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Wireless Sensors

Wireless Infrastructure/Backhaul

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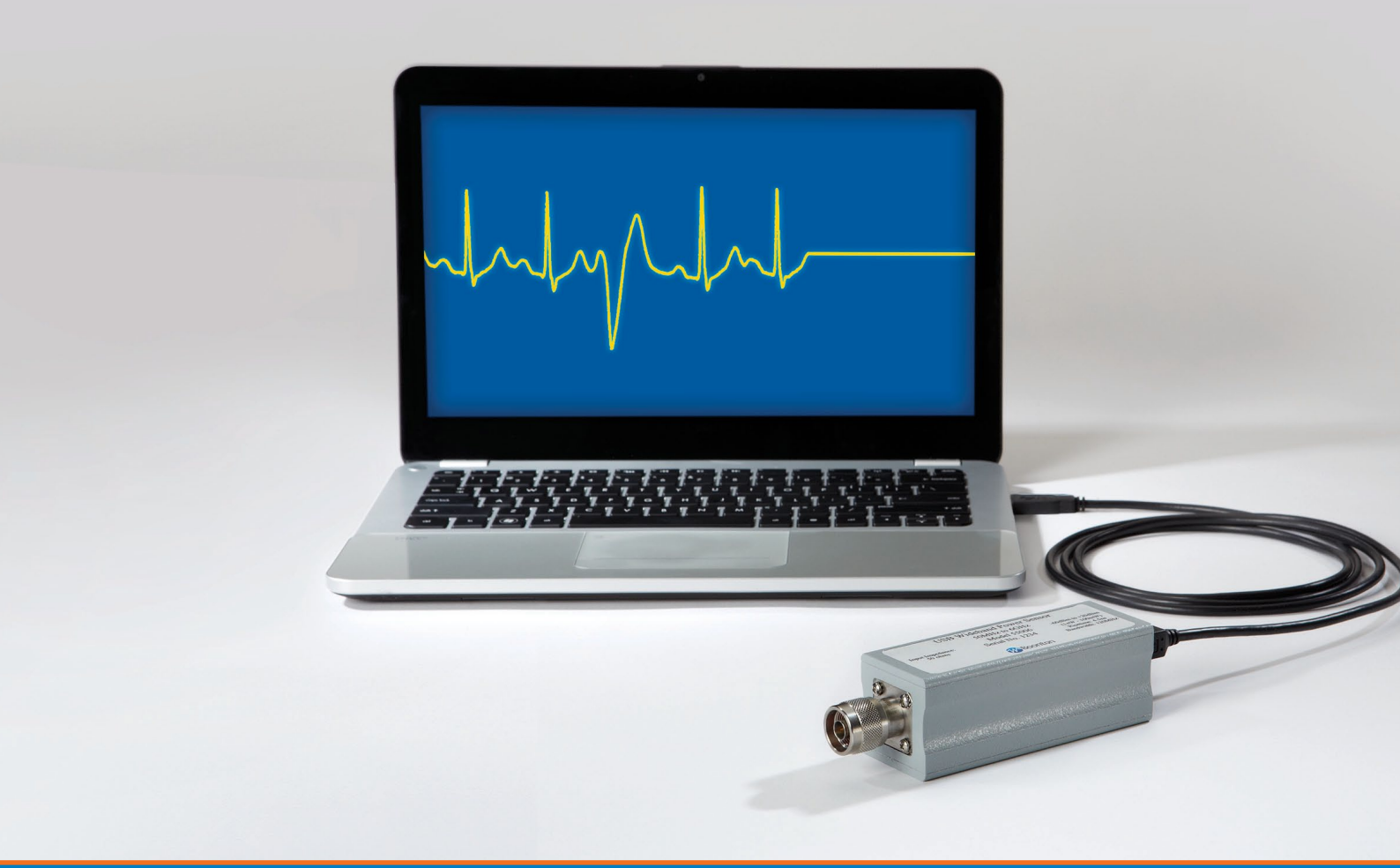

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The smartphone as the controller for the home

The smartphone is a key contender to become the central device in controlling the home. It could also conceivably become the instrument by which we conduct the majority of our purchases, especially small denominations.

There is a lot of talk around wearable technology eventually taking over from the smartphone, but this appears to a rather irrational idea. Smartphones continue to push the limits of computing and communications and it is this very power that is needed for many of the tasks required to control the smart home, carry out secure bank transactions and interact with healthcare. In fact, the very fact that there exists an app-centered approach to addressing a multitude of needs makes the smartphone an ideal general computing platform to base everything on.

Wearable technology will have place, but probably more as an extension of the smartphone. It will allow the smartphone to extend its sensing capabilities into fitness, health and so on, whether as a wearable device or in the form of the so-called smart watch.

Further, the trend in smartphone is towards bigger screens, which makes sense when you mesh a pocket device with the idea of a general controller that is easily customized as needed by simply downloading an app.

What about the home? Smartphones are an ideal platform for basing home control of appliances. As it is app based, it lends itself to change and is easy to implement. Buy a new gadget, simply download the app and connect.

To illustrate this point, San Francisco startup Emberlight has collected nearly five times its initial $50,000 funding goal for commercializing what the company promises to be the simplest way to convert any ordinary dimmable light bulb into a remotely smartphone-controlled light source.

Instead of coming up with yet another remotely controllable fully integrated light bulb, such as Philips' Hue LED bulb or the LimitlessLED, Emberlight offers a universal bulb socket that can receive any type of ordinary dimmable bulb such as Edison screw or Bayonet-based incandescent, halogen, dimmable cold fluorescent lamps or even dimmable LED bulbs.

The adaptor connects to the home's WiFi router so it can be remotely controlled through a cloud-based application, via a smartphone app, from far away. But the Emberlight socket is also Bluetooth Low Energy compatible, so as to detect user proximity for simple walk-in scenarios where the lights turn on automatically or follow pre-set lighting scenarios based on time.

The key differentiation from the competition is that the Emberlight sockets are versatile and future-proof, hints the company in its Kickstarter campaign, as it turns any installed light bulb into a remotely controlled light source, but it also makes it easy to adopt new light bulb technologies as they come along.

The company also claims energy savings, not based on the bulb technology in use, but based on the fact that in response to a smart grid request, their application could unnoticeably dim lights if the user wanted to allow it.

The company is also planning to develop a remote wall switch that would communicate directly with the sockets over Bluetooth. The so-called Flint Switch will be programmable via the smartphone's interface so as to give it the right control effects over the Emberlight sockets.

It would appear that once companies look at leveraging the power of the smartphone, like they did in the PC-era, a lot of possibilities will come to the table. The possibilities and potential are enormous.

By Jean-Pierre Joosting

Controlling graphene's electrical behavior with light

Researchers at MIT have found a way to control how graphene conducts electricity by using extremely short light pulses, which could enable its use as a broadband light detector.

The findings are published in the journal Physical Review Letters, in a paper by graduate student Alex Frenzel, Nuh Gedik, and three others.

The researchers found that by controlling the concentration of electrons in a graphene sheet, they could change the way the material responds to a short but intense light pulse. If the graphene sheet starts out with low electron concentration, the pulse increases the material's electrical conductivity. This behavior is similar to that of traditional semiconductors, such as silicon and germanium.

But if the graphene starts out with high electron concentration, the pulse decreases its conductivity — the same way that a metal usually behaves. Therefore, by modulating graphene's electron concentration, the researchers found that they could effectively alter graphene's photoconductive properties from semiconductorlike to metallike.

The finding also explains the photoresponse of graphene reported previously by different research groups, which studied graphene samples with differing concentration of electrons. "We were able to tune the number of electrons in graphene, and get either response," Frenzel says.

The researchers say the work could aid the development of new light detectors with ultrafast response times and high sensitivity across a wide range of light frequencies, from the infrared to ultraviolet. While the material is sensitive to a broad range of frequencies, the actual percentage of light absorbed is small. Practical application of such a detector would therefore require increasing absorption efficiency, such as by using multiple layers of graphene, Gedik says.

China is attempting to launch its own OS

Xinhua, China's news agency, recently reported that China's home-grown operating system will be unveiled in October this year. Xinhua quoted Ni Guangnan of the Chinese Academy of Engineering saying that the OS will be first seen on desktop devices and later expanded to smartphones and other mobile devices.

Ni's comments were originally reported by the People's Post and Telecommunications News, an official trade paper run by the Ministry of Industry and Information Technology (MIIT).

China's ambition to develop its own OS has been long known. Ni, in fact, heads an OS development alliance established in March in China.

In the Chinese government's point of view, the U.S. surveillance program and Microsoft's PC operating system monopoly (not to mention China's ban on Windows 8), compounded by a mobile market dominated by Google's Android OS and Apple's iPhones, all combine as justification for the Chinese government to pitch its own operating system.

In the Xinhua's story, Ni noted: "China has more than a dozen mobile OS developers with no independent intellectual property rights because their research is based on Android." In his view, future development should be led by the government. Ni's bravado, calling for an environment that can help Chinese "compete with Google, Apple and Microsoft," is impressive. But as Xinhua also noted in its report, "there are still problems in the program, including a lack of research funds and too many developers pulling in different directions."

— by Junko Yoshida, EE Times

Mobile operating system a weak link for hackers

As mobile internet becomes more prevalent and PCs and laptops lose their dominance as a primary gateway to the Internet, hackers are casting their eyes on the mobile operating system with a view to exploiting any vulnerabilities.

A team of researchers, including an assistant professor at the University of California, Riverside Bourns College of Engineering, have identified a weakness believed to exist in Android, Windows and iOS mobile operating systems that could be used to obtain personal information from unsuspecting users. They demonstrated the hack in an Android phone.

The researchers tested the method and found it was successful between 82 percent and 92 percent of the time on six of the seven popular apps they tested. Among the apps they easily hacked were Gmail, CHASE Bank and H&R Block. Amazon, with a 48 percent success rate, was the only app they tested that was difficult to penetrate.

The paper, "Peeking into Your App without Actually Seeing It: UI State Inference and Novel Android Attacks," has been presented at the USENIX Security Symposium in San Diego. Authors of the paper are Zhiyun Qian, of the Computer Science and Engineering Department at UC Riverside; Z. Morley Mao, an associate professor at the University of Michigan; and Qi Alfred Chen, a Ph.D. student working with Mao.

It is believed that their method will work on other operating systems because they share a key feature researchers exploited in the Android system.

The researchers created three short videos that show how the attacks work can be viewed from the hyperlink below.

http://bit.ly/1ByiCd3

Murata to acquire Peregrine Semiconductor

Murata has agreed to swallow Peregrine Semiconductor whole in an all cash transaction that will give it an advanced RF SOI technology and potentially propel it into a leading position in the smartphone market. Peregrine has been steadily working over the years to achieve an all-silicon RF front-end for the smartphone to tackle the ever increasing specifications and complexity of such systems as the world transitions to LTE/LTE-A.

Murata Electronics North America, Inc., a wholly owned subsidiary of Murata Manufacturing Co., Ltd., and Peregrine Semiconductor Corporation have entered into a definitive agreement under which Murata will acquire all outstanding shares of Peregrine not owned by Murata, for $12.50 per share in cash, or a total transaction value of $471 million ($465 million excluding Muratas existing holding).

Upon closing of the transaction, Peregrine will become a wholly owned subsidiary of Murata and continue with its current business model of solving the worlds toughest RF challenges.

www.psemi.com
www.murata.com

Wi-Fi market to hit $26.19 billion by 2019

MarketsandMarkets forecasts the global Wi-Fi Market to grow from $12.89 billion in 2014 to $26.19 billion by 2019. In terms of regions, North America is expected to be the biggest market in terms of market size, while Asia pacific and Latin America are expected to experience increased market traction during the forecast period.

Wi-Fi deployment in enterprises helps them to reduce the cost of network wiring, enables easy and quick maintenance and support of the entire network, provides mobility to the employees, and gives boost to the concept of Bring Your Own Device (BYOD) in the work environment.

A major restraint in deploying Wi-Fi is lack of security over the network.

www.marketsandmarkets.com

Mobile phones gobble up scarce materials

Mobile phones and devices are the fastest growth story this decade and today their numbers are measured in billions. However, the future faces challenges as many innovations from the iPhone to electric motors for hybrid cars require the use of materials — elements — that are scarce or difficult to obtain. For example, smartphones contain a mix of these rare materials such as indium and platinum. Further, the manufacturing of pharmaceuticals uses elements such as palladium and rhodium.

As demand for these devices continues to grow, the problem of dwindling critical element supplies must be addressed, according to a white paper written by eminent scientists. The product of the 5th Chemical Sciences and Society Summit (CS3), the white paper recommends focusing research on finding alternative materials and new approaches to technology development in order to prevent these elements from disappearing.

While the white paper might be somewhat dramatic is claiming that such elements will disappear, the problem lies in their current lack of abundance. As such materials are exploited and consequently become even more scarce, the cost of their use will soar, making mobile phone and other innovative electronic technologies more expensive, possibly even prohibitively expensive in some cases.

The white paper, "The Efficient Use of Elements," was a topic of discussion at this year's the 248th National Meeting and Exposition of the American Chemical Society (ACS), the world's largest scientific society.

Wi-Fi backscatter kicks batteries to power/connect IoT sensors

The holy grail for the IoT is the removal of batteries from devices such as smartwatches and the myriad of sensors that would make up the IoT. Batteries would be replaced by innovative energy harvesting techniques instead.

University of Washington (UW) engineers have designed a new communication system that uses radio frequency signals as a power source and reuses existing Wi-Fi infrastructure to provide Internet connectivity to these devices. Called Wi-Fi backscatter, this technology is the first that can connect battery-free devices to Wi-Fi infrastructure.

The challenge in providing Wi-Fi connectivity to these devices is that conventional, low-power Wi-Fi consumes three to four orders of magnitude more power than can be harvested in these wireless signals. The researchers instead developed an ultra-low power tag prototype with an antenna and circuitry that can talk to Wi-Fi-enabled laptops or smartphones while consuming negligible power.

These tags work by essentially "looking" for Wi-Fi signals moving between the router and a laptop or smartphone. They encode data by either reflecting or not reflecting the Wi-Fi router's signals, slightly changing the wireless signal. Wi-Fi-enabled devices like laptops and smartphones would detect these minute changes and receive data from the tag.

The UW's Wi-Fi backscatter tag has communicated with a Wi-Fi device at rates of 1 kilobit per second with about 2 meters between the devices. They plan to extend the range to about 20 meters and have patents filed on the technology.

http://iotwifi.cs.washington.edu
Paper: http://iotwifi.cs.washington.edu/files/wifiBackscatter.pdf

2014 sees gains in LTE-A network deployments

As of the end of 1Q 2014, ABI Research estimates there were roughly 60 LTE-Advanced trials, commitments and commercial deployments worldwide, of which 22 commitments were from Western Europe, 16 from Asia-Pacific, and 5 from North America.

In addition, Voice over LTE (VoLTE) is gaining market traction in 2014, providing voice services alongside LTE mobile broadband in a reliable and profitable way.

"Carrier aggregation (CA) is the most important feature of LTE-Advanced, which helps mobile carriers to utilize all spectrum resources to increase data rates. In France, Bouygues Telecom first utilized CA to launch LTE-Advanced in six cities in mid-June, 2014, while Orange France and SFR also announced they will commercially deploy LTE-Advanced," comments Marina Lu, research analyst at ABI Research.

"Apart from CA, LTE-Advanced also incorporates other enhancements, like advanced antenna techniques, interference management, and efficient use of heterogeneous networks."

www.abiresearch.com

Project: UWB modules for location awareness

The ALBIREO project was recently launched by CSEM along with SMEs, 3db Access and Insight SiP, to develop miniaturized ultra-wideband (UWB) technologies for enabling precise positioning between connected devices. Location awareness offers enhanced security for applications such as building access and mobile payments.

The ALBIREO project aims at leveraging Impulse-Radio Ultra-Wideband (IR-UWB) technology into miniature wireless modules that allow accurate measurement of the distance between communicating devices, thereby enabling reliable distance-bounding communication protocols. IR-UWB is being investigated worldwide for realizing high-datarate links, and interest has risen recently for exploiting the wide available bandwidth (above 500 MHz in the 6 to 9 GHz bands) to perform accurate distance measurement.

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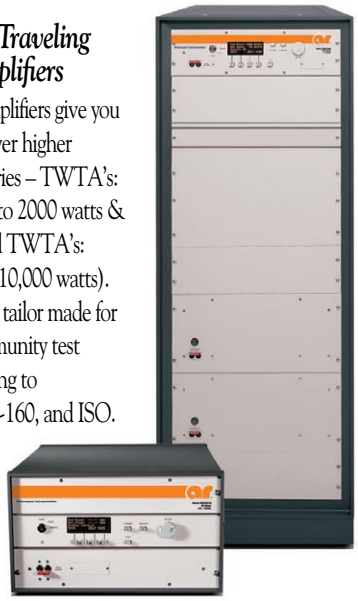

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Rolling Stones move over for wireless electric guitar effects pedals

Nordic Semiconductor ASA has announced that Norwegian startup, Aalberg Audio, is employing Nordic nRF51822 Systems-on-Chip (SoCs) to provide the wireless connectivity in the world's first remote controlled effects pedal for electric guitars.

Aalberg Audio claims the development represents the biggest evolution of the guitar effects pedal since its earliest use by legendary guitarist Keith Richards on the 1962 Rolling Stones hit "(I Can't Get No) Satisfaction".

To be introduced on crowd funding website Indiegogo later this month (aalbergaudio.com/cfaalberg), Aalberg Audio's solution comprises the "EKKO EK-1" wired delay effects pedal and a light weight (37g), palm-sized (30 x 73 x 43 mm) "AERO AE-1" wireless companion controller that is attached to the body or strap of a guitar. This allows guitarists to control every effects parameter - including up to three saved presets - on their pedal using their hands from wherever they are on stage (up to a range of 30 meters / 98-feet) rather than being restricted to the position of a conventional foot-operated pedal.

"Creating music with electric instruments is all about controlling sound," adds Jake Hertzog, award-winning jazz guitarist. "The fact that Aalberg's system gives the player greater 'in-the-moment' control of their sound represents a paradigm shift in what can be created with an electric guitar."

www.nordicsemi.com
http://aalbergaudio.com
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'Air waveguide' creates 'optical cables' out of thin air

The 'air waveguide' makes air behave like an optical cable and it could provide the ability to run an optical cable or fiber to any point on earth, or even into space. In a paper published in the journal Optica, Howard Milchberg, professor of physics and electrical and computer engineering at the University of Maryland, and his lab report using an "air waveguide" to enhance light signals collected from distant sources.

Because light loses intensity with distance, the range over which such tasks can be done is limited. Even lasers, which produce highly directed beams, lose focus due to their natural spreading, or worse, due to interactions with gases in the air. Fiber-optic cables can trap light beams and guide them like a pipe, preventing loss of intensity or focus. But solid optical fibers can only handle so much power. Now, Milchberg's team has found a way to make air behave like an optical fiber, guiding light beams over long distances without loss of power.

Milchberg's air waveguides consist of a "wall" of low-density air surrounding a core of higher density air. In the Optica paper, Milchberg, physics graduate students Eric Rosenthal and Nihal Jhajj, and associate research scientist Jared Wahlstrand, broke down the air with a laser to create a spark. An air waveguide conducted light from the spark to a detector about a meter away. The researchers collected a strong enough signal to analyze the chemical composition of the air that produced the spark.

The signal collected was 1.5 times stronger than a signal obtained without the waveguide. That may not seem like much, but over distances that are 100 times longer, where an unguided signal would be severely weakened, the signal enhancement could be much greater.

Q2 sees 300 million smartphones shipped

Vendors shipped a global total of 301.3 million smartphones in 2Q14, up by 25.3 percent from the 240.5 million units shipped in the same quarter a year before, according to International Data Corp.

Android is the dominant operating system with nearly 85 percent of the market while Apple's iOS has nearly 12 percent, leaving little space for competitors such as Microsoft's Windows Phone or BlackBerry. And the market continues to move towards Android-based smartphones where sales were up 33.3 percent year-on-year. Apple's iOS increased sales by 12.7 percent year-on-year but lost market share to Android. The others all saw declining sales and market share.

"It's been an incredible upward slog for other OS players – Windows Phone has been around since 2010 but has yet to break the 5-percent share mark, while the backing of the world's largest smartphone player, Samsung, has not boosted Tizen into the spotlight," said Melissa Chau, senior research manager with IDC, in a statement.

www.idc.com

Mobile commerce driving global NFC market

The NFC market is currently witnessing rapid growth driven by the increasing trend of mobile commerce, according to a report from ReportsnReports.com. Further, the NFC Forum and GSMA are pushing forward the NFC standard at global level.

Growing at 8.83% CAGR, total NFC Market is expected to reach $16.25 Billion by 2022. This market is expanding globally, however the major market for the NFC ecosystem lies in America. Other regions follow the American terms of the NFC market.

According to the report the major players in this field include: Broadcom, Inside Secure, Infineon Technologies, MediaTek, NXP Semiconductors, Renesas, Samsung Electronics, Sony Corporation, STMicroelectronics, Texas Instruments, and Gemalto.

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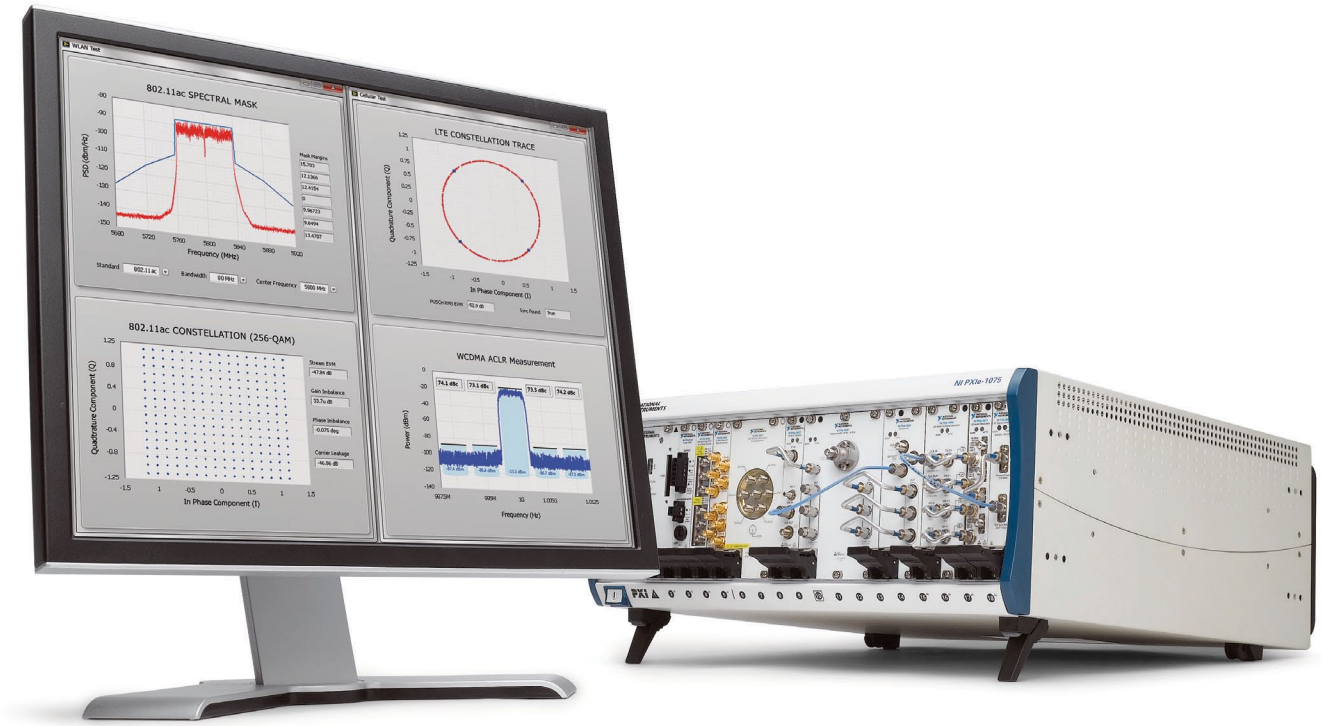

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Premium prices for mm-wave components – are they still justified?

By Andy Trusler, Luso Electronics

Traditionally waveguide components at frequencies above 26 GHz have been expected to carry a much higher price tag than the equivalent products at lower frequencies, sometimes by as much as a factor of three. Nowadays this price differential may be less justified, since technology advances have largely evened out the cost of many of the steps in both design and manufacture where the imbalance had previously been most pronounced. Here we use the example of equivalent 10 dB broadwall couplers in C-band and Ka-band to demonstrate that the decision on which frequency band to use for a particular project need no longer be driven by cost considerations, and can be determined largely by technical and mechanical criteria such as bandwidth, link budget, atmospheric performance and space outline.

Background

In the past the significant difference in cost between C-band and Ka-band components has been justified by the higher machining tolerances required for smaller waveguide sizes, coupled with the relatively higher complexity of the millimetre-wave design process. Indeed for many years millimetre-wave design had a reputation for being a 'black art', because much of it could not be simulated accurately and required an empirical approach and an experienced touch – or a degree of good luck. Military and high-cost professional applications were able to absorb this cost differential, but the move towards employing higher frequencies for commercial communications has brought about pressure to bring down component costs, while at the same time the issues that led to higher costs for millimetre-wave components have largely been resolved. Figure 1 gives a summary comparison of selling price and manufacturing costs of a 10 dB waveguide broadwall coupler in WR-137 for C-band and WR-28 for Ku-band, which are analysed further in this article.

Design costs

In recent years, the accuracy of electromagnetic simulation software at higher frequencies has improved dramatically, meaning that a Ka-band component in WR-28 (WG22) is scarcely more difficult to design, nor takes any longer to simulate, than a C-band part in WR-137 (WG14). If design costs are amortised over a production run then only the smaller volumes that are traditionally ordered at millimetre-wave

Broadwall couplers.

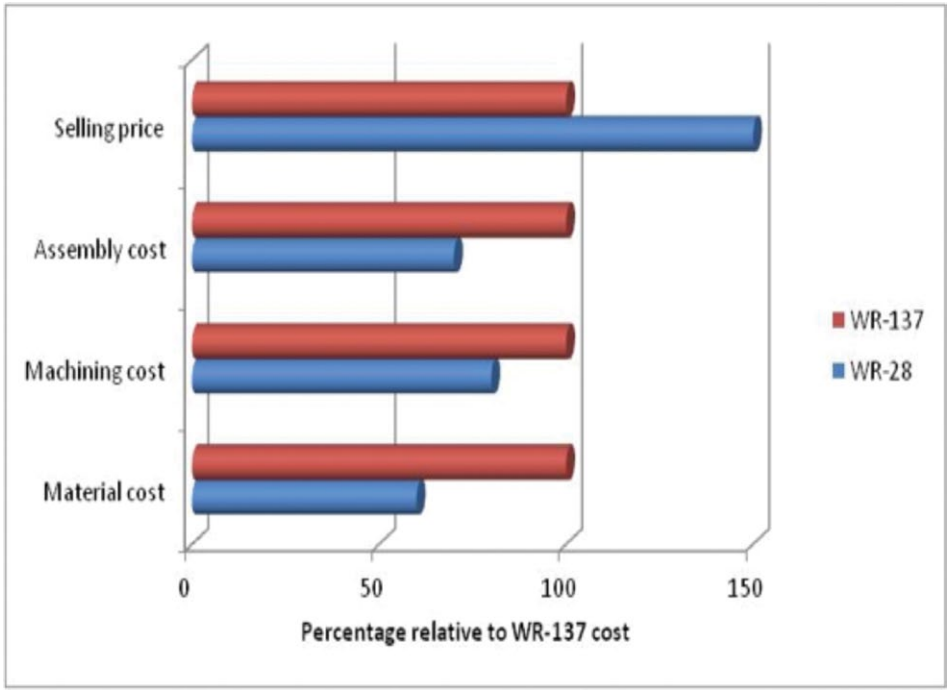

Figure 1: Comparison of selling price and manufacturing costs for a 10 dB broadwall coupler in WR-137 and WR-28.

frequencies will justify a higher cost being passed onto the customer. However, once the industry adapts to the idea that a higher frequency does not necessarily imply a higher price ticket, then volumes will increase and economies of scale should serve to equalise the design costs in the two bands.

Manufacturing costs

Table 1 gives the frequency ranges and dimensions of the main band designations for rectangular waveguide (the even-numbered ones in the European WG types), with the data for WR-137 and WR-28 highlighted in pink. Since waveguide sizes were originally defined in inches, the metric sizes have been rounded to the nearest 0.01 mm. Figure 2 gives an idea of the difference in scale between the two waveguide sizes – roughly 5:1 in each dimension.

Historically C-band and X-band components were routinely machined to tolerances of ±0.05 mm, or even as high as ±0.1 mm, since special skills and exceptional care in setting up tools was required to achieve better results. Due to the smaller waveguide size, Ka-band components demand tolerances of ±0.02 mm, so both machining and assembly costs were higher because of the greater accuracy required. Now the latest CNC machines are able to routinely achieve tolerances of ±0.02 mm or better, which means that not only are the lower frequency components now produced more accurately but also Ka-band components need not cost any more to produce. Indeed, as is shown in Figure 1, using the 10 dB broadwall coupler as an example, the actual manufacturing costs for Ku-band are less than for C-band. The same price comparisons are broadly similar for most waveguide components, from transfer switches through waveguide-to-coaxial adaptors to a full antenna subsystem.

The material cost for a WR-28 coupler is only around 60% of that for an equivalent coupler in WR-137, as the smaller Ka-band component uses much less metal and produces less scrap. The machining time is lower because fewer machining operations are required. The operations are also smaller and the tool travel distance between operations is much shorter.

The cost savings continue when subsystem assembly is taken into account. Less solder is required, and consequently less heat needs to be applied. Where bolts are used, although these are smaller they are often easier to handle, and fewer bolts are required. Millimetre-wave flanges are frequently aligned using dowel pins, which makes assembly quicker and more accurate.

Band designation	Frequency range (GHz)	Waveguide size		Dimensions (mm)*	
		WR	WG	Width	Height
C	5.85 – 8.20	WR-137	WG14	34.85	15.80
X	8.20 – 12.40	WR-90	WG16	22.86	10.16
Ku	12.40 – 18.00	WR-62	WG18	15.80	7.90
K	18.00 – 26.50	WR-42	WG20	10.67	4.32
Ka	26.50 – 40.00	WR-28	WG22	7.11	3.56

Table 1: Table of rectangular waveguide dimensions for primary bands from C-band to Ka-band, highlighting the two bands discussed in this article.

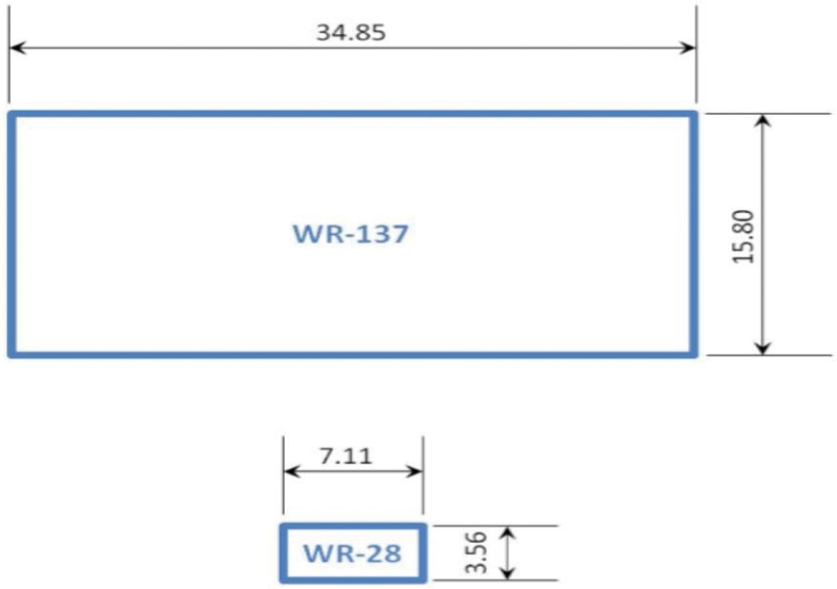

Figure 2: Comparison of dimensions of WR-137 and WR-28.

Testing

An additional factor in the historic price structure was the high cost of purchasing and maintaining millimetre-wave test and measurement equipment. In recent years the price of vector network analyzers (VNA) that can test up to 40 GHz and above have dropped considerably, which means that in addition to the reduction in design and manufacturing costs outlined above, millimetre-wave components need no longer be significantly more expensive to test.

Conclusion

Considering all these factors, it is entirely reasonable for designers of microwave systems to ask, “Are millimetre-wave component prices too high?” The real cost differential is far less than that being maintained by many suppliers, simply because they continue to charge what the market has come to expect. A design engineer working on a new system should be able to confidently choose a millimetre-wave frequency to work at if that band gives the best technical performance without needing to worry whether costs of the waveguide components will make that choice unfeasible.

Additional considerations for a system designer who may be looking at purchasing a full antenna assembly and wishing to minimise total cost of ownership include the ease of upgrade from manual motion type to motorised, which is best achieved with a modular design, and whether the reflector size and centre frequency can readily be changed.

The Microwave Systems Division of Luso Electronics is located in Luton, which manufactures and installs microwave communications systems. The company supports customers across the world, throughout Europe, North America and Asia.

www.lusoelectronics.com

How a new architecture for vector network analysers can transform test performance

By Ajaiey Sharma, Director of Marketing and Business Development, Anritsu

A Vector Network Analyser's (VNA's) operation is based on the use of either mixers or samplers. In traditional sampling VNAs, samplers are gated by pulses generated with a step-recovery diode (SRD) circuit, with the Local Oscillator (LO) and RF source phase-locked to a common frequency reference.

An alternative architecture uses Non-Linear Transmission Line (NLTL) samplers and distributed harmonic generators. NLTL-based samplers offer several benefits: not only do they allow for a simpler VNA architecture, they also enable the production of VNAs which are much more cost effective than those employing fundamental mixing.

This article explains the operation of the NLTL technology inside Anritsu VNAs, and explains how it supports the production of extremely small reflectometers that offer superior performance: lower losses and fewer reflections than conventional reflectometers, with better stability over time and temperature.

The architecture of sampling VNA

VNAs make use of samplers, harmonic mixers, or combinations thereof to down-convert measurement signals to intermediate frequencies (IF) before digitising them. Such down-conversion components play a critical role in VNAs because they set bounds on important parameters such as conversion efficiency, receiver compression, isolation between measurement channels, and spurious generation at the ports of a device under test (DUT).

Mixers tend to be the down converters of choice at RF frequencies, due mainly to their simpler local oscillator (LO) drive system and enhanced spur-management advantages.

At microwave and millimeter wave frequencies however (where receiver compression and cost are of major concern), harmonic sampling is often used. Microwave VNAs, sampling oscilloscopes and frequency counters have traditionally relied on Schottky diodes as switches and on SRDs for pulse generation.

In an SRD-based sampling VNA, the dynamic range of transmission measurements is often limited by the bandwidth of the devices used for isolating the test channels. Channel isolation can be best understood by considering the SRD-gated sampling reflectometer shown in Figure 1. Note that suppression of leaky signals requires the use of broadband isolation devices in the output arms of the power divider.

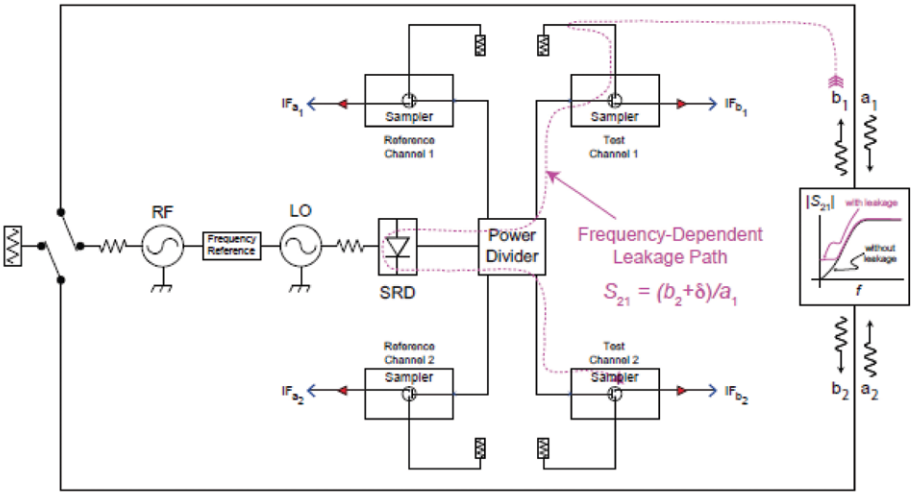

Figure 1: leakage between the test channels in a VNA based on an SRD often limits the instrument's dynamic range.

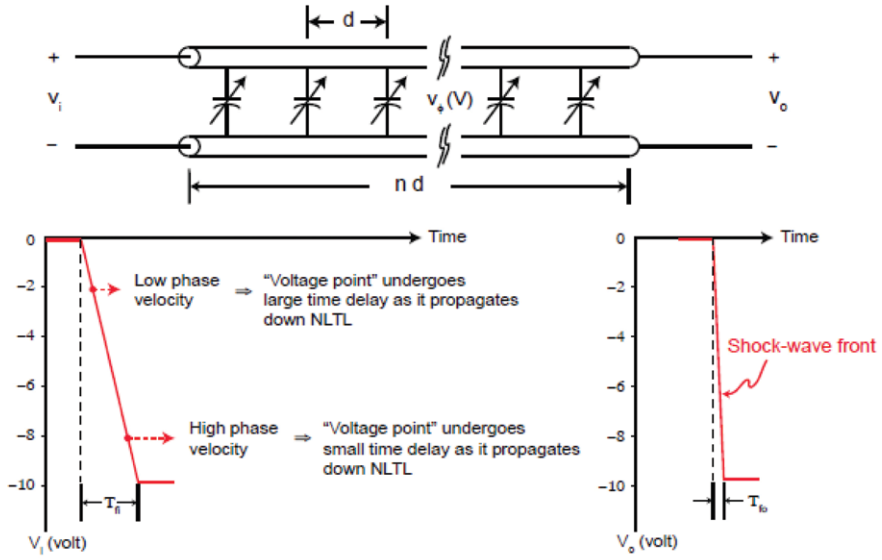

Figure 2: the propagation of an electrical wave along a non-linear transmission line is analogous to that of a wave in the sea before breaking on the shore.

Furthermore, these leaky signals are frequency-dependent, and cannot be removed through calibration. Therefore, they impose limitations on the dynamic range of an SRD-based sampling VNA. This limited dynamic range hampers the full characterisation of highly reflective devices such as high-pass filters, as well as devices in which weak cou-

pling (such as weak crosstalk) between constituents must be measured as a function of frequency.

Users also have to grapple with the poor short- and long-term stability of broadband VNA measurements, attributable to:

- Physically large measurement structures, made of diverse materials, using discrete components such as reflectometers, receivers, signal conditioning devices, interconnect cables, waveguides and so on;
- High-frequency multiplexing schemes;
- Complex receiver structures such as harmonic frequency converters and complex LO distribution networks.

Avoiding the disadvantages of conventional sampling VNA technology

So while conventional sampling VNAs suffer from limited dynamic range and poor stability, alternative VNA technologies promise to offer substantial improvements in measurement performance. And in fact Non-Linear Transmission Line (NLTL) technology offers marked advantages in millimetre wave applications. It has historically been used for pulse-shaping applications and in digitising oscilloscopes. Over the years it has proved to be a credible and robust technology. Now it has been refined by Anritsu for high-frequency use, and complemented with novel monolithic broadband directional bridges, multiplexers, and other key components. This has enabled the production of NLTL-based samplers and distributed harmonic generators suitable for a frequency-scalable VNA architecture.

In general terms, NLTLs are distributed devices that support the propagation of non-linear electrical waves such as shocks and solitons. Shock wave propagation along an NLTL closely mimics the motion of waves in the sea just before breaking on the shore.

In their basic form, NLTLs consist of high-impedance transmission lines loaded with varactor diodes that form a propagation medium whose phase velocity, and thus time delay, are a function of the instantaneous voltage across the diodes (see Figure 2). The lower the voltage, the lower the phase velocity and the longer the time delay of a waveform propagating along the non-linear transmission line. Conversely, the higher the voltage, the greater the phase velocity and the shorter the time delay. When acting on a section of a trapezoidal voltage waveform applied to its input, an NLTL compresses the waveform's front, resulting in a step-like voltage which is rich in harmonics.

By using the fall-time compression characteristics of an NLTL, a train of very narrow gating pulses can be generated at microwave and millimetre-wave frequencies for sampling receivers starting from a carrier wave signal (see Figure 3). An essential ingredient in the pulse formation process is a differentiator circuit (not shown) which transforms the step-like output of an NLTL into a pulse.

On the other hand, broadband distributed harmonic generation is achieved by using the 'harmonic growth' characteristics of NLTLs. Since two primary functions of any VNA are

generating signals and sampling them, NLTL technology is especially well suited for use in such instruments.

NLTL-based samplers endow VNAs with various attractive features, including RF and LO frequency scalability, and high channel-to-channel isolation. As described above, effective isolation underpins high dynamic range: it is achieved by means of amplifiers, filters and other isolation elements (see Figure 4).

Miniature reflectometers

When implemented in modern VNA architectures, NLTL-based samplers offer a number of other benefits as well. For instance, an important advantage of NLTL-based VNAs is the monolithic integration of their various constituents. These include the sampling receivers, distributed harmonic generators, directional bridges, and other key components. The resulting reflectometer modules share the same thermally stable mass. They are also very small (see Figure 5), which greatly reduces temperature variations. This in turn results in excellent short- and long-term stability, and allows for longer intervals between calibrations. In addition, the elimination of microwave connectors between the various reflectometer components enhances performance (because of reduced losses and reflections) while improving system reliability and stability.

The small size of the NLTL-based reflectometers brings several applications into play which would otherwise be difficult or impossible for VNAs to implement:

- High-frequency on-wafer testing, with the advantage of locating the VNA close to the DUT. Directly connecting the reflectometer to the wafer probe enhances directivity, port power and system stability;
- Dense multi-port on-wafer measurements;
- Very low-cost testing of components in production environments;
- Testing of high-frequency devices in the field with a handheld VNA.

Wide dynamic range across a broad frequency range

NLTL samplers offer extremely wide RF bandwidth (see Figure 6), scalable to sub-millimeter-wave frequencies. The continuous frequency coverage is limited only by the bandwidth of the coaxial connector and the number of NLTL frequency multiplier chains. When combined with a directional bridge, NLTL samplers enhance a VNA's directivity.

By contrast, older architectures must concatenate two frequency bands through the implementation of a large external combiner to in order to extend the frequency range of a VNA. This impairs the VNA's raw directivity and output power.

Another important advantage of the NLTL-based reflectometer is its inherent temperature and time stability, a result of its monolithic construction, which produces a vanishing thermal gradient across the reflectometer module and the sampling directional bridge. Measurement stability and temperature drift are markedly better than those of SRD samplers and classical mixers.

More measurement capability, less cost

Anritsu's use of NLTL technology, first introduced commercially in 2009, has enabled it to refine and miniaturise the components of a VNA to the point at which it now has an NLTL-based VNA-on-a-chip. This has opened up a number of new application spaces for the VNA. For instance, price-sensitive component manufacturers face a familiar pressure, to satisfy demand for improved performance and features at lower prices. To help meet this demand, Anritsu introduced in mid-2014 the 'ShockLine' range of NLTL-based VNAs, which provide performance matching that of full-featured, high-end benchtop VNAs at a much lower cost.

The ShockLine VNAs mark a radical departure from conventional VNA design, since they feature no display or keypad. The whole family uses industry-standard LAN communications for remote control. ShockLine VNAs also provide a powerful graphical user interface for manual testing of devices. The full-featured user interface is enabled by attaching a (user-supplied) touch-screen monitor, keyboard and mouse. A small 2U chassis allows the VNAs to easily slide into rack configurations. The space-saving design does not, however, compromise performance. For instance, the ShockLine MS46522A VNA features a 70 µs/point sweep speed, >110 dB dynamic range and corrected directivity of >42 dB.

The development of a brand new category of VNAs, optimised for cost-conscious engineering, production and education environments, shows the value of the fundamental NLTL technology on which they are based, and points to a future in which VNAs become as familiar a presence in the factory as they are today in the laboratory.

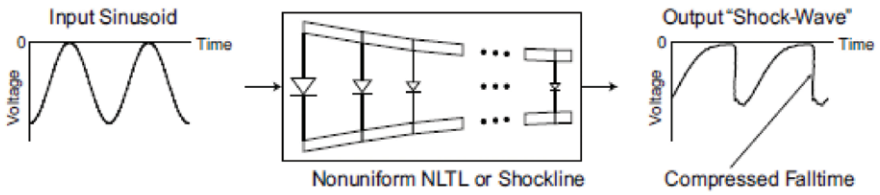

Figure 3: non-uniform NLTLs enhance fall time compression, and result in a train of step-like waveforms when driven by a carrier wave signal. Step differentiation results in a train of pulses that are used for sampler gating.

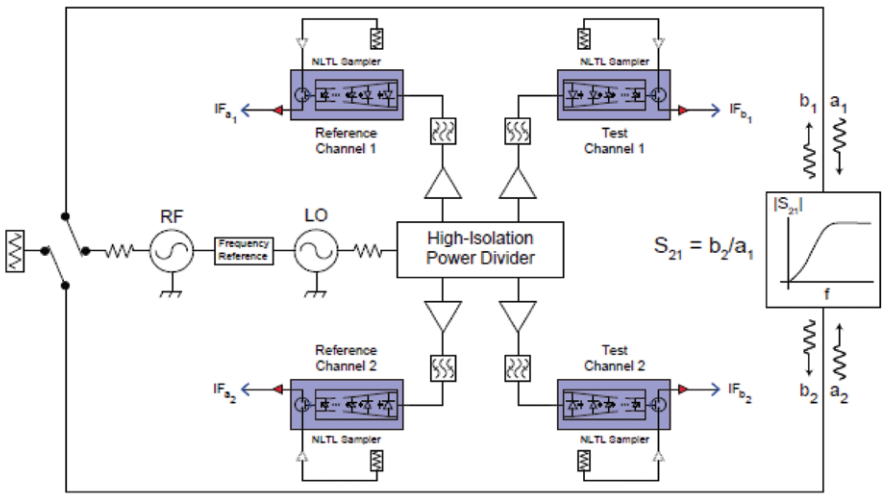

Figure 4: in an NLTL-based VNA, channel leakage is suppressed by means of devices such as amplifiers, filters and isolators.

Figure 5: an NLTL-based frequency extension module operating at up to 145 GHz. Weighing just 365g, it is 1/50th the volume of traditional millimetre-wave modules.

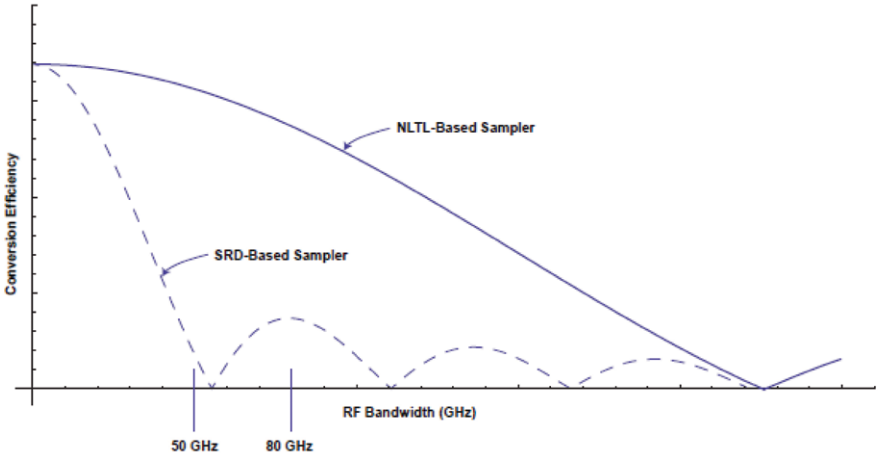

Figure 6: the bandwidth of an NLTL-based sampler is much wider than that of the SRD-based equivalent.

The author

Ajaiey Sharma has held various positions at Anritsu since 2001, including design engineering roles in which he developed high-frequency coaxial and waveguide components. He has led various product development projects related to power measurements, signal generation and vector network analysis and is currently working as a Director of Marketing and Business Development for emerging business operations. Mr Sharma holds an MSEE degree from the University of Nevada, Reno, and an MBA from the Wharton School, University of Pennsylvania.

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www.anritsu.com

Sensor footprint evolution — Does size matter?

By Bosch Sensortec

Steve Barraclough, senior director of product management at Bosch Sensortec, reckons that sensor size matters in the market – but mainly in opening up new applications. In the case of inertial MEMS sensors that is likely to be opening up wearable applications rather than winning mobile design slots.

In a previous incarnation, the article by Steve and co-authored by Lutz Rauscher from Bosch Sensortec, was entitled "Trends in MEMS orientation sensor form factor reduction." That was until we ran the draft past a colleague for proof reading, and in her feedback she summarised: "So, what you are really questioning is does size matter, and if so why does it matter?"

Having realized what she had said, and the three of us blushing past the inevitable smirks and associations that the question raises, we settled on this title simply because it questions the basic assumption within MEMS industry community that smaller actually equates to better. Now, for those to which the question conjures up negative connotations, we offer a small apology, but we do hope we will continue to have your attention.

Industry observers will not argue that the explosion in the adoption of motion sensors, principally accelerometers, was enabled by reducing the form factor to the point where the sensors could easily be integrated into mobile applications. Bosch now ships more than three million sensors a day, a large proportion of which are discrete 2 mm x 2 mm accelerometers, but the roots of the MEMS technology evolution originate in automotive industry where accelerometers were developed to trigger airbag deployment in motor vehicles, a working environment not overly subject to size constraints and in fact there were solid technical reasons not to shrink. A colleague here at Bosch Sensortec who previously worked in the automotive division commented, "None of us believed size reduction of an accelerometer to something smaller than 10 mm x 10 mm was even possible..."

It turned out to be a real challenge, but once the initial hurdles were overcome it became clear that size reduction in this context equated to cost reduction, which eventually drove the sensor footprint down to the point where entry into the mobile space became feasible.

The tipping point for mobile adoption appears to be around 3 mm x 3 mm, a point where cost, size and performance became acceptable for the consumer electronics sector and inertial sensors ubiquitously present in mobiles. That drive for smaller sensors has continued through to today, with Bosch now offering an industry leading accelerometer portfolio with a 2 mm x 2 mm and below footprint.

Customer feedback highlights the advantage: for a typical 80 square millimeters smartphone PCB (available area), moving from a 9 square millimeters to a 4 square millimeters footprint increases placement options by 225%.

A great example are also pressure sensors – being available only in rather large and (maybe even more importantly) thick packages, they have been ignored by the industry for many years. Now being offered in a 2 mm by 2.5 square millimeter without sacrificing performance their use has seen 3-digit percentage year-on-year growth rates.

For mobiles 2 mm by 2 mm seems to be a sweet spot for inertial sensors, establishing a good compromise between placing flexibility, ease of handling, solder pitch, performance and, of course, cost.

So, most of the recent effort went into combining inertial, magnetic sensors and much more intelligence into housing of the same or a just slightly increased footprint. These technological marvels have been pushing the limits of MEMS and assembly technology alike.

But what of the future?

Is there real demand for smaller, and can the significant R&D investments be justified? Maybe not from a purely cost-driven perspective and there are also drawbacks in further miniaturization. For example, reducing footprint also limits pin-out options: a given area and pad pitch – industry standard is 0.4 mm – dictate the total number of pin options. Also handling becomes more difficult the mechanical sensitivity of ever-smaller devices may cause additional effort for the application engineering.

However, the rise of the smartphone and tablet markets has delivered small, low-cost sophisticated components which in turn are enabling wearable technology applications. These products are still in their infancy, and looks to redefine the concept of personal accessory in terms of functionality and applications. Unlike the current smartphone footprint, this market is highly diverse in terms of construction and footprint. One common denominator however is that the working area for the electronics components is just a fraction of what is available in a mobile.

Last year Bosch Sensortec unveiled the 12-bit BMA355 accelerometer in 1.2 mm by 1.5 mm Wafer Level Chip Scale Package (WLCSP) being the smallest sensor of its kind on the market. Indeed this comes as close to a bare die sensor as MEMS will ever get, enabling the next level of system integration. Interest in the device from the smartphone and tablet sector has been limited, but this is no surprise as the current focus for discrete devices is either low cost or highest performance, currently supported by our 2 mm by 2 mm portfolio.

For wearable applications, interest is extremely strong and this is a clear indicator that small size has a clear value in the new and emerging applications.

Working within a 100 cubic millimeter volume, the BMA355 increases placement options by 215 percent over 2 mm by 2 mm devices – similar to what the 2 mm sensors did for mobiles.

In two recent customer engagements, integrating accelerometer functionality into their products – fitness and hearing aid applications – would not have been possible without the BMA355.

So what do we conclude? From a supplier's perspective, the customer vote on the question of "does size matter" is a clear yes. While some areas of the mobile consumer market are pushing for pin compatibility and standard form factors, the new applications are enabled and are driving further innovation and reaping the benefits.

www.bosch-sensortec.com

Steve Barraclough is a 30-year veteran of the semiconductor industry now specializing in product marketing and business development for wireless communications and mobile multimedia consumer products. Steve is senior director of product management at Bosch Sensortec GmbH.

Article courtesy of EE Times' Planet Analog.

Dutch startup shrinks 60-GHz radars while increasing precision

By Julien Happich

Founded in 2011, Dutch startup Omniradar announced it has secured €2.6m of equity and debt financing to roll out its single-chip 60-GHz radar solution. Investing in this round were Orlaco, a manufacturer of camera systems for vehicles and vessels, the company's founders Paul van Zeijl and Hans Brouwer, as well as the Netherlands Enterprise Agency.

With the funds, and together with foundry partner NXP Semiconductors, the startup plans to bring to production its RIC60 60-GHz radar ICs for application in vehicle safety, but also to be used as a new precision sensor for personal security, industrial automation or environmental monitoring.

Operating in the 60-GHz ISM band (57-64 GHz) and measuring only 7.0- x 7.0- x 1.2-mm, this complete SiGe radar front end integrates one transmit- and two receive-antenna on the silicon die, allowing for the simultaneous detection of position, speed and angle of arrival for multiple objects. With its 7 GHz operational bandwidth, the chip can achieve higher position and speed accuracy than competing automotive radars solutions on the market, claims Omniradar.

"The precision is in the order of a few centimetres for discerning between objects", told us Hans Brouwer, the company's CEO, "with a practical sensing range up to 15m".

The company chose the 60-GHz ISM band because it is open, and not restricted to automotive applications.

"We could have also used the same technology in the higher frequency band (76-77 GHz), but it had less bandwidth so less resolution. It is actually linear, so 1-GHz bandwidth gives 1/7 the resolution of 7 GHz. Resolution meaning the possibility to differentiate between two objects. For accuracy we can get to sub mm (100 µm) with the right processing of data, and using our PLL", commented Brouwer.

But most importantly, "because the antennas are integrated in the die, radar system designers don't have to worry about RF design" emphasized Brouwer, and the whole system could be 5 to 10 times smaller and cheaper than existing solutions.

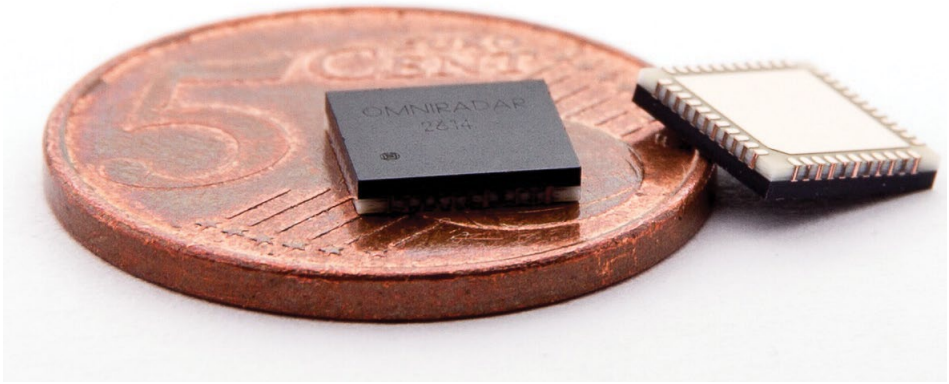


Figure 1: Omniradar's 60-GHz chip measures a mere 7.0- x-7.0- x 1.2-mm.

This makes this sensor solution much easier to adopt, opening up new application areas where radar was never cost-effective or practical, benefiting from speed, resolution and the radar's ability to "see through" obstacles.

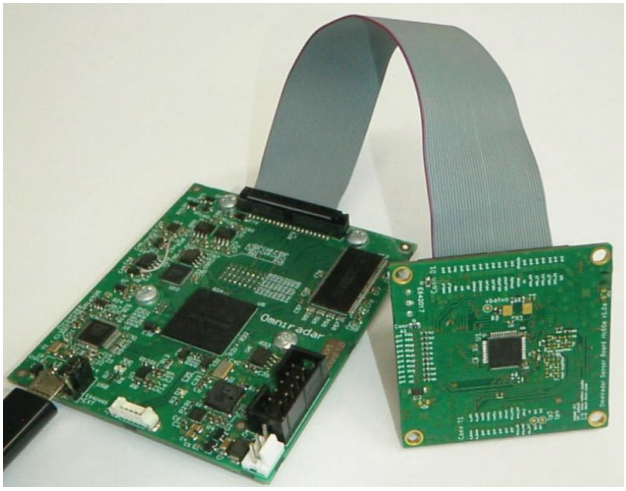


Figure 2: Soon to be released, Omniradar's development kit.

"All that you need to get running is to add a signal processing unit such as an FPGA or a DSP and a small CPU", added Brouwer who does not discard the possibility of producing such a System-in-Package if some high-volume industrial application justifies it in the future.

Although initially, Orlaco and Omniradar will work together to integrate radar blind spot detection across Orlaco's range of products, in the future the radar IC could be used for 3D imaging, for geofencing in security applications, or to implement advanced proximity detection.

The company had its first round of silicon in 2012, then a second round in 2013, and this third IC iteration has come up with the necessary improvements for commercialization. It expects stable and volume production for the first quarter of 2015. To further facilitate design, in the coming weeks the company will release an evaluation platform (the Omniradar Radar Development kit) for the RIC60A complete with an USB-interface board and sample MATLAB scripts for radar measurements and algorithm development on PC.

A second version of the radar chip, RIC60B, has been designed without integrated antenna, to be used as a die or as part of a module with antenna arrays that Omniradar also offers to customize.

www.omniradar.com

Monitoring deteriorating bridges with wireless sensors and drones

Developed countries have an enormous amount of infrastructure built over many decades. But there is a downside, all this infrastructure that has been put in place is facing ever rising inspection and maintenance costs. Ways need to be found to find faults before they happen, known as preventative maintenance, that are more automated and significantly cheaper.

Today, bridges are inspected visually by teams of engineers who dangle beneath the bridge on cables or look up at the bridge from an elevated work platform. It is a slow, dangerous, expensive process and even the most experienced engineers can overlook cracks in the structure or other critical deficiencies.

Recently a report from the Obama administration warned that one in four bridges in the United States needs significant repair or cannot handle automobile traffic.

In order to tackle this problem, Tufts University engineers are employing wireless sensors and flying robots that could have the potential to help authorities monitor the condition of bridges in real time.

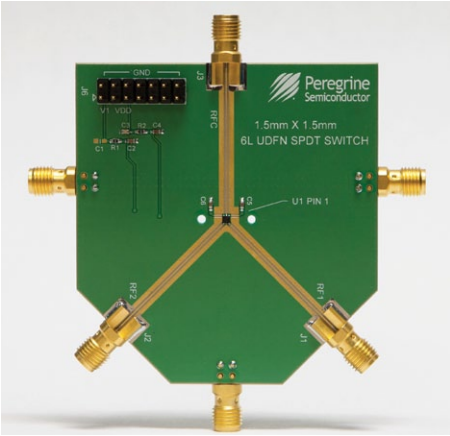
In the detection system being developed by Babak Moaveni, an assistant professor of civil and environmental engineering at Tufts School of Engineering, smart sensors are attached permanently to bridge beams and joints. Each sensor can continuously record vibrations and process the recorded signal. Changes in the vibration response can signify damage, he says.

Moaveni, who received a grant from the National Science Foundation (NSF) for his research, is collaborating with Tufts Assistant Professor of Electrical and Computer Engineering Usman Khan to develop a wireless system that would use autonomous flying robots (quadcopters) to hover near the sensors and collect data while taking visual images of bridge conditions.

The drone-like robots would transmit data to a central collection point for analysis. Khan received a $400,000 Early Career Award from the NSF earlier this year to explore this technology, which requires addressing significant navigational and communications challenges before it could be a reliable inspection tool. Moaveni and Khan's work could help monitor bridges and identify those that are at risk more accurately than current methods. Once installed, the sensors would provide information about the condition of bridges that cannot be obtained by visual inspection alone and would allow authorities to identify and focus on bridges that need immediate attention.

Carrier-grade Wi-Fi switch

cuts power and footprint



Peregrine Semiconductor has introduced the UltraCMOS® PE42424 high-isolation, SPDT switch optimized for 802.11ac carrier and enterprise Wi-Fi access points. Successor to last year's groundbreaking PE42423, the upgraded switch is 75 percent smaller and features a 60-percent increase in power handling and a 350-percent faster switching speed.

The PE42424 is ideally suited for transmit/receive switching applications for outdoor Wi-Fi access points that require high power handling and rugged, high-temperature performance. Peregrine's RF switch enables these WLAN products to realize the promise of 802.11ac, which is offering high data throughput in increasingly dense, bring-your-own-device (BYOD) environments.

The PE42424 is designed to meet specific 802.11ac-based ODU access point needs. It delivers high power handling of 8 W to accommodate the higher transmit power of the access-point radios and fast switching speed of 145 ns to enable higher throughput and data rates in high-density, BYOD environments. A high port-to-port isolation reduces signal leakage between transmit and receive paths.

The device also features temperature support up to 105°C to withstand harsh environments and to reduce thermal constraints, and a small 1.5x1.5 mm footprint to reduce board area and offer engineers more design options for other functions.

High linearity of 61 dBm IIP3 over the entire power-supply range enables system designs with lower supply rails and prevents linearity degradation through maximum power levels. A high ESD rating of 2500V (on RF pins) increases product reliability and eases manufacturing flow. The 50-ohm absorptive switch supports +1.8 V standard logic control and provides stable RF performance over a power supply range between 2.3 V and 5.5 V. Samples, evaluation kits and volume-production parts are available

www.psemi.com

Development kit

enables rapid prototyping for IoT devices and applications

Broadcom Corporation has introduced a development kit into its Wireless Internet Connectivity for Embedded Devices (WICED™) family to enable developers to rapidly prototype ideas and concepts for IoT devices and applications.

The WICED Sense development kit is an all-in-one IoT prototyping kit that includes tha company's latest Bluetooth Smart chip, five micro electro-mechanical systems (MEMS) and has a software stack that is Bluetooth 4.1 compatible.

The WICED Sense kit provides innovators of all sizes a cost-effective platform that minimizes set-up time and enables rapid demos of IoT concepts for hardware and software developers. By shortening the time between early ideas and end products, companies are able to deliver devices to market more quickly and with higher confidence in their success.

www.broadcom.com

Single-chip car radio receiver

delivers global coverage and cuts costs

Si4790x is an automotive receiver family that scales from economical, single-tuner designs to premium, multi-tuner car radio systems.

The superior linearity of the Si4790x tuner's integrated RF front-end, combined with a comprehensive AM/FM firmware running on a high-performance on-chip radio DSP, sets a new bar for key automotive radio metrics such as sensitivity in weak signal environments, selectivity in the presence of blockers, and immunity to multipath fading and distortion.

To address today's global market, the Si4790x tuner family supports all worldwide broadcast radio bands including AM/FM, longwave (LW), shortwave (SW), NOAA weather band, FM RDS decoding, and AM/FM HD Radio and DAB reception (Band-III and L-band).

The Si4790x family's scalable architecture allows developers to optimise system configurations to match specific automotive OEM requirements worldwide. Using the Si4790x family, Tier 1 suppliers can make the most of their R&D investment across multiple product segments, from cost-effective single-tuner designs to premium multi-tuner systems, with one modular architecture. All tuner devices in the Si4790x family share the same application programming interface (API) allowing infotainment system developers to reuse the same software across different product lines and market segments.

www.silabs.com

RF amplifier

delivers high power with 256 QAM modulation

SST12CP21 is a 2.4 GHz 256-QAM RF high-power amplifier that offers low EVM and current consumption for IEEE 802.11n systems. It delivers high linear output power of up to 23 dBm at 1.75% dynamic EVM, with MCS9 HT40 MHz bandwidth modulation at 5V and 320 mA current consumption.

The amplifier provides 25 dBm of linear power, at 3% EVM with 350 mA current consumption for 802.11g/n applications. This performance extends the range of 802.11b/g/n WLAN and MIMO systems, while consuming

extremely low current at the maximum 256-QAM data rate. The SST12CP21 is also spectrum mask compliant up to 28 dBm for 802.11b/g communication. Board space is reduced by the 3 x 3 x 0.55 mm, 16-pin QFN package that matches a popular pin-out.

This amplifier also features 50Ω on-chip input match and simple output match, which is easy to use and reduces board size. The integrated linear power detector provides accurate output power control over temperature and 2-to-1 output mismatch.

www.microchip.com

C-band to KA-band VSAT antennas

modular design, cut costs

Luso Microwave, an operating division of Luso Electronics, has announced a family of modular C–band to KA-band antennas in a range of reflector sizes from 1.2 m to 4.2 m. The modular design reduces installation time, cut costs and adds flexibility to microwave satellite networks, including making KA band installations financially viable for cost-sensitive commercial applications.

KA band usage is growing due to problems with spectrum overload in other bands. Furthermore, a 1.8 metre diameter KA band dish offers comparable performance to a 4.2 meter KU band antenna. The much smaller antennas and waveguides simplify transportation, handling and installation.

Luso will deliver the antennas from stock. Installation and commissioning of a 5-piece motorized system is typically completed in one day, about one-third of normal installation time for comparable antennas. Customers can opt for a fixed installation in the first instance then upgrade easily to a full tracking one at a later date. The modular design also simplifies other changes that may be needed during the life of the installation.

The antennas are supplied in four variants: fixed, manually adjustable, motorized and full tracking. A range of ancillary components is also available.

www.lusoelectronics.com

Fixed frequency synthesizer

delivers ultra low phase noise

Z-Communications has announced an RoHS compliant fixed frequency synthesizer designated model SFS6864A-LF in the C-band. This single frequency synthe-

sizer operates at 6864 MHz with a 10 MHz reference and features a typical phase noise of -86 dBc/Hz at the 10 kHz offset.

The SFS6864A-LF is designed to deliver a typical output power of 3 dBm with a VCO voltage supply of 5 Vdc while drawing 35 mA (typical) and a phase locked loop voltage of 3 Vdc while drawing 11 mA (typical). It features a typical 2nd harmonic suppression of -20 dBc and spurious suppression of -65 dBc.

The device is ideal for satellite communications applications and operates over -40 to 85°C.

www.zcomm.com

PIN diode switches

up to 12 GHz offer isolation as high as 90 dB

Pasternack Enterprises is offering a family of high isolation PIN diode switches consisting of three low insertion loss, high isolation and high speed modules, covering a frequency range of 1 to 12 GHz.

When signal integrity and performance are a critical component of system functionality, the higher the isolation figure, the better the overall performance will be. These latest PIN diode switches feature very high port-to-port isolation of greater than 90 dB at 1-2 GHz, 80 dB at 2-4 GHz and 75 dB at 6-12 GHz. Insertion loss of the high isolation switches varies between 1.0 dB and 2.5 dB depending upon the frequency and switching speed performance ranges from 35 and 75 nanoseconds.

These RF switches are designed with complementary-metal–oxide–semiconductor (CMOS) transistor–transistor logic (TTL) drivers, and are fully matched internally for 50 Ohm input and output, which eliminates the customers need for any additional sensitive RF tuning components.

The company's hi-rel PIN diode switches are housed in SMA-connector-ized casings that are built to withstand a wide operating temperature range of -54

to +85 °C

www.pasternack.com

EMC broadband source

covers 1 GHz to 40 GHz

Heuermann HF-Technik GmbH offers a second generation broadband test-transmitter based on an improved comb generator and a broadband antenna.

The SG-CG2 wideband comb generators were developed for quick microwave receiving equipment test under various conditions. Quick and simple usage was one of the primary design goals. The SG-CG2 transmitters generate a crystal referenced fundamental frequency of 1.00 GHz and generate harmonics on whole-number multiples of the fundamental, up to 40 GHz and beyond, via non-linear elements. The generated frequency comb is then radiated by an internal wideband microwave antenna with an antenna gain of 0 dBi.

An internal wideband antenna increases ruggedness as no external precision microwave connectors are necessary. Other features include a stand alone system with internal 9 V battery holder or external DC supply possible; compact and rugged case, ideal for portable and field use; and internal low noise oscillator and high power comb oscillator.

www.hhft.de

Next generation multi-mode LTE modem

enters mass production

Spreadtrum Communications (Shanghai) has announced its next generation multi-mode LTE modem, the SC9620. This LTE modem pairs with Spreadtrum's smartphone chipsets to provide customers with a complete turnkey mobile platform for 4G smartphones. The company's 4G mobile platform has been adopted by leading handset brands Lenovo and Coolpad and is shipping in 3-mode LTE smartphones recently launched for the domestic Chinese market.

The SC9620 is an LTE baseband modem designed for use in 4G smartphones, tablets, or other data devices, supporting 3GPP LTE Release 9 Category 4 at up to 150 Mbps downlink speed. In tandem, Spreadtrum has released a turnkey solution for 3-mode LTE devices supporting TD-LTE, TD-SCDMA and EDGE/GPRS/GSM for the domestic Chinese market. Supported TD-LTE bands include Band 38, 39, 40 and 41.

Turnkey platforms supporting 5-mode operation are expected to follow later this year.

www.spreadtrum.com

Low power GNSS module

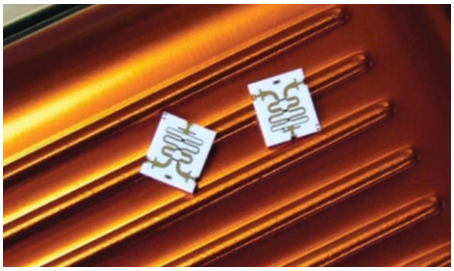
ideal for automotive and wearable designs

Hong Kong based manufacturer of location receivers, Maestro Wireless Solutions, and CSR, have introduced the A5100-A, a next-generation SiRFstarV Global Navigation Satellite Systems (GNSS) positioning module that combines high performance GPS and GLONASS receiver technology in a 10 x 15 mm package.

The A5100-A is suitable for applications including wearable devices, cameras and automotive trackers. It is the first release in Maestro's new line of GNSS receivers, and achieves high levels of accuracy with quad-constellation support, up to 30% faster Time-To-First-Fix (TTFF), and up to 20% lower power consumption using CSR's TrickleFix Power and Push-to-Fix (PtF) modes.

The module reduces development risks by integrating a number of features including, TCXO, SAW filter, RTC, antenna control mechanism, and flash memory for future-proof upgrades, as well as, offering a drop-in replacement capability for Maestro's previous SiRFstar4 generation modules. The castellated edge form factor also enables simpler manufacturing and reduces assembly cost.

Supporting all currently deployed GNSS, the A5100-A acquires and tracks all visible GPS, GLONASS, QZSS, and SBAS satellites.



www.maestro-wireless.com
www.csr.com

Wilkinson power divider

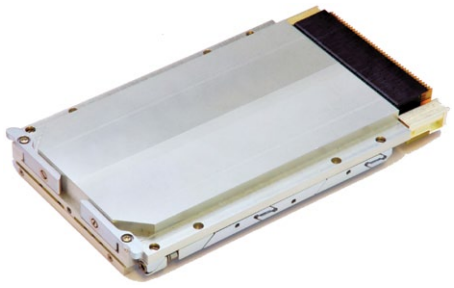
ideal for low power in-phase combining or splitting

Knowles Capacitors is offering a Wilkinson power divider from their Dielectric Laboratories (DLI) facility. It is designed to provide in phase power splitting or combining over a broad bandwidth in low power applications.

This is achieved by application of precision thin film fabrication with integrated resistors, coupled with DLI's high permittivity ceramic materials, to provide a high performance and repeatable design solution.

DLI product PDW05758 provides broad band performance in a compact and convenient surface mount package for easy integration. At 0.160-inch (4.06 mm) x 0.185-inch (4.7 mm) this divider can replace both packaged MMIC based devices as well as larger dividers integrated into printed wiring boards (PWB) without sacrificing performance.

The power divider utilizes a proprietary ceramic substrate. This high permittivity, yet temperature stable, substrate allows for the design of the power divider without typical parasitic effects associated with MMIC base solutions. The result is broad band 6 GHz to 18 GHz operation. The return loss and isolation are typically 20 dB or better throughout the band of operation while the mid band insertion loss is typically 0.4 dB.



www.dilabs.com

Rugged VPX module

provides DSPs and FPGA for software radio, imaging or radar

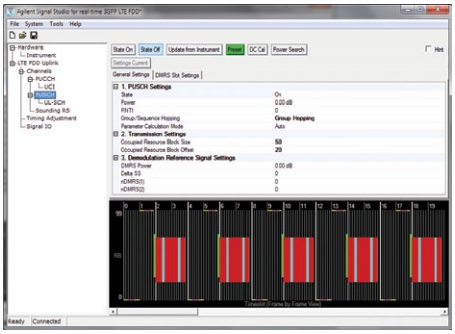
CommAgility has announced that its VPX-D16A4 module is now shipping to early customers. The module has also now been tested across its full conduction cooled, -40C to +70C temperature range.

The VPX-D16A4 is a rugged high performance DSP and FPGA based card, and is CommAgility's first board in the compact VITA™ 65, 3U OpenVPX™ form factor. It is ideal for applications such as software defined radio (SDR) (including LTE, Remote Radio Head (RRH), WiMax and Cloud RAN), imaging or radar, and is well suited to military or other harsh field deployment environ-

ments. It is available as either conduction cooled or air cooled versions.

The board is based around a Texas Instruments (TI) TCI6638K2K KeyStone™-based System-on-Chip (SoC) and a TI TMS320C6678 SoC, which between them contain sixteen C66x DSP cores and four ARM® Cortex®-A15 cores. The two SoCs are closely coupled with TI's HyperLink bus as well as Gigabit Ethernet, and each device has a 20Gbaud SRIO link to the VPX backplane.

The module provides flexible I/O interfacing, including support for SRIO, Ethernet, CPRI and Multi-Gigabit Transceiver (MGT) to the backplane plus links to RF or analogue I/O. For additional I/O or co-processing, the main DSP is connected via PCI Express and the AIF2 CPRI interface to a Xilinx Kintex-7 K325T FPGA, which also has Gigabit Ethernet and its own backplane MGT connections.



www.commagility.com

Signal generation tools

for Wi-SUN and LTE/LTE-Advanced

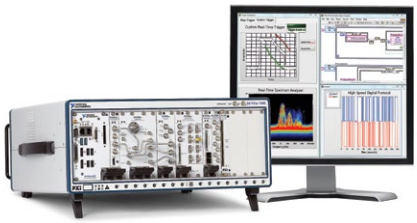
Keysight Technologies have announced two additions to its Signal Studio software suite of signal creation tools. The first is signal generation software for the IEEE 802.15.4g-based Wi-SUN standard. The second is support for LTE/LTE-Advanced uplink (UL) 2x2 MIMO with real-time Hybrid Automatic Repeat Request (HARQ).

These latest capabilities further ease the signal generation requirements for R&D and manufacturing engineers developing or testing the conformance of devices to the Wi-SUN and LTE/LTE-A standards.

N7610B Signal Studio software generates Wi-SUN signals and supports the MR-FSK and MR-OFDM Wi-SUN modes. A fully coded advanced capability allows the software to easily make receiver conformance tests using Keysight signal generators (e.g., MXG/EXG, PSG/ESG or PXIe). For a more complete R&D and manufacturing solution, the N7610B can be used with the company's signal analysis tools.

N7624B/25B is ideal for base station R&D engineers working on LTE eNB receiver conformance testing to the 3GPP TS 36.141 standard. The software runs on either Keysight's PXB or X-Series signal generator. With the PXB, the 2x2 MIMO signal is configured directly on the PXB. An internal fader adds the propagation condition. The closed-loop feedback HARQ signal is generated by the eNB and sent to the PXB, where its baseband generator responds in real-time. Two RF signal generators then upconvert the signal for the PXB.

www.keysight.com



Software-designed instruments

redefine oscilloscopes, signal analysers and high-speed serial test

NI has announced that it has delivered the power and flexibility of software-designed instrumentation to new instrument types and automated test applications, further freeing engineers and organisations from the costs and limitations of vendor-defined instruments.

Two years ago, NI introduced the first software-designed instrument, the vector signal transceiver. By replacing traditional vendor-defined instruments with NI software-designed instrumentation, Qualcomm Atheros improved test speeds by more than 200X and Hittite Microwave reduced test times by more than 30X. The latest software-designed instruments address automated test and research applications across wireless and mobile devices, semiconductor, automotive and aerospace/defence industries, and include:

- 14-bit, 250 MS/s, 300 MHz, 8-channel oscilloscope;
- 26.5 GHz high-performance RF vector signal analyzer;
- 12-bit, 2 GS/s, 2 GHz intermediate frequency digitizer;
- 12.5 Gb/s, 8 TX/8 RX lane high-speed serial instrument.

NI software-designed instruments contain a user-programmable FPGA customised with the familiar graphical data flow of LabVIEW system design software, eliminating the need for specialised languages such as VHDL and Verilog, costly digital design experts or payments to instrument vendors for customisation.

www.ni.com

Synchronised RF transceiver

rapid prototyping kit for software defined radio

Analog Devices claims to offer the industry's first software-defined radio (SDR) rapid prototyping kit with dual 2 x 2 AD9361 RF transceivers, to simplify and rapidly prototype 4 x 4 multiple-input multiple-output (MIMO) wireless transceiver applications on the Xilinx® Zynq®-7000 All Programmable SoC development platforms.

The AD-FMCOMMS5-EBZ rapid prototyping kit provides a hardware/software ecosystem solution addressing the challenges of SDR transceiver synchronization experienced by RF and analog designers when implementing systems using MIMO architectures.

The rapid prototyping kit includes: an FPGA mezzanine card (FMC) featuring two of the company's AD9361 2 x 2 RF transceivers and support circuitry, reference designs, design and simulation tools for MathWorks, HDL (hardware description language) code, device drivers for Zynq-7000 All Programmable SoCs and online support at Analog Devices's EngineerZone for rapid prototyping to reduce development time and risk.

The AD9361 operates over the 70 MHz to 6 GHz range. It is a complete radio design that combines multiple functions, including an RF front end, mixed-signal baseband section, frequency synthesizers, two analog-to-digital converters and two direct conversion receivers in a single chip. The AD9361 supports channel bandwidth from less than 200 kHz to 56 MHz, and is highly programmable, offering the widest dynamic range available today.

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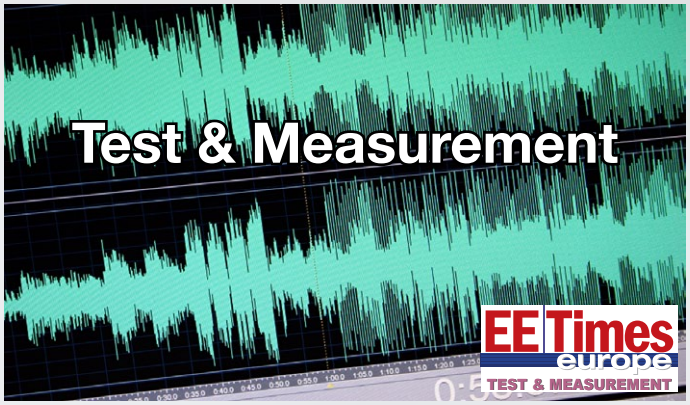

www.tm-eetimes.com

www.power-eetimes.com

WIDEBAND RF SIGNAL PROCESSING SOLUTIONS

BETTER.
BY A WIDE MARGIN.

› 75 dB SFDR at 1.8 GHz Ain

› 80 dB SFDR at 1 GHz Ain

Analog Devices provides the industry's highest dynamic range in wideband RF signal processing solutions – to enable superior designs, in less time, with less risk. In fact, our new GSPS A/D converters deliver 6 dB+ more spurious-free dynamic range than competitive solutions. This performance breakthrough can simplify RF architectures and improve system sensitivity and functionality.

BETTER TECHNOLOGY

- Industry-leading GSPS ADCs with integrated digital downconverters for application flexibility and JESD204B-coded serial digital outputs for simplified interface.
- Portfolio of ADC drivers, DACs, RFICs, clocks, & power components for the complete high-performance wideband RF signal processing signal chain design.

BETTER TOOLS FOR WIDEBAND RF SYSTEM DESIGN

- As a design aid, ADI's GSPS ADC ICs are available on Rapid Development Prototyping and Reference Design FMC modules that seamlessly connect to the Xilinx FPGA development platform ecosystem.
- Modules include validated signal chain hardware, complete HDL code, Linux drivers, documentation, and software reference designs.
- Design tools include Mathworks Simulink® and IIO scope.

Start Prototyping Today!
analog.com/WidebandRF

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