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MICROWAVE engineering europe

Editor In Chief
Jean-Pierre Joosting
Tel. +44-7800 548-133
email: jean-pierre.joosting@eetimes.be

Advertising Production
Lydia Gijsegom
Tel +32 (0) 2 740 00 50
email: lydia.gijsegom@eetimes.be

Circulation & Finance
Luc Desimpel
Tel +32 (0) 2 740 0055
email: luc.desimpel@eetimes.be

Art Manager
Jean-Paul Speliers
Tel +32 (0)2 740 0052
email: jean-paul.speliers@eetimes.be

Accounting
Ricardo Pinto Ferreira
Tel +32 (0)2 740 0051
email: financial@eetimes.be

Publisher
Andre Rousselot
Tel +32 (0)2 740 0053
email: andre.rousselot@eetimes.be

European Business Press SA
533 Chaussée de Louvain
1380 Lasne - Belgium
Tel: +32 (0)2 740 00 50
Fax: +32 (0)2 740 00 59
www.microwave-eetimes.com
VAT Registration: BE 461.357.437
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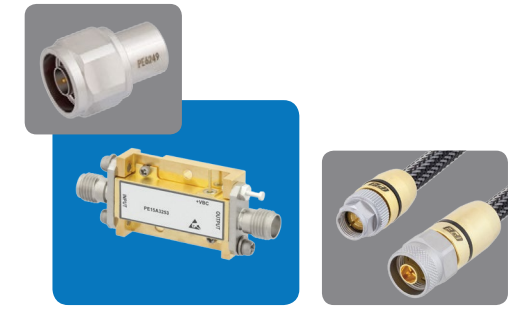

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Visible light communications is growing fast and could revolutionise communications

Visible Light Communication (VLC) is growing rapidly as a market and is no longer the sole domain of researchers, though research will be key to developing the technology to reach the point of mass adoption, which could be sooner than previously thought.

Market research firm Global Market Insights has published a report that contends that the VLC market valued around $300 million in 2014 is expected to exceed $10 billion by 2023, representing a growth rate of 90% CAGR over the next six years!

Manufacturers considered in the report include Axrtek, Outstanding Technology, LightPointe Communications, Koninklijke Philips, Wireless Excellence, Lightbee, Nakagawa Laboratories, Casio Computer, Fraunhofer Heinrich, ByteLight, PureLifi Ltd, LVX System, Gallium Lighting LLC, Supreme Architecture, Fsona Networks, and General Electric Company among others.

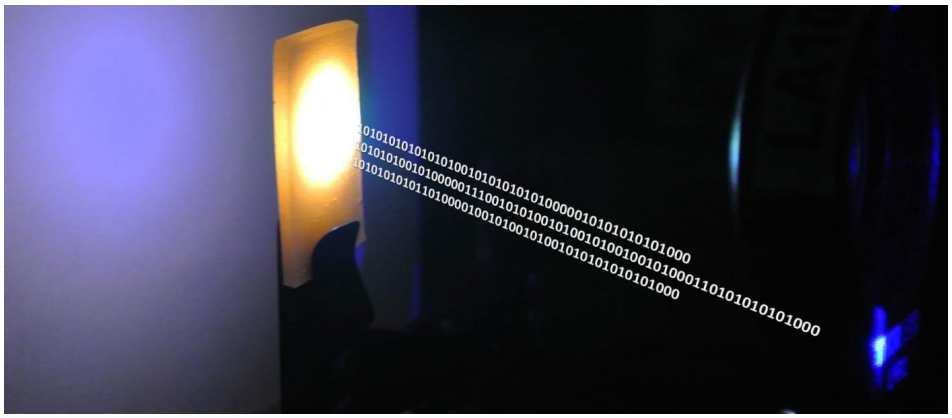
A major factor contributing to the growth of this market is the availability of a new area of bandwidth (visible light) for communications. However, the firm suggests that lack of standardisation and complexity in simultaneous data transmit and receive within the same module, however, could hamper demand.

Though VLC or Li-Fi are not threats to Wi-Fi at the moment, the rapid growth of this market could in the end replace Wi-Fi. One could also suggest that the differences here are really about available bandwidth as well as interference and security issues implying that the natural evolutionary path for Wi-Fi is towards Li-Fi.

Earlier this year Grand View Research published a report where they predicted the global VLC/Li-Fi market to reach $101.30 billion by 2024, boosted by increasing concerns over cyber security.

The firm contends that the growing need of green technology with low power consumption is encouraging the development of advanced communication systems and VLC is expected to grab a substantial portion of the Wi-Fi industry in the near future.

One key area of research is to increase the data rate in VLC systems,



A nanocrystal-based material converts blue laser emission to white light for combined illumination and data communication. Image courtesy of KAUST.

currently limited by the LEDs as the primary component needed to produce white light. LEDs that produce white light are usually fabricated by combining a diode that emits blue light with phosphorous that turns some of this radiation into red and green light. However, this conversion process is not fast enough to match the speed at which the LED can be switched on and off – limiting speed to about one hundred million bits per second.

Instead KAUST Professor of Electrical Engineering Boon Ooi, Associate Professor Osman Bakr and their colleagues developed a nanocrystalline material that rapidly makes white light out of blue laser light overcoming the data rate limitations of using LEDs in VLC. This nanocrystal-based converter enables data rates that are around 40x faster.

The team created nanocrystals of cesium lead bromide that were roughly eight nanometers in size using a simple and cost-effective solution-based method that incorporated a conventional nitride phosphor. When illuminated by a blue laser light, the nanocrystals emitted green light while the nitride emitted red light. Together, these combined to create a warm white light.

The researchers characterized the optical properties of their material using a technique known as femtosecond transient spectroscopy. They were able to show that the optical processes in cesium lead bromide nanocrystals occur on a time-scale of roughly seven nanoseconds. This meant they could modulate the optical emission at a frequency of 491 MHz, 40 times faster than is possible using phosphorus, and transmit data at a rate of two billion bits per second.

"The rapid response is partly due to the size of the crystals," said Bakr. "Spatial confinement makes it more likely that the electron will recombine with a hole and emit a photon."

Importantly, the white light generated using their perovskite nanostructures was of a quality comparable to present LED technology.

"We believe that white light generated using semiconductor lasers will one day replace the LED white-light bulbs for energy-efficient lighting," said Ooi.

To summarise, VLC is potentially a game changer, especially if some of the technical challenges can be overcome. As volumes pick up costs should drop even for systems based on semiconductor lasers. The large available bandwidth, as well as cybersecurity and interference benefits of the technology should enable a massive market in five to ten years. VLC could be a key enabler of 5G and its eventual roll out by enable massive amounts of data to offloaded from the network, much like the role of Wi-Fi in todays 3G and 4G networks.

www.globalinsights.com
www.grandviewresearch.com
http://kaust.edu.sa

By Jean-Pierre Joosting, Editor, MWEE

ADI buys cybersecurity capabilities

Analog Devices, Inc., (ADI) has acquired the Cyber Security Solutions business of Sypris Electronics LLC, which is well-known as a leader in secure system and software products and technology, enhancing and broadening its portfolio of system hardware and software-based cryptographic technologies.

For more than 50 years, Sypris has built a proven track record of delivering high-assurance information security services to the world's most demanding customers, including military and government organizations.

With this transaction, ADI enhances its aerospace and defense capabilities in the area of secure radio communications, bolsters its portfolio of system hardware and software-based cryptographic technologies, and adds a cybersecurity software and services business that supports our ability to offer more comprehensive high-performance analog solutions across multiple market segments such as Internet of Things (IoT), industrial, automotive, and more.

www.analog.com/iot

Bluetooth LE IP advances hearing aid performance

Designer and supplier of DSP and wireless IP for SoCs, CEVA, has disclosed that hearing aid maker Oticon has licensed its Bluetooth Low Energy technology. Oticon has developed technology it calls BrainHearing, and applies CEVA's RivieraWaves Bluetooth technology to implement direct streaming between its Oticon Opn hearing aid and smartphones, DTVs and other devices.

Oticon Opn combines technologies to "help people with hearing loss hear better, with less effort and better recall" including the innovative TwinLink technology which incorporates both binaural processing and direct connectivity into a single hearing aid design. This combination of binaural processing and 2.4 GHz Bluetooth connectivity is developed by Oticon as a dedicated hearing aid solution and allows the Opn hearing aid to directly connect to external Bluetooth-enabled devices, including smartphones and TVs.

"Bluetooth low energy is a critical, differentiating feature of our Opn hearing aid, allowing our customers to directly connect and stream audio between their Bluetooth-enabled devices for a significantly enhanced user experience," said Finn Möhring, VP of R&D at Oticon.

The IP platforms consist of a hardware baseband controller, plus a software protocol stack. For Bluetooth Low Energy, this protocol stack encompasses the Link Layer up to the GAP/GATT plus a comprehensive set of Services and Profiles. For Bluetooth Dual Mode, this protocol stack presents an industry standard HCI interface. A flexible radio interface allows the platform to be deployed with either RivieraWaves RF or various partners' RF IP, enabling optimal selection of foundry and process node.

www.ceva-dsp.com

Radar systems market growing

The latest report from Markets and Markets expects the Radar Systems Market to grow from USD 20.29 Billion in 2016 to USD 26.37 Billion by 2021, at a CAGR of 5.39% from 2016 to 2021.

Factors, such as increased usage of radar systems in unmanned vehicles and homeland security, are expected to drive the growth of the radar systems market.

In 2016, the pulsed radar segment led the radar systems market. This growth can be attributed to the fact that pulsed radar systems aid in efficient and accurate object detection and estimation of its range.

Based on application, the radar systems market has been segmented into defense and commercial. The report shows that the commercial segment is expected to lead the radar systems market, which can be mainly attributed to the increasing demand for radars across various industries, such as automotive and oil and gas.

www.marketsandmarkets.com

Chaos could secure and enhance wireless communications

A team of researchers at the Xian University of Technology in China and the University of Aberdeen in the United Kingdom have demonstrated that chaos can, in fact, be used to transmit information over a wireless physical channel offering wide-ranging advantages from enhanced communications security.

Wireless communication is the fastest growing segment of the communication industry. But the physical constraints of wireless physical media, such as multipath propagation, complex ambient noises and interference, prevent quick transmission of information and at a low error rate.

Chaotic signals are aperiodic, irregular, broadband spectrum, easy to generate and difficult to predict over time, making them desirable for communication, sonar and radar applications. While much of the previous research focused on the use of chaos in conventional wired communications, H.P. Ren at the Xian University of Technology in China and a team of researchers sought to demonstrate numerically and experimentally that chaotic systems can be used to create a reliable and efficient wireless communication system.

"We showed that the information transmitted over a wireless channel in a chaotic signal is unaltered even though the received chaotic communication signal is severely distorted by the wireless channel constraints," Ren said. "We also demonstrated that it can be decoded to provide an efficient framework for the modern communication systems."

The research team ran into a pleasant surprise when they found that the chaotic signal they used as a basis for their communication system (generated by an electronic device) can encode any binary source of information in an energy efficient way.

http://chaos.aip.org

World's highest output RF power transistor replaces vacuum tubes in industrial systems

John Powell, EMEA RF Industrial Product Marketing Manager, RF Power, NXP Semiconductors

The latest advances in LDMOS technology have allowed RF power transistors to be employed in systems that were formerly the exclusive domain of vacuum tubes, while also expanding their use in new applications. The new NXP MRF1K50H RF power transistor further extends the capabilities of LDMOS, as it delivers 1500 W at 50 V between 1.8 and 500 MHz in either pulsed or CW operation, making it the highest power transistor available in any technology and any frequency.

When NXP introduced a 1250 W CW transistor several years ago, it became popular in a variety of high-power applications in which triode and tetrode vacuum tubes were traditionally used, as it was the first extremely rugged LDMOS transistor that could be used in systems where huge impedance mismatches can occur.

The new MRF1K50H (Figure 1) increases this level of ruggedness to even greater RF power levels and even greater ruggedness, which makes it even more appealing for these high-power applications. They include excitation of CO2 laser and plasma sources and high-energy physics applications such as particle accelerators employed in scientific or medical applications, in which they create the electromagnetic field that accelerates the particle beams.

Figure 1: *NXP's new LDMOS 1.5 kW RF power transistors, shown here in their three packaging variants, produce the highest CW RF output power of any semiconductor device. The air-cavity ceramic version is pin-compatible with existing transistors – only light retuning is needed to obtain the highest power.*

The MRF1K50H is also well suited for use in many industrial systems such as heating, welding, and drying, in which vacuum tubes have always been used, as there were no solid-state RF power sources that combined the ruggedness of tubes with high RF output power. Other applications include FM and VHF TV broadcast transmitters, UHF radars, and land mobile radio base stations.

The MRF1K50H is also likely to become popular with manufacturers of linear amplifiers in amateur radio service, where a single transistor can comfortably produce the maximum output power (1500 W PEP) allowable on nearly all HF and some VHF bands.

The reliability and operating life of this transistor is substantially longer than any vacuum tube. Under extreme conditions leading to the maximum 225°C junction temperature, the Mean-Time-To-Failure (MTTF) of the MRF1K50H will be 35 years, but in a normal operating mode with a 100°C case temperature it is longer than 450 years. When combined with its ruggedness, the transistor ensures long-term operation without the need for replacement units or the maintenance cost and time required to install them – dramatically reducing the down time of any industrial system. Solid-state RF sources also enable power control across their full dynamic range, enabling new use cases.

Output power of 1.5 kW is available in either a traditional air-cavity ceramic package (MRF1K50H) or in an over-molded plastic package (MRF1K50N). The MRF1K50H is pin-compatible with its 1250-W MRFE6VP61K25H predecessor and with devices from other manufacturers, so that RF designers can make a seamless transition to the new transistor. Not only is it built in the same package, it also exhibits a similar output capacitance making it possible to use the same printed circuit board with only minimal retuning to achieve its higher RF output power.

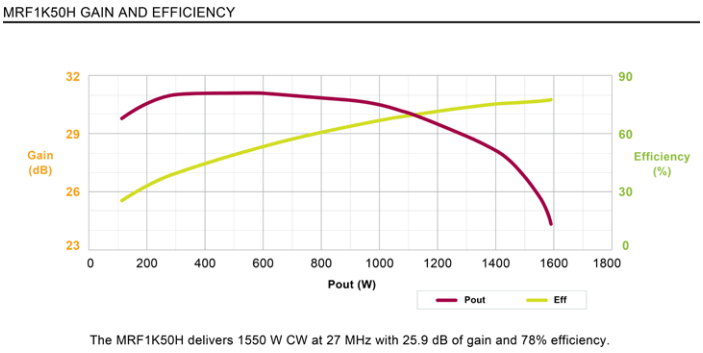


Figure 2: *The MRF1K50H delivers 1550 W CW at 27 MHz with 25.9 dB of gain and 78% efficiency.*

DESIGNED FOR DEMANDING ENVIRONMENTS

As noted earlier, the MRF1K50H is extremely rugged, capable of surviving a VSWR of 65:1 without device degradation or failure. It features a 135 V breakdown voltage (BV(dss)), with a drain-source avalanche energy absorption capability that is

40% higher than its predecessor, making it ideal for the harshest industrial environments.

High RF output power also puts stress on cooling systems. To reduce cooling requirements and increase reliability, the MRF1K50H in an air-cavity ceramic package has been designed for low thermal resistance, 0.12°C/W, and the over-molded plastic version MRF1K50N embodies the inherent benefits of copper-flange packaging such as reduced junction-to-case thermal resistance of 30%. It also ensures more precise attachment to the circuit board during manufacturing thanks to its tighter dimensional tolerances and better solder connections.

Design resources are essential complements to the introduction of any new device, so NXP offers four reference circuits dedicated to frequencies at which the MRF1K50H will most frequently be used:

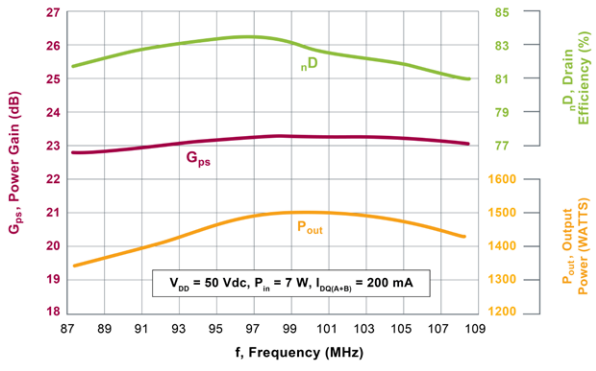
• 27 MHz: This narrowband reference design is dedicated to the most common frequency employed in industrial applications such as heat sealing, drying, and welding.

• 81.36 MHz: Manufacturers have settled on 81.36 MHz for excitation of CO2 lasers, for which the MRF1K50H is well-suited.

• 87.5 to 108 MHz: FM and digital radio transmitters will benefit from the very high power of the MRF1K50H, as it can reduce the number of transistors and amplifier modules required to deliver a specific RF output power at the antenna terminals. This broadband reference design expressly serves the design of the systems.

• 230 MHz: Narrowband aerospace and other applications operating at this frequency use pulsed rather than CW signals. This reference design is designed to accommodate applications with pulse rates of 100 µs at 20% duty cycle while delivering 1500 W of peak power.

MRF1K50H BROADBAND REFERENCE CIRCUIT TYPICAL CHARACTERISTICS—87.5–108 MHz



Power Gain, Drain Efficiency and CW Output Power versus Frequency at a Constant Input Power.

Figure 3: *Key performance specifications for the MRF1K50H over the FM broadcast band show 81 to 84% efficiency. Further details are available on NXP's website.*

The MRF1K50H and its variants are currently in production. In addition, many of the systems in which the MRF1K50H will be used, especially those in defense and industrial applications, are expected to be in service for many years. Consequently, it's essential for OEMs to know that key components will be available over this time period. To accommodate these applications, NXP has created a Product Longevity Program that guarantees availability of RF power transistors such as the MRF1K50H for at least 15 years after their introduction. In the case of the MRF1K50H, NXP will provide the device into least 2031.

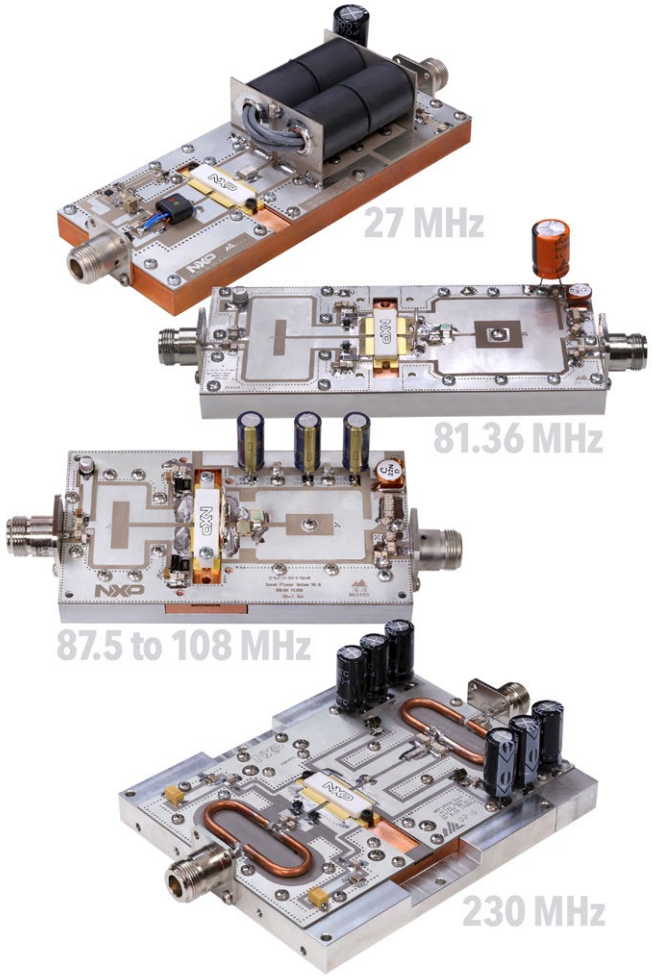


Figure 4: *To help demonstrate the MRFK150 typical RF performance characteristics, NXP offers four reference circuits ranging from 27 MHz to 230 MHz. For additional information and sampling inquiries, please contact NXP Semiconductors.*

NXP Semiconductors,
1300 North Alma School Rd., Chandler, AZ 85224, USA
http://www.nxp.com/RF.

ABOUT THE AUTHOR

John Powell is a market development specialist responsible for the RF Power business in EMEA at NXP Semiconductors. His background in RF power semiconductors spans device design and development with III-IV compound semiconductors. He has international experience from working with customers in all regions of the world. His current area of focus at NXP is on devices and solutions in industrial, scientific, medical, broadcast, aerospace and defense, and other industries in which solid-state RF power brings performance advantages. John Powell holds a BSc in Physics from the University of Manchester, England.

First IoT worm targeting CCTV revealed

A provider of cybersecurity for the Industrial Internet of Things (IIoT), CyberX has revealed the first IoT worm which is aimed at CCTV devices. This discovery comes at a time when Internet-connected devices are growing at an exponential rate due to the proliferation of IoT platforms such as ThingWorx from PTC and Predix from General Electric, and the corresponding consequences of attacks are estimated to be hundreds of millions of dollars.

The malware was revealed as part of the research of a global cyber security campaign, dubbed RADIATION by the CyberX research team. The uniqueness of this campaign can be attributed to the targeting of IoT devices and the enhancement of an existing family of malware for that purpose. The malware infected organizations in multiple industries, with the highest number of victims residing in Taiwan, US and Israel. The RADIATION campaign is categorized as an IoT Distributed Denial of Service (DDoS) campaign.

"This event is a cornerstone in the evolution of IoT security. These advanced threats are shaping before our very eyes, and should not be taken lightly," said Omer Schneider, CEO & Co-Founder of CyberX. "RADIATION demonstrates the continuously evolving skillset of attackers. It is only the beginning of what we believe to be the dawn of IoT cyber campaigns," said Nir Giller, CTO & Co-founder of CyberX. "Ranging from manipulation of infusion pumps to ransomware for IoT thermostats, IoT environments are becoming high value targets."

The CyberX research team started investigating RADIATION following a notification which was generated by XSense, the CyberX flagship solution for Industrial IoT environments.

http://cyberx-labs.com

Peregrine claims fastest GaN FET driver

Peregrine Semiconductor claims to offer the word's fastest gallium nitride (GaN) field-effect transistor (FET) driver, the UltraCMOS® PE29100.

Built on the company's UltraCMOS technology, this GaN driver is designed to drive the gates of a high-side and a low-side GaN FET in a switching configuration, the PE29100 delivers the industry's fastest switching speeds, shortest propagation delays and lowest rise and fall times to AC-DC converters, DC-DC converters, class D audio amplifiers and wireless charging applications.

The UltraCMOS PE29100 is a half-bridge GaN FET driver with internal dead-time control. The high-speed driver operates up to 33 MHz and handles voltages up to 80V. It delivers a short propagation delay of 8 ns. It has a rise time of 2.5 ns and fall time of 1.8 ns when driving a 1000 pF load and 1 ns rise and fall times with 100 pF load. The PE29100 has a one-pin, single-phase input mode and has an output source current of 2A and an output sink current of 4A.

www.psemi.com

Beta global communications app draws a million downloads

The Primo app from Primo Connect is the first over-the-top (OTT) global communications app to provide free international calls and texts to-and-from phone numbers for over half of the world's population. To date the app, available for Android and iOS, has been downloaded more than 1 million times even though it is still a public beta version.

Launched in public beta in March, Primo has attracted users across 50 countries, with over 50 percent retention for continued monthly use.

Incubated under parent-company Ka'ena Corporation by the team at Ultra Mobile, Primo Connect was born from the telecom industry to bridge the gap between next-generation communications and traditional telecom services so anyone can connect from anywhere on any device. To date, 92 percent of communications through the Primo app has consisted of outgoing calls to landline and mobile phone numbers.

"Apps like WhatsApp are great for connecting to other app users but there are billions of people around the world that have a phone and no data. We have been able to leverage our background in telecommunications to make Primo work seamlessly between phones and apps," said Primo Connect Chief Product Officer and Co-Founder Chris Furlong.

The Primo app is slated to officially launch in late September for iOS and Android, with additional operating systems and features to roll out later in the year. In addition to English, the official release version of the app will be available for multiple languages. App-to-app communications are free and unlimited on the Primo app, and users receive monthly free minutes to connect with international phone numbers each month.

www.startengine.com/startup/primo-connect-inc

LTE ideal for public safety mobile broadband

According to a report by Market Reports Hub, LTE has emerged as the leading candidate for public safety mobile broadband networks due to its thriving ecosystem, spectrum flexibility and performance metrics. Further, with the recent approval of the MCPTT (Mission Critical Push to Talk) voice standard as part of 3GPP Release 13, LTE has also become an attractive substitute for providing LMR-like voice services.

The research estimates that annual investments on public safety LTE infrastructure will reach $600 Million by the end of 2016. The market, which includes base stations (eNBs), mobile core and transport networking gear, is further expected to grow at a CAGR of 33% over the next four years. By 2020, these infrastructure investments will be complemented by over 4.4 Million LTE device shipments, including smartphones, rugged handheld terminals and vehicular routers.

www.marketreportshub.com

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Keeping ahead of the interference challenges

By Dean Miles, Tektronix

In our highly wireless world, interference is an unwelcome addition to the equation that results in noise, interrupts cell phone calls and just generally messes up communication. In the case of cellular networks, interference is actually part of the network. While more networks today have built-in features to detect interference, these tools often lack context as they are geared towards only a few types of signals and may only be able to measure the impact of the problem over a single channel.

A spectrum analyzer is the trusted tool that engineers use to measure and identify sources of interference. There are many types of spectrum analyzers on the market, but many people opt for small battery-powered spectrum analyzer models because they need to be able to move around freely and correlate data from multiple locations.

When on the hunt for interference the first challenge is to determine if it's even possible to measure the interfering signal. Typically, a victim receiver, which is the first place to look, is easy to identify. The challenge is that radio receivers are able to detect very small signals. Therefore, the spectrum analyzer must be set up to closely mimic the sensitivity of the victim receiver to "see" what the receiver is "seeing." For example, an average LTE receiver has a sensitivity in the area of -120 dBm. This means that any RF pollution on the receiver channel that is greater than -120 dBm can affect the operation of the receiver.

There are two controls in the spectrum analyzer to adjust sensitivity: reference level (RefLvl) and resolution bandwidth (RBW). The challenge is that when taking measurements "over the air" (OTA), the reference level needs to be kept fairly high (-30 dBm), so that the spectrum analyzer doesn't become overloaded with all of the RF energy being measured.

In most spectrum analyzers the RBW control is set automatically based on the frequency span that the user has configured. In OTA measurements RBW values should be reduced in order to see small signals that could be affecting the victim receiver. This combination results in a very slow sweep rate for most battery-powered spectrum analyzers which means that it's almost impossible to see intermittent low-level transient signals that are causing the interference.

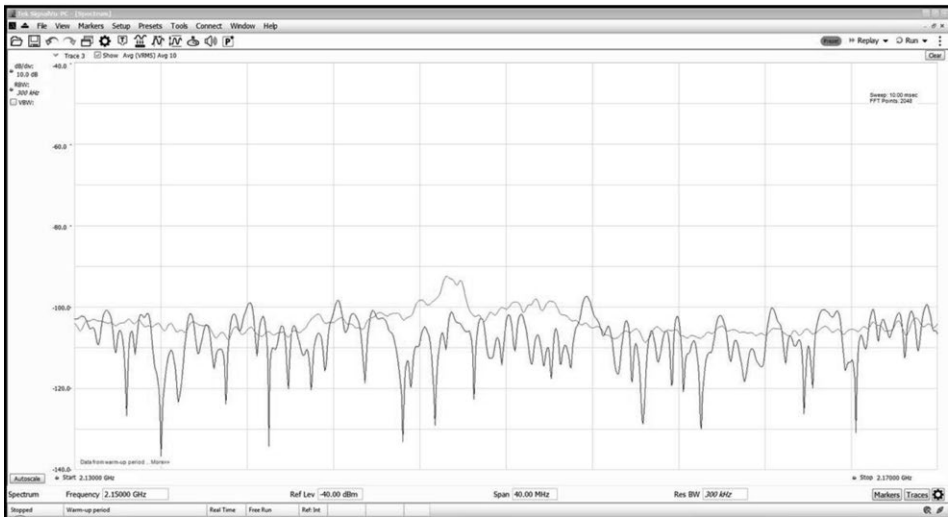

Figure 1: This is an example of how an LTE signal looks OTA.

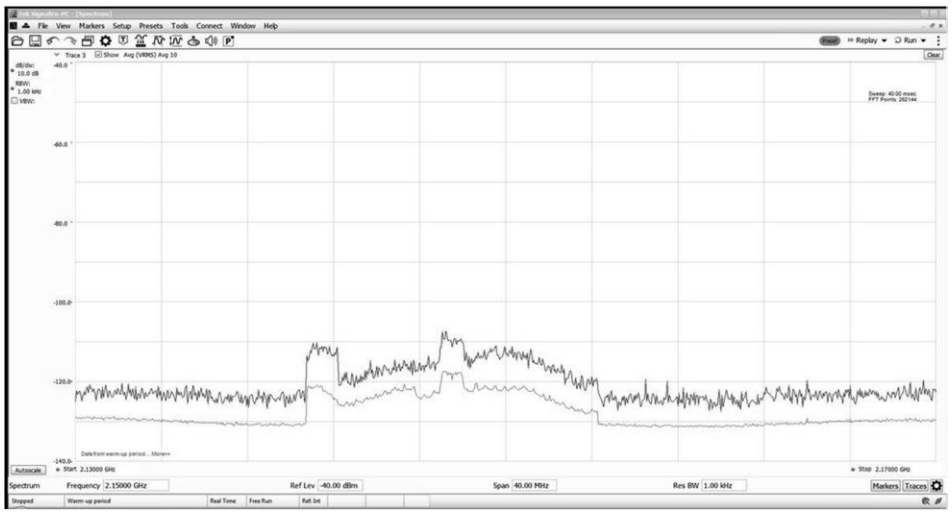

Figure 2: A real-time spectrum analyzer with a 1kHz RBW filter improves visibility on a LTE signal.

Real-time spectrum analyzers address this shortcoming by being able to measure the spectrum with a narrower RBW filter, faster than basic sweeping spectrum analyzers. Figure 1 shows an example of what a LTE signal looks like OTA. In this case the span is set to 40 MHz, which results in a default RBW of 300 kHz. Note that determining the emission in the center of the display is quite difficult. If there was a narrow-band (< 300 kHz) interferer it would be almost impossible to see it with this setup.

Figure 2 shows the same setup using a 1 kHz RBW filter. In this case, it's clear that the LTE channel and the effective sweep time has only increased to 40 msec. This is one of the first benefits of using a real-time spectrum analyzer (RTSA) to measure interference on the radio channel. Once expensive and desk-bound, a new class of affordable, battery-powered, USB-based real-time spectrum analyzers are now becoming available on the market, making RTSA a practical choice for interference-hunting applications.

MEASURING FREQUENCY OF INTERFERENCE

Traditionally, the various trace modes available in a spectrum analyzer are used

to help characterize RF signals of interest. Peak hold, average and minimum hold are common. Even when employing these trace modes it is still difficult to determine how often a signal is occurring or if one signal is somehow related to other signals in the same span.

RTSAs provide a solution to this problem: a fast spectrum display with persistence effects. Remember that in a real-time spectrum analyzer, for any span up to the maximum real-time span, the instrument is not sweeping, which means it is capable of measuring the spectrum tens of thousands of times per second. But the spectrum cannot be displayed that fast. To solve that problem, spectrum analyzers with persistent displays were developed as shown in Figure 3.

A persistence display (or digital phosphor display) keeps track—pixel by pixel—of how often energy is being measured. The color of the pixel indicates how often a signal is present. With temperature scaling, red means a signal is on often while blue means it's on less often. With the combination of fast spectrum measurements and persistence, infrequent events can be more easily identified.

When operating with a real-time display, it's important to take care when selecting the RBW filter. Just like in a regular spectrum display, the RBW filter selection will greatly affect the speed of the spectrum measurements. One of the key specifications for an RTSA is the probability of intercept (POI). This specification dictates the minimum signal duration that the instrument is guaranteed to detect. Selecting a narrow RBW will change the POI for the measurement—an important factor to be aware of.

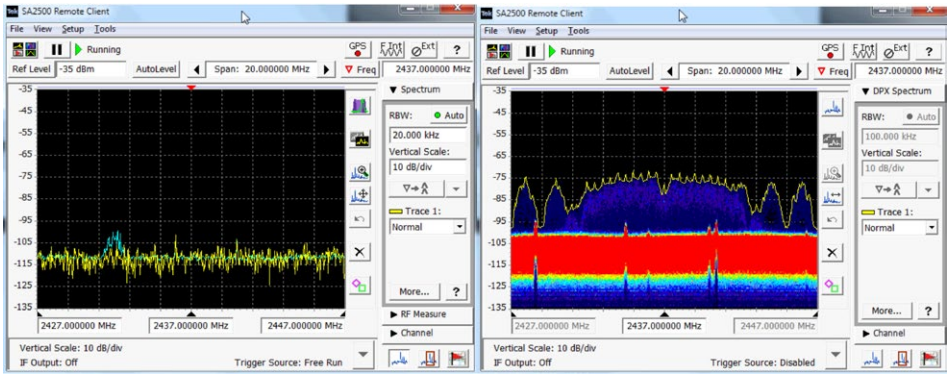

Figure 3: A real-time spectrum analyzer display shows much more information than a traditional display.

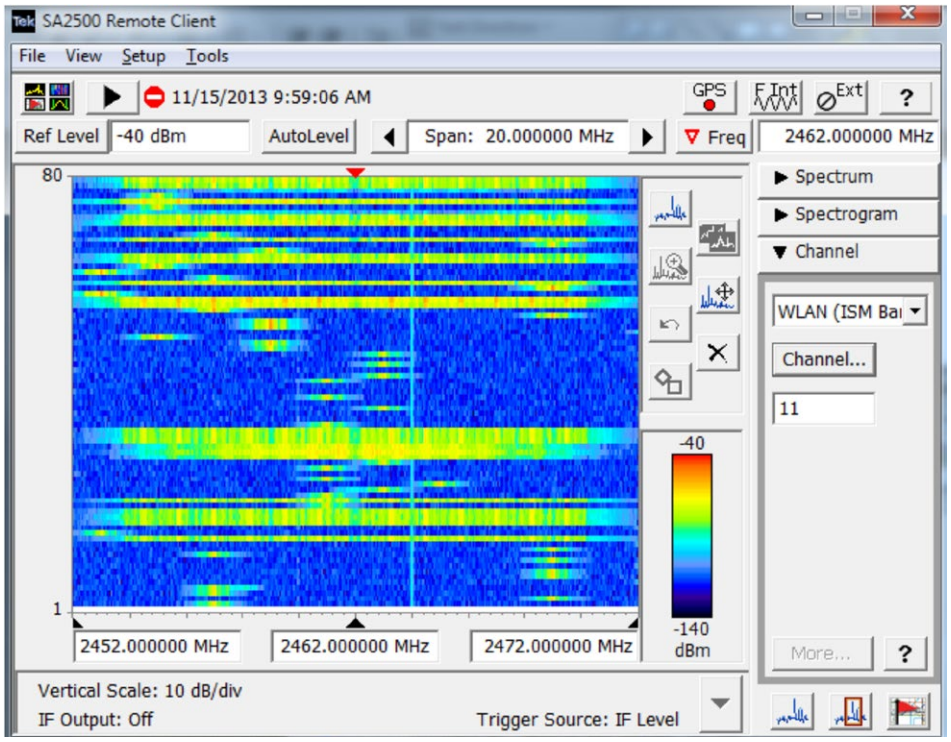

Figure 4: The spectrogram allows you to record spectrum for long periods of time and playback problem periods.

REVEALING THE WHOLE STORY

While a much greater amount of information can be obtained from the persistent display compared to a basic spectrum display, it doesn't reveal the whole story. In modern radios there are many protocols that employ some form of clear channel assessment. Essentially, such radios are capable of determining how busy a channel is and will only transmit when no one else is using the frequency. Even a fast persistent display cannot show the timing relationships between two signals. To determine the timing of signals we need to use the spectrogram function as shown in Figure 4 which allows us to plot the spectrum data over time to determine how often signals are active.

Spectrograms are a type of waterfall display that plots the spectrum activity over time. As in a typical spectrum display, the start frequency is on the left-hand side and the stop frequency is on the right-hand side. Time is the on Y-axis and color indicates signal amplitude—red being the highest amplitude and black being the lowest. The spectrogram is composed of the peak detected data from the persistence display, and the amount of spectrum data aggregated is defined by the user.

With these controls the user can record the data for long periods of time (hours) and then export and share the results. This is especially useful when there is a stubborn interference problem and the spectrum needs to be monitored for a long time. In the event that you are dealing with an intermodulation issue, the spectrogram can help determine the fundamental elements of the mix.

Keep in mind that with RTSAs the spectrum information is instantaneously measured for the entire time span. This means that we can use the data to perform a visual carrier correlation to confirm the timing relationships between source carriers and intermodulation products.

HAPPY HUNTING!

Interference is a meddlesome guest in our wireless world that will never leave. The best solution to this thorny problem is to become good hunters with real-

time spectrum analyzers whose displays are up to the task of pin-pointing and displaying interfering signals no matter how elusive.

ABOUT THE AUTHOR

Dean Miles is a senior EMEA Technical Marketing Manager at Tektronix responsible for Tektronix' High Performance Product Portfolio. Dean has held various positions with Tektronix during his more than 20 years with the company, including Global Business Development Manager for Tektronix RF Technologies and Business Development Manager for Tektronix' Optical Business Unit. Dean has presented Tektronix' technologies in more than 80 countries around the world, met with more than 10,000 engineers and had more than 40 technical papers published.

'Interscatter' communications technology lets implants talk Wi-Fi

University of Washington researchers have developed what they call "interscatter communication" technology that backscatters (or reflects) existing signals like Bluetooth in the air, transforming wireless transmissions from one technology to another.

Specifically, the team of UW electrical engineers and computer scientists has demonstrated for the first time that Bluetooth transmissions can be used to create Wi-Fi and ZigBee-compatible signals. As a result, the new technology can now give power-constrained devices like medical implants the ability to "talk" to other devices using standard Wi-Fi communication.

'RECYCLE' RADIO SIGNALS

Picture tiny devices such as smart contact lenses, brain implants or credit cards, said Vikram Iyer, a UW electrical engineering doctoral student who co-authored the paper. "They can't use Bluetooth or Wi-Fi chips because they consume too much power in generating their own radio signals."

Enter the world of "interscatter communication." Instead of generating their own radio signals, those "interscatter" devices can "recycle" radio signals transmitted by nearby devices like smart watches.

"We allow a device like a smartwatch or smartphone to do the power expensive generation of radio signals, and then our low-power contact lens, implant or credit card reflects this signal in a way that encodes its own data," he explained. The transmitter of such interscatter devices isn't a normal radio. It's just a switch connected to an antenna, Iyer added.

"Turning on and off this switch allows us to change how the antenna reflects

In one example, Bluetooth signals from a smartwatch (left) transmit data from a neural device that can be implanted in a patient's brain (right) to a smartphone via Wi-FI (Source: Mark Stone/ University of Washington).

energy. Just by turning on and off this switch at the right rate, our interscatter device is reflecting a Bluetooth signal created by something like a smartwatch to make it look like a Wi-Fi packet that can be received on your phone."

In one example, the team demonstrated a smartwatch transmitting a Bluetooth signal to a smart contact lens outfitted with an antenna. To create a blank slate on which new information can be written, the UW team developed a way to transform the Bluetooth transmission into a "single tone" signal that can be further manipulated and transformed.

By backscattering that tone signal, the contact lens can encode data — such as health information it may be collecting — into a standard Wi-Fi packet readable by a smartphone, tablet or laptop.

Preserving battery life is paramount for implanted medical devices. "If you have a radio that quickly drains the battery then you might need surgery to replace it," said Iyer.

Interscatter enables Wi-Fi for these implanted devices while "consuming only 10,000x less power than a normal Wi-Fi chip," he added.

IMPLANTS THAT CAN TALK

Many implant devices thus far have been voiceless. Due to their size and location within the body, they have not been able to send data using Wi-Fi to smartphones and other mobile devices.

Giving implanted devices the ability to communicate with others "can transform how we manage chronic diseases," said Iyer. "For example, a contact lens could monitor a diabetic's blood sugar level in tears and send notifications to the phone when the blood sugar level goes down."

Asked why the team chose to reflect Bluetooth signals, Iyer said, "Because it is widely available on mobile devices and its frequency shift keying protocol makes it easy to use our technique to convert it Wi-Fi."

CHALLENGES

In developing the intercommunication technology, the team encountered some challenges. Among these issues, the backscattering process creates an unwanted mirror image copy of the signal, which consumes more bandwidth as well as interferes with networks on the mirror copy Wi-Fi channel. But the team developed a technique called "single sideband backscatter" to eliminate the unintended by-product.

The researchers built three proof-of-concept demonstrations for previously infeasible applications, including a smart contact lens and an implantable neural recording device that can communicate directly with smartphones and watches.

The author, Junko Yoshida is Chief International Correspondent at EE Times

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NATIONAL INSTRUMENTS™

Reducing the standard compliance uncertainty by using ferrite type CMADs during radiated disturbance measurements to CISPR 16-2-3

By Jens Medler, Rohde & Schwarz GmbH & Co. KG, Test and Measurement Division, Standardization and Application Support for EMC Test Equipment

The consideration of measurement instrumentation uncertainty is common practice when determining compliance or non-compliance with a disturbance limit. But MIU is just a subpart of the standard compliance uncertainty which also addresses uncertainties related to the EUT set-up, EUT operation and measurement procedure. One major influence quantity of SCU is the termination of cables leaving the test volume of the radiated disturbance measurement set-up. With the publication of Amendment A2 to 3rd Edition of CISPR 16-2-3 in 2014 new requirements for minimizing this effect became effective. It requires the termination of cables leaving the test volume using a ferrite type common mode absorption device. The significant technical changes and measurement results with and without using CMAD are presented.

I. INTRODUCTION

It is common CISPR policy that measurement instrumentation uncertainty (MIU) shall be taken into consideration as per CISPR 16-4-2 [1], when determining compliance with the disturbance limits. For this purpose CISPR 16-4-2 describes in detail the input quantities to be considered for the estimation and treatment of the MIU. This includes the uncertainty contributions of the measuring receiver as well as the ancillary equipment (e.g. connecting cables, transducers such as artificial mains networks (AMN), absorbing clamps and antennas) and the test sites (e.g. site attenuation, antenna distance and test table). The expanded MIU is typical 3 dB for conducted disturbance measurements and may in the order of up to 6 dB for radiated disturbance measurements [1].

Not included in CISPR 16-4-2 are uncertainties related to the equipment under test (EUT) set-up or operation of the EUT as well as of the test specification (e.g. EUT arrangement, layout and termination of cables, measurement procedure,

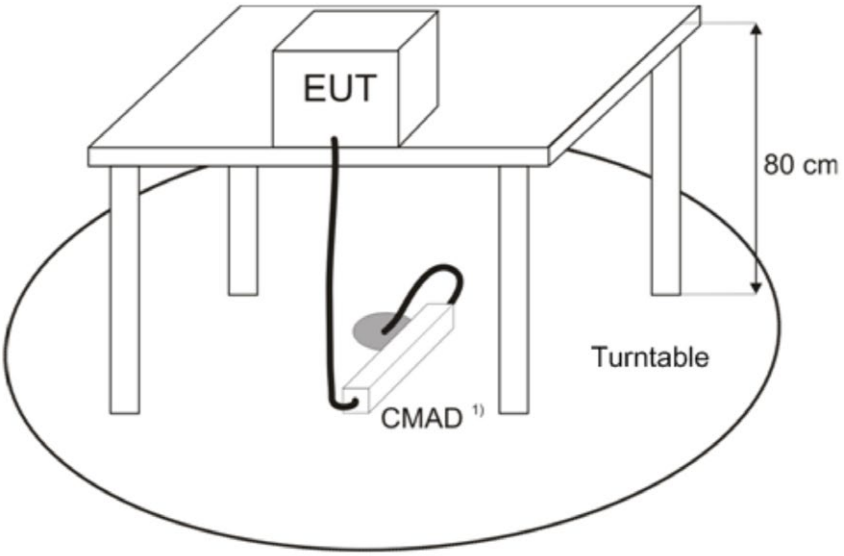


Figure: 1 Position of CMAD for table-top equipment on OATS or in SAC according to Amendment 2:2014-03 to CISPR 16-2-3:2010-04 [5].
(1) CMADs shall comply with the relevant specifications of CISPR 16-1-4; their use shall be documented in the test report.

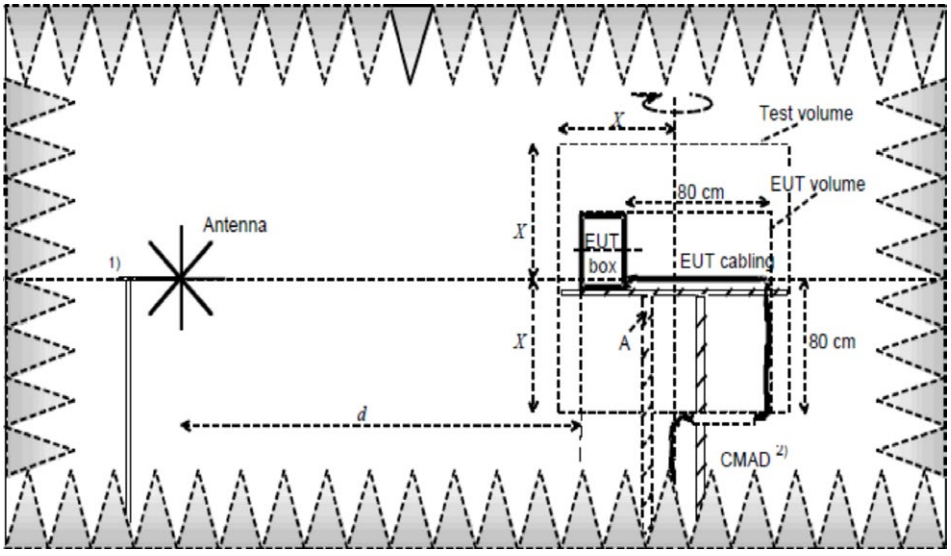


Figure 2 Position of CMAD for table-top equipment in FAR according to Figure 8 in CISPR 16-2-3:2010-04 [5]. (2) CMADs shall comply with the relevant specifications of CISPR 16-1-4; their use shall be documented in the test report.

etc.), which together with the MIU are comprised in the term **"Standard Compliance Uncertainty" (SCU)**. MIU is a subpart of the SCU. Guidance on the treatment of the SCU is given in the technical report CISPR 16-4-1 [2]. But references to CISPR 16-4-1 are not in place in product standards. As a consequence the SCU need not be taken into account in the determination of compliance today.

However compared to the MIU the magnitude of the SCU may have relatively large values, e.g. in the order of 10 dB or more and so it has much influence on the reliability and reproducibility of RF disturbance measurements. In general it is the responsibility of the product committees to reduce the intrinsic uncertainty of the measurand in question to an acceptable low level. For example, this can be achieved by a detailed specification of the EUT set-up. A good example for this approach is CISPR 32:2015 [3] on emission requirements for multimedia equipment. In this standard, detailed normative requirements are made for exercising the EUT (Annex B), measurement procedure (Annex C) as well as arrangement of EUT and associated cabling (Annex D). It comprises figures of the EUT set-up with arrangement spacing, distances and belonging tolerances.

One important input quantity of SCU is the termination of cables leaving the test volume of the radiated disturbance measurement set-up. Investigations by Ryser [4] have been shown that the termination of those cables has much influence on the measurement result in the frequency range 30 MHz to about 200 MHz. It is characterized by the impedance of the connection to the ground plane and length of the cable inside and outside the test volume. The function of the common mode absorption device (CMAD) is to avoid such influences caused by the difference in the connection point on different test sites. Therefore the SCU can be reduced.

It is important to note that this deviation is related to the test site and not to the EUT set-up and so this subject is not essentially in the responsibility of product committees as mentioned above. Because of this reason the work was addressed to CISPR sub-committee A with the aim to amend the basic standard CISPR 16-2-3 accordingly.

II. NEW REQUIREMENTS FOR RADIATED DISTURBANCE MEASUREMENTS IN CISPR 16-2-3

The new Amendment A2:2014 to CISPR 16-2-3:2010-03 [5] requires the use of ferrite clamp type CMADs to reduce the influence of cables outside the test volume on radiated disturbance measurement results. Ferrite clamps offering the highest flexibility as they can simply clamped on the cable and are applicable for almost any type of cable as long the opening of the CMAD is large enough.

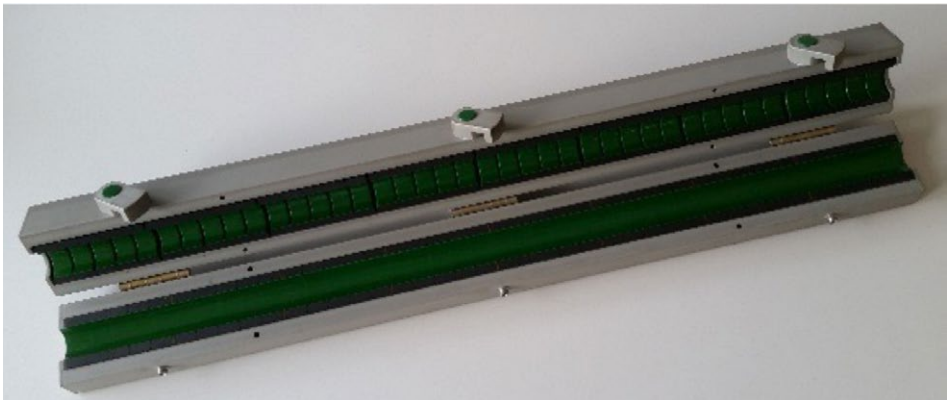
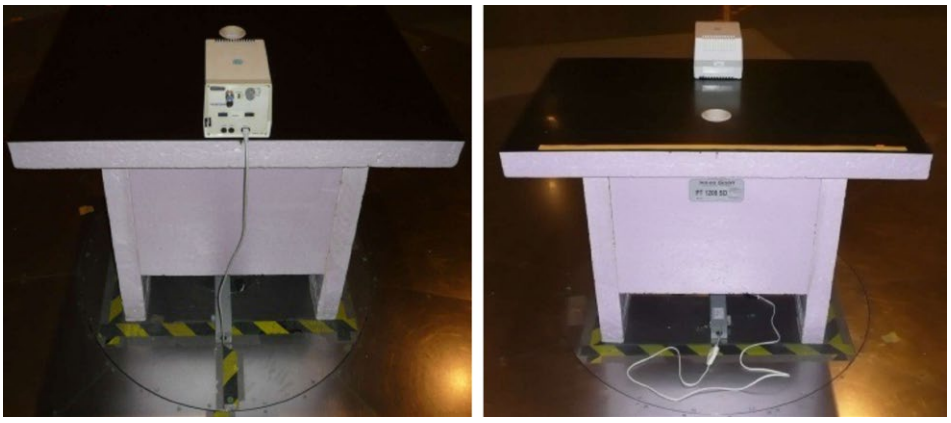
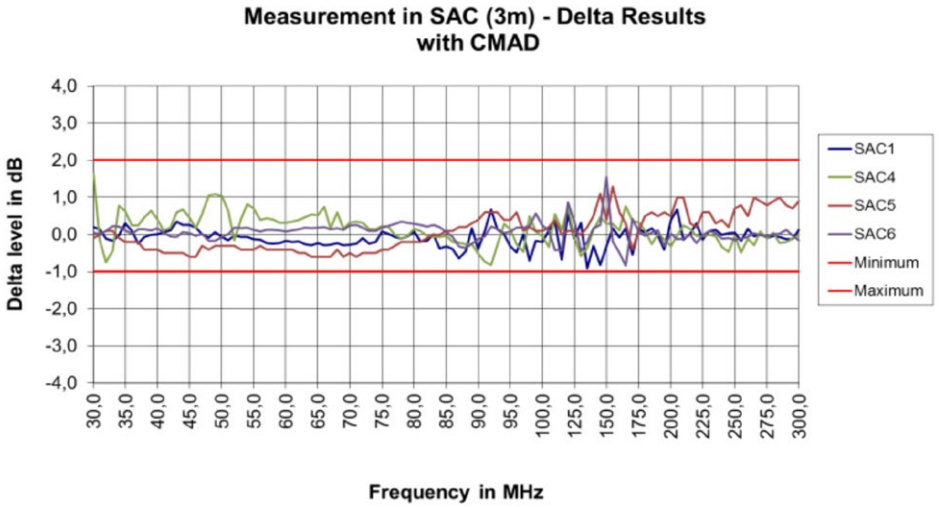


Figure 3: R&S®EZ-24 Ferrite Clamp 1 to 1000 MHz, maximum cable diameter 22 mm.



Front view *Rear view*

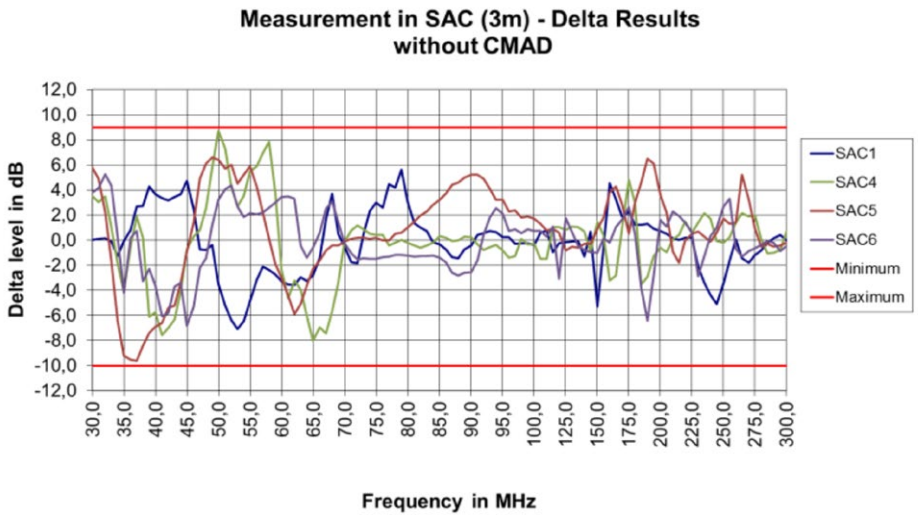
Figure 4: First test in SAC with CMAD – standard mains cable (length = 1.6 m) extended by 3 m.



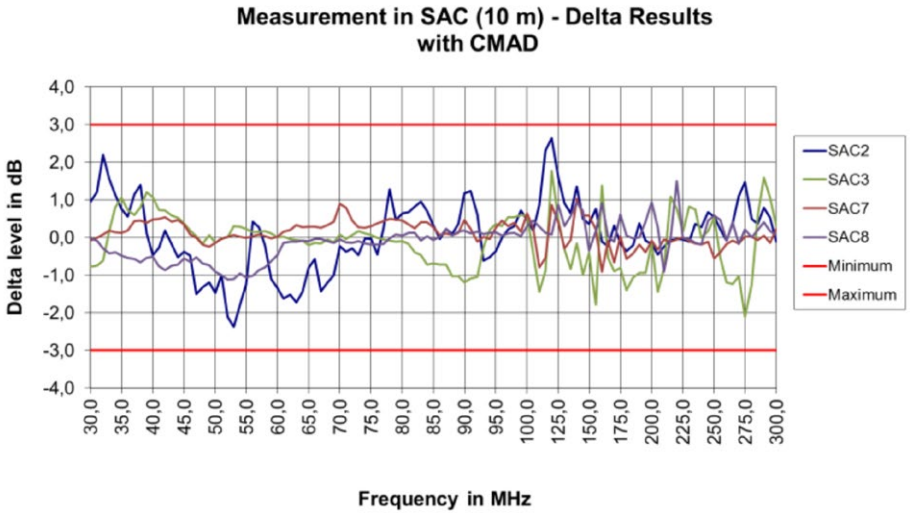
Delta result = Difference between maximum results of first and second test.
Figure 5: Maximum deviation in SACs 1, 4, 5 and 6 with CMAD (3 m).

The position of the CMAD in the test set-up for table-top equipment on open-area test site (OATS) or in semi-anechoic chamber (SAC) is quite important for minimizing the effect caused by the cable length.

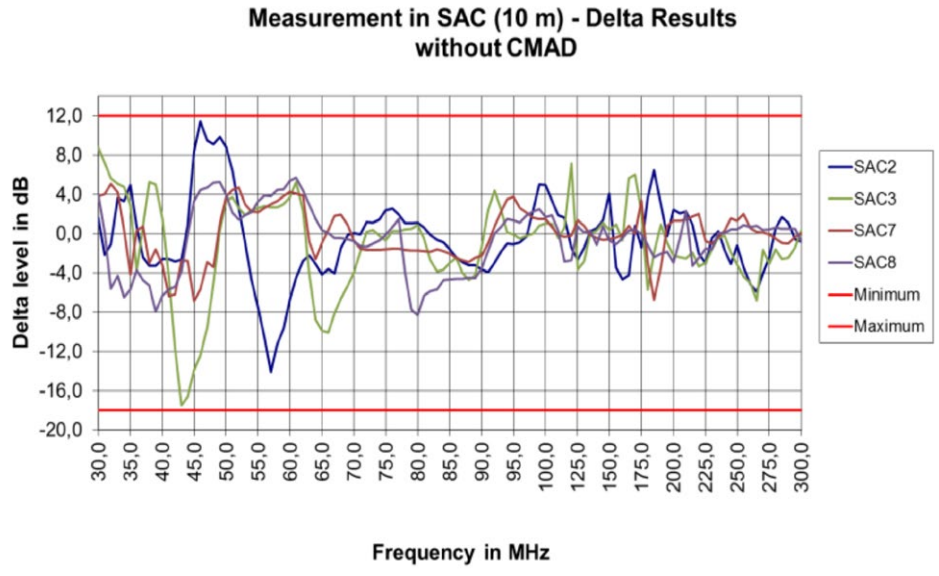
The new CISPR 16-2-3 defines it in such a way that the cable leaving the



Delta result = Difference between maximum results of third and fourth test.
Figure 6: Maximum deviation in SACs 1, 4, 5 and 6 without CMAD (3 m).



Delta result = Difference between maximum results of first and second test.
Figure 7: Maximum deviation in SACs 2, 3, 7 and 8 with CMAD (10 m).



Delta result = Difference between maximum results of third and fourth test.
Figure 8: Maximum deviation in SACs 2, 3, 7 and 8 without CMAD (10 m).

test volume shall enter the CMAD at the point where it reaches the ground plane as shown in Figure 1. In addition the CMAD shall always be placed flat on the ground plane and the part of the cable between the exit point of the CMAD and the exit point of the turntable shall be kept as short as possible.

In a fully-anechoic room (FAR) the cable leaving the test volume shall enter the CMAD at the point where it reaches the bottom of the test volume (turntable) as shown in Figure 2.

Generally, each cable shall be treated with a separate CMAD. However, cables with diameters larger than the cable openings of commercially available CMADs do not have to be treated with CMADs. For EUTs with up to three cables leaving the test volume, each cable shall be treated with a CMAD during radiated disturbance measurements. This requirement applies to any type of cable (e.g. power, telecommunication, and control). For a test set-up with more than three cables leaving the test volume, only the three cables from which the highest emission is expected need to be equipped with CMADs. The cables on which the CMADs have been applied shall be documented in the test report.

III. MEASUREMENT DATA

A Round-Robin Test (RRT) was performed for getting experience in using ferrite clamp type CMADs during radiated disturbance measurements. For this purpose comparison measurements on different test sites were performed with and without CMAD for both radiated disturbance measurements in a fully-anechoic room (FAR) and semi-anechoic chamber (SAC). The used CMAD (R&S®EZ-24 Ferrite Clamp, see Figure 3) complies with the required specification in CISPR 16-1-4 [6]. The mains operated EUT consists of a comb generator with an inductive coupling (ferrite core) of the disturbance signal to the mains line. All these parts are located inside a plastic enclosure. The EUT is to be regarded as Class B table-top ITE.

The results are presented as a series of diagrams which are showing the maximum deviation (delta result) of the measurement result with and without CMAD as a function of test frequency for each test site category. The delta result is the difference between the measurement results if the length of the cable outside the test volume is varied by 1.5 m.

A. Measurement Data in SAC (3 m and 10 m)

The following four cable set-ups were used for the test.

a) First test: With CMAD, standard mains cable (length = 1.6 m) extended by 3 m, see Figure 4.
b) Second test: With CMAD, standard mains cable (length = 1.6 m) extended by 1.5 m.
c) Third test: Without CMAD, standard mains cable (length = 1.6 m) extended by 3 m.
d) Fourth test: Without CMAD, standard mains cable (length = 1.6 m) extended by 1.5 m.

Note: The difference of cable length outside the test volume is 1.5 m between tests a) and b) for measurements with CMAD and again 1.5 m between tests c) and d) for measurements without CMAD. All other arrangements of the test set up remain unchanged.

B. Measurement Data in FAR (3 m)

The following four cable set-ups were used for the test.

a) First test: With CMAD, standard mains cable (length = 1.6 m) extended by 3 m.
b) Second test: With CMAD, standard mains cable (length = 1.6 m) extended by 3 m +1.5 m.
c) Third test: Without CMAD, standard mains cable (length = 1.6 m) extended by 3 m.
d) Fourth test: Without CMAD, standard mains cable (length = 1.6 m) extended by 3 m + 1.5 m.

IV. DISCUSSION OF RESULTS

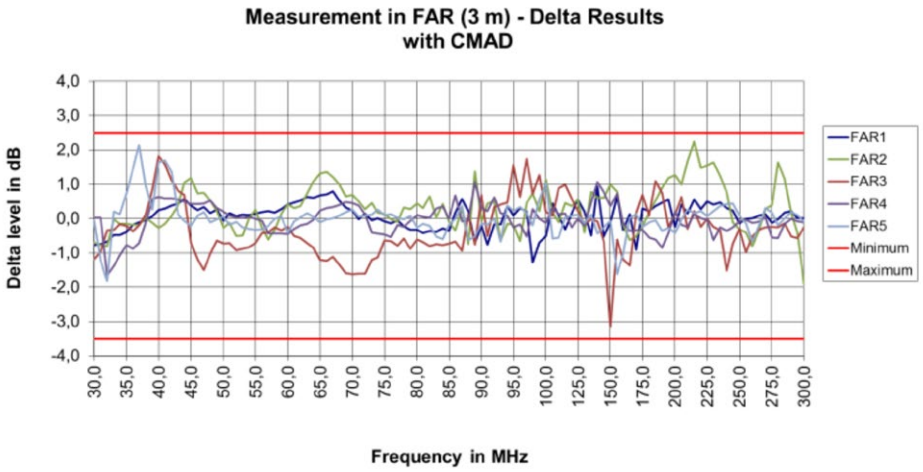
The maximum deviation between the tests with CMAD on each test site is much smaller than without CMAD as shown in Figures 4 to 9. The extreme values for each test site are presented in Table I. For the measured EUT the maximum deviation with CMAD is less than 3.2 dB whereas without CMAD it became up to 19.8 dB in FAR3. Therefore, applying the ferrite type CMAD results in a significant reduction of the SCU and so the reliability of the measurement results is much better.

Furthermore, the reproducibility in case of re-testing on different test sites can be improved significantly using the ferrite type CMAD as shown in Table II.

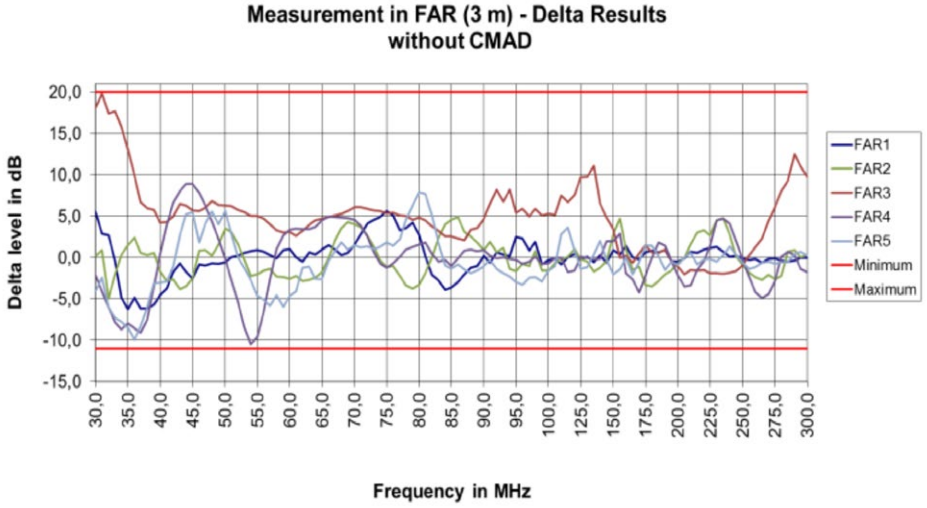
V. CONCLUSIONS

The termination of cables leaving the test volume of the radiated disturbance measurement set-up has much influence on the measurement result in the frequency range 30 MHz to about 200 MHz. With the publication of Amendment A2 to 3rd Edition of CISPR 16-2-3 in 2014 new requirements for minimizing this effect became effective. It requires the termination of cables leaving the test volume using a ferrite type common mode absorption device.

Using such CMADs during radiated disturbance measurements will result in a significant reduction of the standard compliance uncertainty with the advantage to get a better reproducibility if the measurements are performed at different test sites. In general the maximum deviation with CMAD in one laboratory is much smaller than without CMAD. For the measured EUT the maximum deviation in FAR3 was reduced from about 20 dB without CMAD to about 3 dB using the CMAD. In SAC4 (3 m) it was reduced from about 9 dB to about 2 dB and in SAC3 (10 m) it was reduced from about 18 to about 2 dB.



Delta result = Difference between maximum results of first and second test.
Figure 9: Maximum deviation in FARs 1, 2, 3, 4 and 5with CMAD (3 m).



Delta result = Difference between maximum results of third and fourth test.
Figure 10: Maximum deviation in FARs 1, 2, 3, 4 and 5 without CMAD (3 m).

VI. ACKNOWLEDGMENT

The measurements were performed in the laboratories of Alcatel-Lucent in Vimercate, Italy; BNetzA in Kolberg, Germany; Hitachi in Kanagawa, Japan; METAS in Bern, Switzerland; Panasonic in Osaka, Japan; Rohde & Schwarz in Munich, Germany; Sony in Stuttgart, Germany; TESEQ in Berlin, Germany and Underwriters Laboratories in Melville, NY, USA between November 1st 2008 and September 11th 2009. The author would like to thank all participants for their efforts in doing the measurements and for sharing their data.

VII. REFERENCES

[1] CISPR 16-4-2:2011-06 (Edition 2) Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainties in EMC measurements

Test Site	Measurement Distance	Maximum Deviation **with** CMAD	Maximum Deviation **without** CMAD
SAC 1	3 m	-0.9 / +0.7	-7.1 / +5.6
SAC 4	3 m	-0.8 / +1.7	-8.0 / +8.7
SAC 5	3 m	-0.6 / +1.3	-9.6 / +6.6
SAC 6	3 m	-0.8 / +1.5	-6.8 / +5.3
SAC 2	10 m	-2.4 / +2.6	-14.1 / +11.4
SAC 3	10 m	-2.1 / +1.8	-17.5 / +8.8
SAC 7	10 m	-0.9 / +1.0	-6.9 / +5.1
SAC 8	10 m	-1.1 / +1.5	-8.3 / +5.7
FAR 1	3 m	-1.3 / +0.9	-6.2 / +5.6
FAR 2	3 m	-1.9 / +2.2	-5.0 / +4.9
FAR 3	3 m	-3.2 / +1.8	-2.0 / +19.8
FAR 4	3 m	-1.7 / +1.1	-10.5 / +8.9
FAR 5	3 m	-1.8 / +2.1	-10.0 / +7.9

Table I: Maximum deviation with and without CMAD on each test site.

Test Site	Measurement Distance	Maximum deviation from normalised average [1] **with** CMAD	Maximum deviation from normalised average [1] **without** CMAD
SAC 1,4,5,6	3 m	-4.0 / +4.4	-9.0 / +7.0

Table II: Maximum deviation from average for each type of test site.

[2] CISPR/TR 16-4-1:2009-02 (Edition 2) Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-1: Uncertainties, statistics and limit modelling – Uncertainties in standardized EMC tests.

[3] CISPR 32:2015-03 (Edition 2) Electromagnetic compatibility of multimedia equipment – Emission requirements.

[4] Ryser, H., Motivation for the use of CMAD in radiated emission measurements (CMAD: Common mode absorption devices), Report 207-218-630, Federal Office of Metrology (METAS), Bern-Wabern, Switzerland, 11 September 2007, available as a downloaded PDF from http://www.metas.ch/2007-218-630.

[5] Amendment A2:2014-03 to CISPR 16-2-3:2010-04 (Edition 3) Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements.

[6] CISPR 16-1-4:2010-04 (Edition 3) Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements.

BluStor and Arrow collaborate on personal mobile cloud security

BluStor™ a leader in multi-factor biometric authentication, authorization and data security within smart card solutions, and Arrow Electronics have joined forces to target the fast-growing, multi-factor biometric authentication market by enabling BluStor to scale its CyberGate Personal Mobile Cloud (PMC) to the market quickly and efficiently.

The CyberGate Personal Mobile Cloud (PMC) targets the often overlooked fact that individuals will always be the weakest link in the security chain. Setting itself apart from most of its competitors, the it focuses on securing the individual at the point of every mobile transaction by requiring users to seamlessly prove their identity and that their actions are authorized.

Finis Conner, the founder and CEO of BluStor, is a veteran of the technology industry having co-founded and founded two fortune 500 companies, including Seagate Technology and Conner Peripherals. The father of the modern-day hard drive, Finis led Conner Peripherals to become the fastest growing manufacturing start-up in U.S. history, surpassing $1.3B in sales in just four years.

"BluStor's strategic collaboration with one of the world's leading supply chain services company in this era of technology commoditization is a major advancement. It will allow us to scale quickly, knowing that we can maintain the highest level of manufacturing quality, no matter how fast we grow," Conner said.

"Working with Arrow will allow BluStor to build, manage and distribute the CyberGate Personal Mobile Cloud platforms — enabling faster time to market, accelerated revenue growth and increased flexibility at a lower total cost."

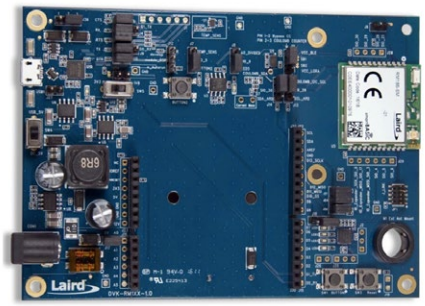
This collaboration provides BluStor with access to Arrow's extensive global network of components suppliers, contract manufacturers and commercial customers.

Designed for government, enterprise, healthcare, medical, telecom and financial services markets, the CyberGate PMC platform claims to be the first to address the full array of digital security: device, user and data.

www.blustor.com

IoT modules combine Bluetooth v4.0 and LoRa

Available form Alpha Micro Components the the Laird RM1 series IoT (Internet of Things) modules combine Bluetooth v4.0 and LoRa support in a single device – enabling low energy connectivity over distances of many miles, thus saving money and time while enhancing safety and slashing downtime.



The RM1 series of modules – currently comprising the RM191 for FCC compliance and the RM186 for CE compliance – are particularly suitable for IoT monitoring, tracking and data collection tasks that require reliable battery-powered devices in remote, dangerous and difficult-to-access locations. Potential applications include industrial, agricultural, utility, as well as many others.

These modules allow IoT devices to gather sensor data and send control messages via short range wireless Bluetooth or physical links. They can share that data with central servers or gateways – and also be remotely managed – via LoRa, over a range of up to 10 miles (about 15 km).

The RM1 series modules are remarkably easy to integrate into IoT devices and they offer integrators very rapid time to market, thanks to their support for the smartBasic language.

www.alphamicro.net

OCXO delivers low phase noise

Greenray Industries has announced the availability of the YH1421 series OCXO,

available from 10 MHz to 120 MHz, with a +3 dBm typical sinewave output into 50Ω.

The YH1421 features low phase noise with a -160 dBc/Hz noise floor, and also maintains very good holdover and medium/long term stability for wireless communications and data, including for upcoming 5G applications.

The YH1421 uses a +5 or +3.3 VDC supply and is packaged in a compact 0.8- x 0.5-inch, low profile, DIP package. It can also be provided with an SMT adapter. EFC (electronic frequency control) is available for precise tuning or phase locking applications.

www.greenrayindustries.com

Wirepas and u-blox partner on scalable IIoT

Wirepas and u-blox have partnered to offer advanced decentralized radio communications (comparable with advanced mesh technology) for demanding industrial Internet of Things (IoT) applications.

The IoT industry is still quite young and fragmented, making deployment of industrial IoT applications slow and complex for the end customers. The goal of u-blox and Wirepas is to make large scale, decentralized industrial IoT networks easy to deploy for their customers.

One part of this partnership is the NINA-B1 from u-blox, which is a small, stand-alone Bluetooth low energy module, with the latest state-of-the-art power performance. The module targets several different applications, such as healthcare, connected buildings, manufacturing and telematics. It has been certified for a range of countries world-wide, thus reducing risk and time to market for customers integrating the module in their devices.

"The NINA-B1 in combination with the Wirepas Connectivity software enables short time to market for easy-to-install, large scale, decentralized industrial IoT applications in segments such as lighting, sensor, asset tracking and beacons," says Hakan Svegerud, Head of Product Strategy, Short Range Radio, at u-blox.

www.wirepas.com
www.u-blox.com

Wi-Fi dual-band module with BLE 4.1

The ART6212 from Amp'ed RF Wireless Technology is a Wi-Fi dual band and Bluetooth LE (Low Energy) module that offers superior data throughput, range and power consumption to help enable Internet of Things (IoT) applications.

The module is configured with a Bluetooth SIG pre-certified BLE stack that speeds up the certification process. The ART6212 features dual-band technology so that the Wi-Fi signal can occupy the 5 GHz band while BLE can occupy the 2.5 GHz band – addressing questions around co-existence.

"ART6212 not only offers faster speeds than competitors but also faster certification," said Kelly Simone, president and chief technology officer of Amp'ed RF Wireless Technology.

The modules are provided with an auto-launch BLE to Wi-Fi code, and are availble with stacks or developers can use open source software.

Support for wireless devices and ART6212, speeds up both development and authentication. The company provides the code for BLE to auto-launch Wi-Fi for consumers.

www.ampedrftech.com

Airbourne SMT frequency synthesizer

covers 6 to 7.5 GHz

Designed for an airbourne RF jammer that operates under extreme vibration and shock conditions, the THOR-7500-XA frequency synthesizer covers 6 to 7.5 GHz.

The device also features low phase noise (under -95 dBc/Hz at 100 KHz) and fast switching capability (<300 µs Band-Edge to Band-Edge) critical for signals intelligence applications.

The frequency synthesizer also locks to a ±5 ppm stability and contains a channel step size of 500 KHz, +15 dBm output power, -60 dBc spurs and -25 dBc harmonics, all housed within a small surface-mount package measuring 6.4- x 2.8- x 1.0-cm (2.5- x 1.1- x 0.4-inches). This high performance design operates across temperatures from -40° C to +85°C with extended temperatures available.

The THOR-7500-XA adds a new performance-focused, uniquely designed architecture to the company's trusted THOR Series product line. It delivers excellent resolution and ultra-fast switching for applications with agile tuning requirements.

www.emresearch.com

CPRI interface panel kits for connectivity testing

Used to test fiber connectivity between Optical Base Band Units (BBU) and Remote Radio Heads (RRH), Common Public Radio Interface (CPRI) panels from Radio Frequency Systems (RFS) enable cell operations and system performance engineers to ensure the best performance without having to disconnect the fiber optical system or disrupt service.

The CPRI panel enables easy RF over CPRI testing at the bottom of the tower, reducing the need for unnecessary tower climbs, thus minimizing maintenance cost and overall OPEX for customers. The RFS CPRI panel is bundled with high-quality fiber optic jumpers from RFS, providing an end-to-end system that includes HYBRIFLEX™ fiber-to-the-antenna DC and F/O solutions.

The rugged, lightweight aluminum CPRI interface panel provides bidirectional continuity and uniformity in attenuation over the full CDWM spectrum while utilizing included optical terminators to reduce optical return loss in the communication link. Engineers can access the transmit data stream or uplink or downlink through a monitor port that does not affect service, eliminating the complications and downtime associated with disconnecting the RRH from the continuous communications optical link.

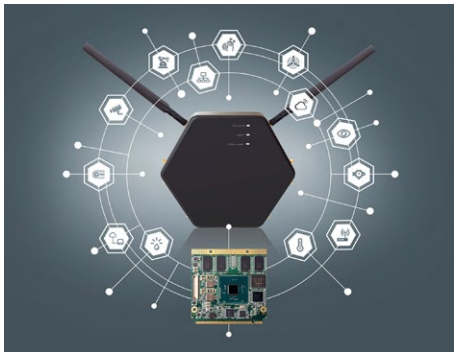
www.rfsworld.com

Flexible IoT gateway system

ideal for rapid field deployments

Congatec has introduced its flexible IoT gateway system that is application ready and easily customizable for rapid field deployment. The congatec IoT gateway offers extreme levels of flexibility in terms of processing performance and software integration, able to host up to 8 wireless antennas that can be connected to 3 mini PCI Express slots and 6 internal USB based slots for wireless and wired connectivity modules. Customized system designs are also available upon request.

OEMs utilizing the IoT gateway system benefit from a pre-configured, pre-certified IoT gateway that can easily connect a wide range of heterogeneous sensors and systems to cloud-based services. Target uses include Industrial Internet of Things (IIoT) applications such as smart cities, smart agriculture, connected homes and vehicles, digital signage systems and other IoT applications.



The wireless connectivity of the congatec IoT gateway system is extremely scalable: 6 internal USB ports and 3 miniPCIe slots are available and able to support LTE 3GPP modems, 2x WI-FI, 2x LAN with PoE and PROFINET features, low power BlueTooth (BTLE) and 6LoWPAN. Other low power wide area networks including LORA, 3GPP, LTE-MTC, Sigfox or UNB can be supported upon customer request. This allows for maximum flexibility in supporting all major IoT connectivity requirements. The housing is equipped to mount up to 8 antennas supporting multiple wireless standards in parallel, while enhancing signal quality by utilizing antenna diversity. The small size (200- x 230- x 40-mm) metal housing is certified to IP53 protection class for outdoor applications.

The congatec embedded board support packages cover all major operating systems – including Windows 10 IoT – to enable easier software integration.

www.congatec.com

Optically isolated measurement system

features 1 GHz bandwidth

The IsoVu™ measurement system form Tektronix, previewed earlier this year at the APEC 2016 show, is now shipping and available for worldwide delivery to customers. It combines wide common mode range, 120 dB common mode rejection and 1 GHz bandwidth, enabling previously hidden signals to be made visible.

The IsoVu™ platform uses an electro-optic sensor to convert input signals to optical modulation, electrically isolating the device-under-test from a Tektronix oscilloscope. The system incorporates four separate lasers, an optical sensor, five optical fibers, and sophisticated feedback and control techniques. The sensor head, which connects to the test point, has complete electrical isolation and is powered over one of the optical fibers. Ten patent applications have been filed for this ground breaking technology.

A critical advantage this technology offers for designers, such as those working on power devices involving GaN and SiC technologies, is superior common mode rejection that makes signals previously buried in common mode noise visible for the first time. IsoVu offers 1,000,000:1 (120 dB) common mode rejection (CMRR) up to 100 MHz and 10,000:1 (80 dB) CMRR at 1 GHz. By comparison, competitive systems at 100 MHz offer approximately 20 dB CMRR at 100 MHz, making IsoVu 100,000 times better.

Using IsoVu, engineers can accurately measure small differential signals (5 mV - 50 V) in the presence of large common mode voltages from DC to 1 GHz. IsoVu is the first signal acquisition product where the common mode voltage capability does not de-rate over bandwidth. IsoVu technology is available in 6 models of the TIVM Series Isolated Measurement Systems with 200 MHz, 500 MHz and 1 GHz bandwidth configurations with either 3-meter or 10-meter fiber optic cable lengths.

www.tektronix.com

End-to-end security for IoT devices

connects to AWS

Microchip Technology has announced the first end-to-end security system for Internet of Things (IoT) devices that connect to Amazon Web Services IoT (AWS IoT).

Microchip and AWS collaborated to develop this integrated system to help IoT devices quickly and easily comply with AWS's mutual authentication IoT security model. Using the latest security system from Microchip will help companies implement these security best practices from evaluation through production – adding a high level of security, simplifies the supply chain, and is now one of the fastest ways to connect to the AWS Cloud.

Currently, third party manufacturers of devices that connect to AWS IoT service must take specific actions to comply with the advanced security model. First, they must pre-register their security authority to AWS servers in order to establish a trust model. Second, for each IoT device they must generate unique cryptographic keys that are mathematically linked to the pre-registered security authority. Finally, the unique device keys must remain secret for the life of the device. In volume production, the generation and secure handling of these unique keys can be a daunting challenge in the chain of manufacturing especially where third parties with different trust and compliance levels are involved.

Microchip's end-to-end security system handles this process during three production steps. First, the AT88CKECC kit will allow customers to meet the security standard of AWS's mutual authentication model and easily connect to the AWS IoT platform during the evaluation and engineering phase. Second, the AWS-ECC508 device assists with meeting security standards during the prototyping and pre-production phase. Finally, devices will be customized for production stages to ensure information security in customer applications.

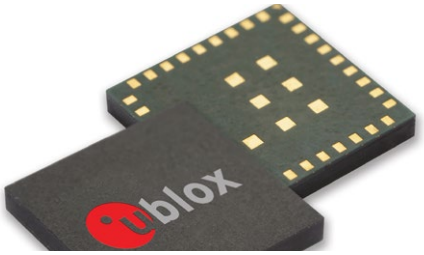
Customers simply solder the device on the board and connect it over I2C to the host microcontroller (MCU) which runs an AWS Software Development Kit (SDK) leveraging the ECC508 device for AWS IoT. Once this is complete, there is no need to load unique keys and certificates required for authentication during the manufacturing of the device as the AWS-ECC508 is pre-configured to be recognized by AWS without any intervention. All the information is contained in a small (3- x 2-mm), easy to deploy crypto companion device.

www.microchip.com

Miniature GNSS receiver

ideal for covert asset tracking using small antennas

Swiss company, u-blox has announced the EVA-M8Q GNSS receiver, completing its lineup of receivers in the miniature and cost-effective EVA 7- x-7-mm form-factor package.



The EVA-M8Q is TCXO-based and is optimized to provide the highest acquisition and tracking sensitivity, making it ideal for use with small antennas either in covert applications such as asset tracking and stolen vehicle recovery, or in portable devices.

The ease of manufacturing offered by the QFN-like package suits requirements for medium to high volume production. While the highly integrated module of the EVA-M8 series allows OEMs to achieve a faster time-to-market. EVA-M8 series are the smallest GNSS modules featuring GPS, BeiDou, Galileo and GLONASS reception. Three out of the four GNSS constellations can be received concurrently, which leads to highest positioning accuracy. The series also features anti-spoofing and anti-jamming technology to provide superior security and integrity protection.

Samples of the EVA-M8Q are available now. The modules will be in full production in Q4 2016.

www.u-blox.com

6-GHz DAC features on-chip synthesiser

The AD9164 from Analog Devices is a digital to analogue converter that spans audio to 6 GHz frequencies. It has the same conversion specification as the recently-announced AD9162, and also includes an on-chip direct digital synthesizer. Further, it offers more accuracy in a smaller footprint for diverse applications ranging from radar to smartphone testing.

The AD9164 D/A converter supports high resolution radar images for designers of military and commercial radar while reducing overall component count. For designers of precision instrumentation equipment, such as smartphone testers, the new device ensures improved accuracy as well as speed of test, contributing to faster market-ready time while significantly decreasing tester complexity and size. Thanks to its audio to 6 GHz frequency coverage, the 16-bit, 12-Gsample/s AD9164 with 2.5-GHz bandwidth moves the tester market one step closer to a universal wireless test platform, according to ADI.

The devices comes with its own "remote evaluation tool". Users can 'test-drive' the AD9164 at: http://labs.analog.com/ad916x.

It is supported by an evaluation board that has a common footprint for each of the D/A converters in this device family.

ADI presents the AD9164 as having the highest linearity in its D/A converters portfolio; 100 to 1,000 times improved spectral purity versus previous generation ADI devices (20-30 dB better); and higher agility, with frequency change time now a 100 times shorter than traditional ADI phased locked loop (PLL) systems.

The reduction in overall component count and thus size enables element-level digital beam-forming advanced radar solutions. With the same performance specifications as the already released AD9162, the AD9164 D/A converter includes an on-chip direct digital synthesizer (DDS) that ensures phase-coherent fast frequency hopping of less than 300 ns for up to 32 different frequencies. This makes the AD9164 D/A converter suited for testing anything from AM broadcast band or Japanese FM band, to 5.8 GHz UNII band.

The converter features a 2x interpolator (FIR85), which enables configurability for lower data rates and converter clocking to reduce overall system power and ease filtering requirements. In mix-mode operation, this D/A converter can be configured to reconstruct RF carriers in the 2nd and 3rd Nyquist zones up to 7.5 GHz while maintaining exceptional dynamic range

www.analog.com/AD9164

25Gbps DFB laser

targets mobile networks

Mitsubishi Electric is now shipping a 25 Gbps distributed feedback (DFB) laser diode for optical transmission at 1310nm between base stations and central offices in radio access networks within mobile telecommunication systems.

The 25 Gbps DFB laser diode (part number ML764AA58T) comes in a 5.6 mm TO-CAN package and operates in a temperature range of -20 to +85ºC. Transceivers incorporating the new DFB laser can operate outdoors without a cooling system. The device's simple structure helps satisfy the SFP28 standard for 25 Gbps compact transceivers.

www.mitsubishielectric.com

RF switches

for connected home applications

Skyworks is introducing two RF switches that are ideal for the Internet of Things applications including the connected home. In addition to the connected home, the SKY13587-378LF, which is a pHEMT GaAs SPDT switch, can be used for transmit and receive switching in industrial, lighting and smart energy applications, as well as 802.11a/b/g/n WLAN networks that operate at 2.4 GHz and 5.8 GHz. The second device, the SKY13588-460LF is a CMOS silicon-on-insulator SP3T switch made for antenna selection in Wi-Fi applications in IoT systems.

These advanced switches feature an operating temperature range up to 105°C, making them ideal for applications that require extended temperature. They also boast high isolation and low insertion loss which is best for low-power transmit/receive applications. Their positive voltage control provides low current and optimal efficiency for battery-operated IoT applications and their broadband frequency ranges from 20 MHz to 6.0 GHz (SKY13587-378LF) to 0.1 to 6.0 GHz (SKY13588-460LF).

These devices are available in compact MLPD/QFN packages (6-or 12-pin), saving precious application board space and design cost for OEMs.

www.skyworksinc.com

Dual directional coupler

MECA has announced its latest addition to their extensive line of stripline couplers with the 785-dB-9.700, covering the frequency range of 7.0 to 12.4 GHz.

The stripline couplers are available in

10 and 20 dB models with SMA female connectors, optimized for excellent performance with industry leading specifications offering typical VSWRs ranging from 1.30:1 and isolation of 20 dB typical.

www.e-MECA.com

Integrated 24 GHz transceiver

targets automotive radar, industrial sensing

UMS – United Monolithic Semiconductors, has introduced a fully integrated 24 GHz trasnsceiver for industrial sensor and automotive applications. The CHC2442-QPG is designed for signal generation and dual reception for automotive radar applications and industrial sensors in the 24 GHz ISM band. The device is a monolithic microwave IC (MMIC) in an SMD leadless package. The multifunction chip integrates a low phase noise VCO, Tx MPA, two Gilbert based heterodyne receivers and a switchable prescaler. The circuit is controlled by SPI and monitored with power and temperature sensors It has been designed for signal generation and reception for automotive radar applications and is supplied in an RoHS compliant plastic SMD package.

Features include: 24-24.5 GHz frequency range; >13 dBm maximum Tx power; 12 dB Tx power control range; 37 dB Rx gain; 24 dB Rx gain control range; and maximum RF gain of 11 dB (Rx SSB NF at IF≥100 Hz). The CHC2442 is qualified to AEC-Q-100.

www.ums-gaas.com

Coaxial voltage variable attenuators

cover 400 MHz to 18 GHz

Pasternack has introduced an all new line of voltage variable attenuators offering up to 60 dB of attenuation across broad frequencies from 400 MHz to 18 GHz.

This line of voltage ariable attenuators is most commonly deployed in applications such as electronic warfare, instrumentation, point-to-point and point-to-multipoint radios, fiber optic and broadband telecom, microwave radio and VSAT, military radios, radar, ECM, SATCOM and sensors, and R&D.

In most communications systems, the RF components used (transmitters, receivers, mixers, multipliers, attenuators, amplifiers, VCOs, phase locked loops, etc.) may require specific power levels to run optimally. These power levels may differ from one component to the next in a system network and may require the attenuation level to be finely adjusted to account for changes in received signal levels or to optimally match the input power into a sensitive circuit. Pasternack's latest PIN diode-based voltage variable attenuators (VVAs) provide accurate control and broadband flatness where the output level can be adjusted continuously by varying an analog voltage on the input control line. These VVAs are ideally suited for use with variable gain amplifiers, power level control, feed-forward amplifiers, and automatic level control (ALC) circuits.

The portfolio of voltage variable attenuators from Pasternack includes 6 models covering octave broadband frequencies from 400 MHz to 18 GHz while boasting low insertion loss and wide dynamic range. Moreover, these modules display excellent VSWR over all attenuation levels. CW input power is rated up to +23 dBm. Each unit is designed into rugged coaxial packages to meet MIL-STD-202 environmental conditions.

www.pasternack.com

www.microwave-eetimes.com

Small vector signal transceiver

boosts bandwidth 5x

National Instruments (NI) has announced a second-generation vector signal transceiver (VST), the PXIe-5840 module, which claims to be the first 1 GHz bandwidth VST and is designed to solve the most challenging RF design and test applications.

The FPGA programmable instrument combines a 6.5 GHz RF vector signal generator, 6.5 GHz vector signal analyser, high-performance user-programmable FPGA and high-speed serial and parallel digital interfaces into a single 2-slot PXI Express module. With 1 GHz of bandwidth, the latest VST is ideally suited for a wide range of applications including 802.11ac/ax device testing, mobile/Internet of Things device testing, 5G design and testing, RFIC testing, radar prototyping and more.

The PXIe-5840 provides 1 GHz of instantaneous bandwidth for advanced digital pre-distortion (DPD) test and wideband signals such as radar, LTE-Advanced Pro and 5G. Its excellent measurement accuracy enables the second-generation VST to measure 802.11ax Error Vector Magnitude (EVM) performance of -50 dB. Further, the instrument boats measurement speeds up to 10X faster than traditional instrumentation using FPGA-based measurement acceleration and highly optimised measurement software.

The small size and tight synchronisation fo the VST enables up to 8x8 multiple input, multiple output (MIMO) configuration in a single 18-slot chassis, while a user-programmable FPGA allows engineers to easily design with LabVIEW.

"Although engineers can use the second-generation VST to solve many advanced RF test applications right out of the box, its software-designed architecture enables engineers to uniquely customise the user-programmable FPGA," said Charles Schroeder, Vice President of Product Marketing, RF at NI.

www.ni.com/vst

Cloud Wi-Fi simplifies wireless networking

Ruckus Wireless, Inc., now part of Brocade, has announced the availability of Ruckus Cloud Wi-Fi, a wireless local area network (WLAN) management-as-a-service powered by the Ruckus public cloud platform. Cloud Wi-Fi enables distributed organizations with limited IT resources to set up, monitor and manage a high-performance multi-site WLAN of any size. Featuring an intuitive, intent-driven user interface for managing some of the industry's highest performing access points (APs), network managers benefit from cloud simplicity without having to compromise on Wi-Fi performance.

www.ruckuswireless.com

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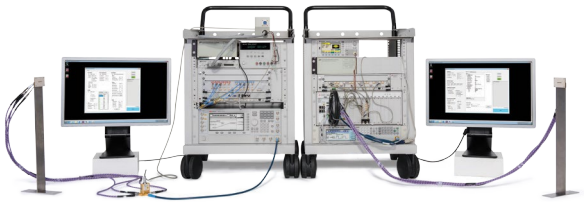

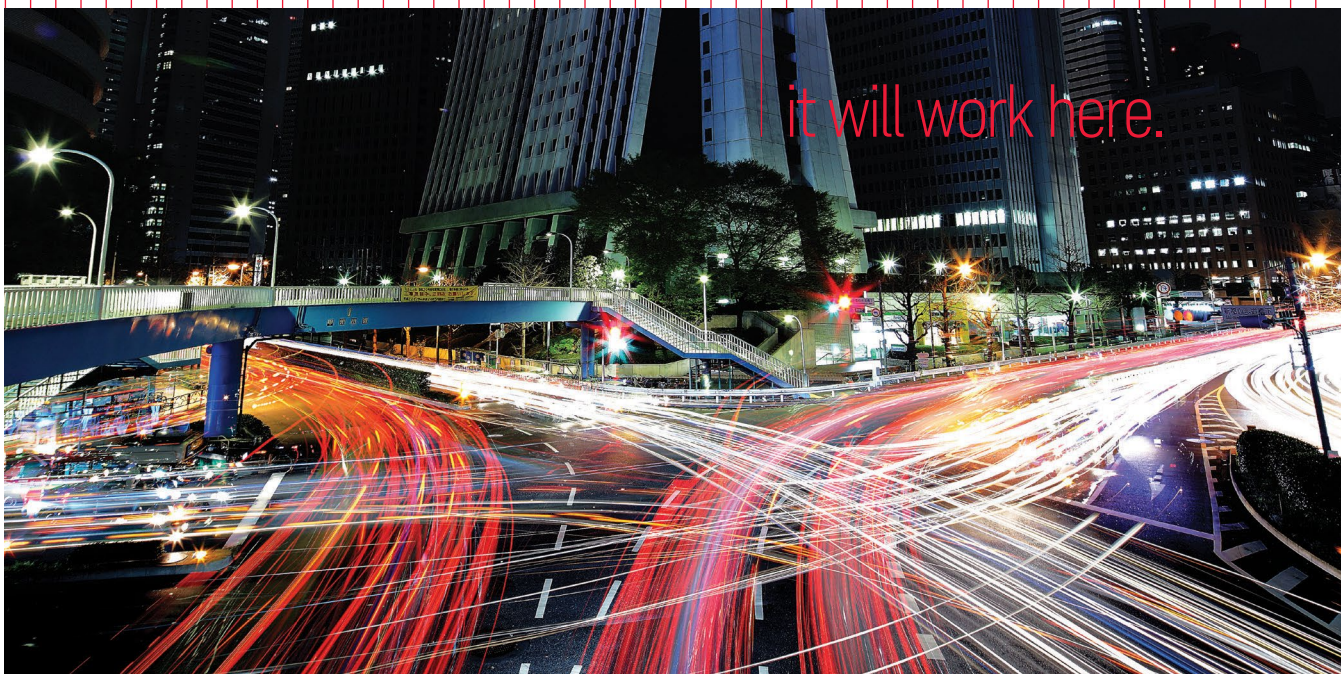

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