest Windows operating system, USB 3.0 ports, a card reader for extra security, fiber port options, DB9/DB37 connectors, and a high-performance power line filter. The system measures: 18.50" high x 6.65" wide x 17.50" deep.

Equipto Electronics
equiptoelec.com

Product Showcase

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Mini-Circuits PRODUCT SPOTLIGHT

MMIC Amp Provides Positive Gain Slope to 18 GHz

Mini-Circuits' model AVA-183P+ is a wideband InGaAs E-PHEMT MMIC gain-block amplifier in a low-profile package for applications from 0.5 to 18.0 GHz. Measuring just 3 × 3 × 0.89 mm, the surface-mount amplifier is well suited for dense circuit layouts, including in a wide range of wireless designs such as Wi-Fi circuits and WLANs. It features a positive gain slope with frequency, with typical gain of 6.8 dB at 0.5 GHz, rising to 8.1 dB at 10.0 GHz and 10.8 dB at 18.0 GHz. Well matched to 50 Ω, the RoHS-compliant amplifier delivers typical output power at 1-dB compression of +10.9 at 0.5 GHz, +11.7 dBm at 10 GHz, and +11.8 dBm at 18 GHz with well-controlled noise figure of typically 7.5 dB at 0.5 GHz, 4.8 dB at 10.0 GHz, and 5.0 dB at 18.0 GHz. The amplifier draws typical current of 46.3 mA from a single +5-V dc supply and has an operating temperature range of -55 to +100°C.

2-dB Attenuator Pads DC to 65 GHz

Mini-Circuits' model BW-E2-1W653+ 2-dB attenuator is one member of a family of fixed attenuators that includes 1-, 3-, 6-, 10-, and 20-dB coaxial units for broadband applications from DC to 65 GHz. As with other values, the 2-dB model delivers high accuracy, providing typical attenuation tightly maintained close to 2 dB across the frequency range: 1.7 dB from DC to 26.5 GHz, 2.1 dB from 26.5 to 40.0 GHz, 2.2 dB from 40 to 60 GHz, and 2.6 dB from 60 to 65 GHz. The RoHS-compliant attenuator handles power levels to 1 W and is well matched to 50 Ω, achieving typical VSWR of 1.09:1 from DC to 26.5 GHz, 1.13:1 from 26.5 to 50.0 GHz, and 1.12:11 from 50 to 65 GHz. The 2-dB model includes a durable 1.85-mm female and 1.85-mm male passivated-stainless-steel coaxial connectors. Ideal for test and measurement applications, the coaxial attenuators are 0.88 in. (22.2-mm) long and 0.31 in. (8.0 mm) in diameter and designed for operating temperatures from -55 to +100°C.

Right-Angle Adapter Connects DC to 40 GHz

Mini-Circuits' model KMR-24F+ adapter makes it possible to mate two different coaxial connectors across a wide frequency range, using a right-angle 2.4-mm female port and a 2.92-mm male port. The coaxial adapter features extremely low loss, with typical insertion loss of 0.16 dB from DC to 40 GHz. It is well suited for systems-integration and test-and-measurement applications and is well matched to 50-Ω operating environments, with typical 1.09:1 VSWR across the full frequency range. The rugged RoHS-compliant coaxial adapter is constructed of a stainless-steel body with passivated and gold-plated beryllium copper center contacts and designed for operating temperatures from -55 to +100°C.

Flexible Cables Fit Tight Spots to 40 GHz

Mini-Circuits' model FL086-3KM+ coaxial cable is a 3-in.-long assembly with 2.92-mm male coaxial connectors for high-power, low-loss applications from DC to 40 GHz; other, custom lengths are also available. The flexible cable assemblies feature tight, 6-mm bend radius for fitting the smallest spots and providing ready replacements for custom-bent 0.086-in.-diameter. The RoHS-compliant cable assemblies meet MIL-STD-348 connector interface and can serve a variety of wideband, high-power commercial and military applications. Typical insertion loss ranges from 0.1 dB from DC to 6 GHz, 0.2 dB from 6 to 18 GHz, 0.3 dB from 18.0 to 26.5 GHz, and 0.4 dB from 26.5 to 40.0 GHz. Typical return loss is 31 dB from DC to 18 GHz and 29 dB from 18 to 40 GHz. Typical power-handling capability is 198 W at 0.5 GHz, 45 W at 10 GHz, 33 W at 18 GHz, and 13 W at 40 GHz. The high-performance cable assemblies are constructed with low-loss PTFE dielectric and tin-soaked copper braid outer shield to minimize signal leakage and have an operating temperature range of -55 to +105°C.

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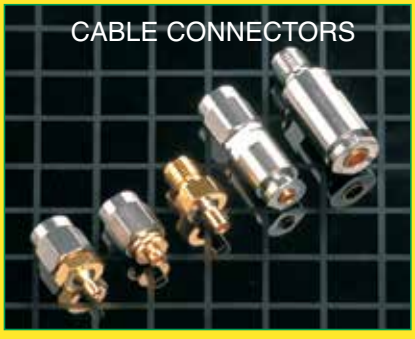

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