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Antennas

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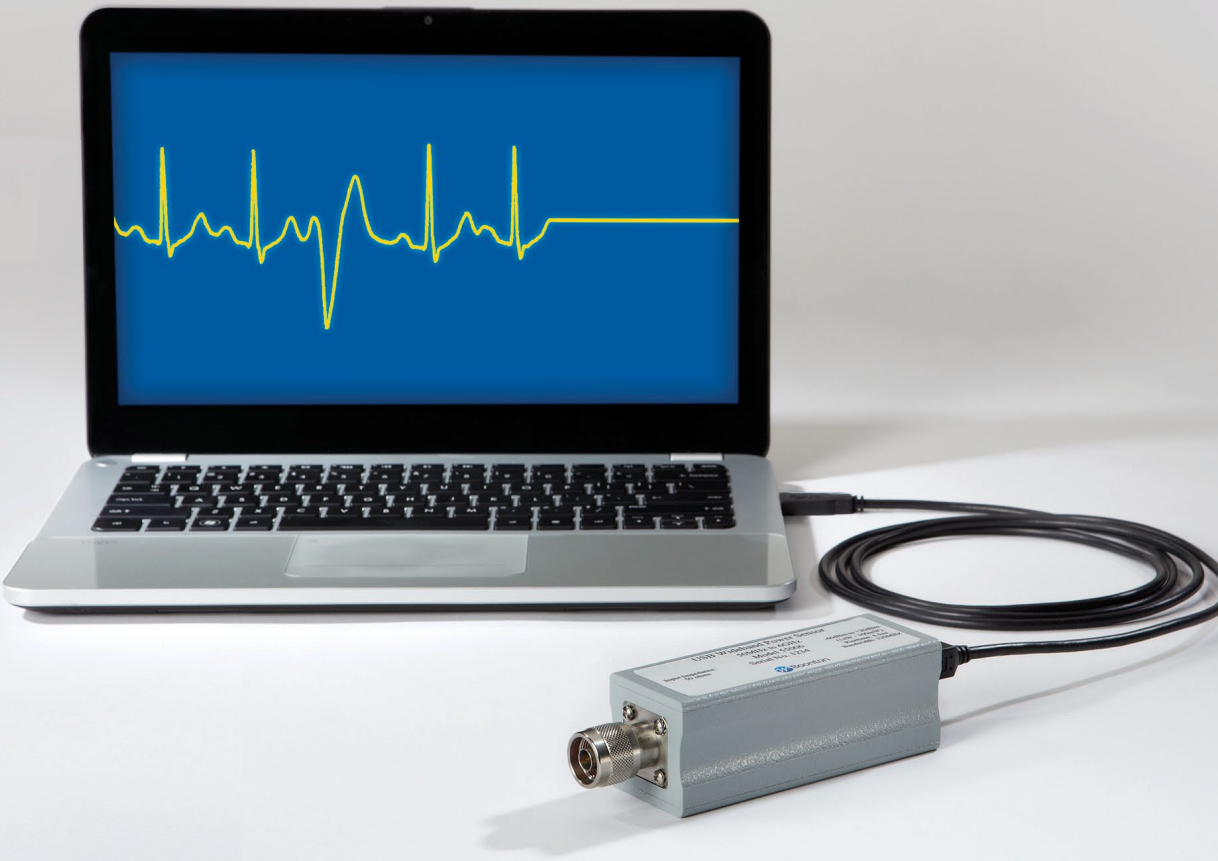

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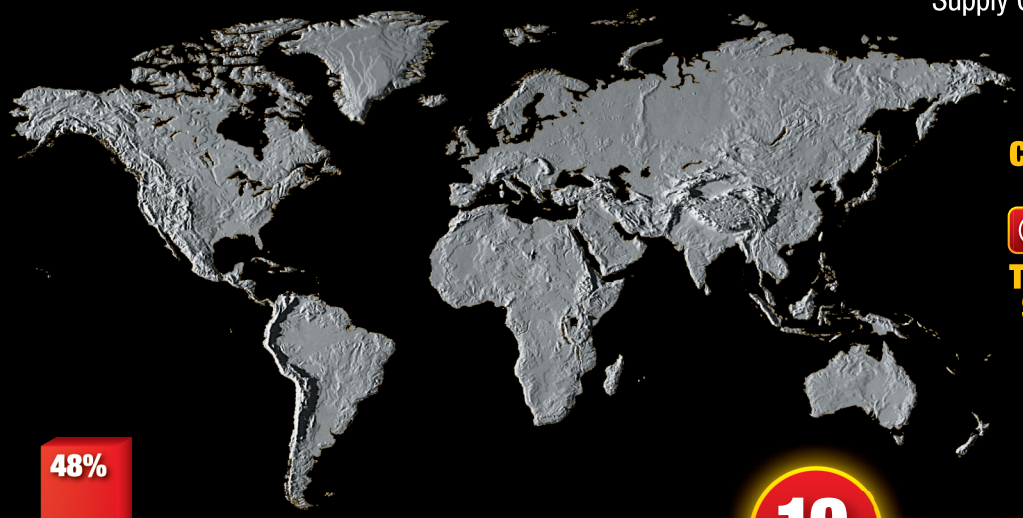

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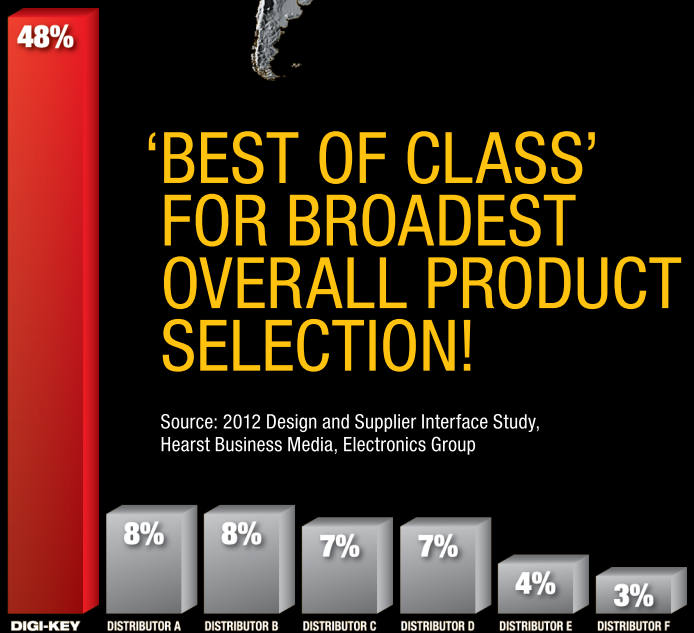

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Comment: The Internet of Everything is starting to take shape

What is driving the Internet of Everything (IoE)? It would appear that the key to IoE growth from here will be sensor based devices rather than mobile devices and computers.

ABI Research's latest data on the Internet of Everything (IoE) shows that there are more than 10 billion wirelessly connected devices in the market today; with over 30 billion devices expected by 2020. According to ABI, node or sensor type devices will account for 60% of the total installed base of devices by 2020 though devices such as smartphones, tablets, and laptops will continue to be an important influence

Jim Feldhan, Semico Research, believes that several factors will drive the Internet of Things. These include but are not limited to: controlling electric usage to minimize energy consumption; remotely monitoring home and appliances; security concerns for home, office and industrial environments; inventory control; and access to entertainment from home, auto or other remote locations.

Another very important area will be healthcare and preventative medicine, here sensors will play a large roll in monitoring vital signs, drug delivery, mobility, and so on.

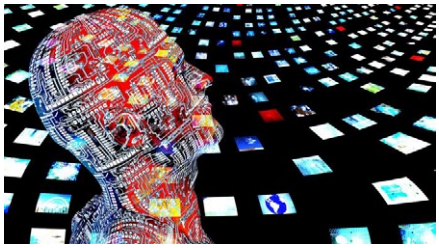
One of the key reasons for developing the IoT is to manage usage of resources more intelligently by minimizing wastage and preventing costly breakdown of vehicles and equipment through the use of preventative maintenance. Concepts such as smart grids, healthcare in the home, smart cities, or asset tracking are becoming more crucial in today's environment. For the IoT to work and help realize these goals the connectivity between sensors, people and machines needs to put into place.

The concept of the smart home will play a large role in developing the services and infrastucture that will make up the IoT. Both energy consumption and healthcare are two areas that could be leveraged by the smart home in the early stages of the buildout of the IoT.

Maybe, we will need new classes of devices. To this end GreenPeak Technologies has released a white paper called "Sentrollers and the Internet of Things" where it defines Sentrollers as a new, all-encompassing term for sensors, actuators and controllers – the various devices that make up the Internet of Things.

The white paper also describes the important role of ZigBee, the technology of choice for the Smart Home, as the crucial enabler for the development of the Internet of Things.

According to the company more devices in the home are connecting to the internet, building the Smart Home, and



starting to shift the balance away from people towards connected things. These devices are usually sensors, controllers, actuators or combinations that together, can be considered as "Sentrollers". For instance: a thermostat senses the temperature, compares this with a desired temperature and activates a heater or air conditioner, controlling, essentially "sentrolling", the temperature. The Smart Home will also accelerate the use of sentrollers beyond the home: in building automation, for the smart grid, and from there in logistical, industrial and agricultural applications.

Time will tell, but it appears we are seeing the beginnings of the next revolution that will redifine not only the way we live but the economics of how we consume resources.

By Jean-Pierre Joosting
Editor: Microwave Engineering Europe
Mobile: +44-07800-548133

Imec and Renesas collaborate on ultra-low power short range radios

Imec and Renesas Electronics have entered into a new strategic research collaboration at Holst Centre to enhance ultra-low power (ULP) wireless technologies for short range communication, targeting sensor networks for automotive and industrial purposes.

As the newest member of imec's ULP wireless systems program, Renesas will work to jointly develop multi-standard radio solutions for small battery-operated or harvested wireless handheld devices. By combining innovative architectures, advanced ULP design IP and efficient low power circuits, imec's ULP radios achieve best-in-class performance and reduce power consumption by a factor of 3 to 10 lower than today's radios. Additionally, imec's ULP high-performance radios are compliant with state-of-the-art wireless standards, such as Bluetooth Low Energy (2.4 GHz band) and ZigBee (2.4 GHz band).

"After five years of successful collaboration in our Green Radio program, we are pleased that a prominent semiconductor company as Renesas now joins our ULP wireless systems R&D. We look forward to developing enhanced ULP solutions contributing to the realization of the internet of things in mass market applications", said Harmke de Groot, program director ULP wireless technologies at imec/Holst Centre.

Researchers from Renesas will reside at Holst Centre in Eindhoven, Netherlands, to closely collaborate with imec's research team. Renesas will gain access to imec's years of research in this space.

www.imec.be
www.renesas.com

Online development environment for the Internet of Things

Thingsquare has announced Thingsquare Code, to help connect products such as light bulbs, thermostats, and smart city systems to smartphone apps.

Thingsquare Code claims to be the world's first online interactive development environment (IDE) for the Internet of Things and works with a number of recent chips that target the emerging Internet of Things market, from leading chip vendors Texas Instruments and ST Microelectronics. Thingsquare Code lets developers of Internet of Things products program their wireless chips from a web browser. Before Thingsquare Code, developing Internet of Things products used to be time-consuming and would require extensive expertise on behalf of the developer. With Thingsquare Code, developers can quickly prototype and validate their products, directly from their web browsers.

"The latest IP/6LoWPAN solutions for IoT applications from Texas Instruments (TI) will be ready for Thingsquare Code," said Oyvind Birkenes , general manager, Wireless Connectivity Solutions, TI. "Thingsquare opens the door to developers from various disciplines to connect their products faster to the Internet."

Thingsquare Code already works with a number of microprocessor platforms, including the ARM Cortex M3 and the TI MSP430. By leveraging secure cloud connectivity, devices can be programmed without cables and without having to install compiler toolchains, which is a large step forward for IoT programming.

Thingsquare Code is currently available for beta testers and will be available for use with a number of wireless chips for the emerging Internet of Things market developed by Texas Instruments and ST Microelectronics.

www.thingsquare.com

Qucell integrates Symmetricom SoftClock into 4G/LTE small cells

Symmetricom has announced the successful design integration of its SoftClocks into 4G/LTE + WiFi small cells offered by Qucell. This successful integration enables Qucell to join Symmetricom's SyncWorld® Ecosystem Program in the small cells category.

Working closely with Symmetricom, Qucell validated the compliance of its "Evolve Q1016" and "Evolve Q1008," two 4G/LTE enterprise and residential small cell products, with the LTE FDD standard. Throughout rigorous testing, Qucell's small cell portfolio was capable of maintaining precise and constant synchronization using Symmetricom's SoftClock software. Qucell enabled Korea Telecom to launch the world's first massive commercial LTE small cell service with its Evolve Q1016 enterprise LTE small cells.

"Symmetricom's SCr/SCe SoftClocks have played an important role in the commercialization testing of Qucell's 4G/LTE + WiFi small cell access points," said Mr. Mark Choi, vice president of Qucell. "It has allowed us to integrate packet-based synchronization into our small cells products."

A recent report by NPD In-Stat on Small Devices predicts that due to skyrocketing demand for mobile data services, the sale of small cell devices will hit $14 billion in retail value by 2015. This growth is being attributed to the surge in mobile data services that are placing a high level of stress on mobile networks typically designed to handle less intensive voice traffic.

Qucell's commercial experience includes 6,000 successful large-scale 4G/LTE + WiFi small cell deployments in 2012 alone, with an additional 12,000 units expected to be deployed by June 2013.

www.symmetricom.com

30 Billion wireless devices on the Internet of Everything by 2020

ABI Research's latest data on the Internet of Everything (IoE) shows that there are more than 10 billion wirelessly connected devices in the market today; with over 30 billion devices expected by 2020.

"The emergence of standardized ultra-low power wireless technologies is one of the main enablers of the IoE, with semiconductor vendors and standards bodies at the forefront of the market push, helping to bring the IoE into reality," said Peter Cooney, practice director. "The year 2013 is seen by many as the year of the Internet of Everything, but it will still be many years until it reaches its full potential. The next 5 years will be pivotal in its growth and establishment as a tangible concept to the consumer."

Bluetooth, Wi-Fi, ZigBee, Cellular, RFID, and many other wireless technologies are all important to drive Internet of Everything growth. The long term expansion of the market will be dependent on wireless technology becoming invisible so that the consumer will be oblivious to which technology is used and only know that it works.

www.abiresearch.com

TSR adds wireless functionality to LED lamp

US-based design company Thermal Solution Resources (TSR) has introduced a LED luminaire with integrated wireless access circuitry, including antenna, microcontroller and software.

The intelliSSL MR16 luminaire is equipped with an extremely compact driver architecture; the control algorithms run on a JN5168 microcontroller from NXP which is designed for extremely low-power applications. Also integrated in the luminaire is the RF receiver and the antenna. The luminaire can be controlled through apps installed on smartphones running under Apple iOS, Android or Windows. The device runs the WPAN protocol IEEE 802.15.4, but since this protocol only covers the two lowest layers of the OSI stack, the luminaire can be used with a broad spectrum of network software stacks including ZigBee Light Link, ZigBee Home Automation and JenNet IP.

www.thermsource.com

MEMS-based micro mirror laser projector can be integrated into cell phones

For years, Fraunhofer IPMS has been working on scanning mirrors for light deflection in one and two dimensions. Alongside resonant scanners with constant sinusoidal movement, a quasi-static variation has also been available for a while, which serves to make linear movement or static orientation in a specified position possible.

Both types make compact laser projection systems possible in practice. These could be used as pico-projector components to be integrated into smart phones, supporting projections at the size of a TV screen, even at a short projection distance. Fraunhofer IPMS now concentrates on the "laser beam steering" principle for image generation. Here, a brightness controlled laser beam (e.g. three, in red, green and blue, for full color display) is directed by a single miniaturized scanning mirror over the projection surface fast enough to generate an image which appears cohesive to the human eye.

The scanning mirrors typically have a diameter of about one millimeter and are manufactured from mono-crystalline silicon wafers using established processes in cost-effective, large batches in the MEMS clean room at Fraunhofer IPMS. It was easy to make one and two dimensional scanners with conventional planar structures (i.e. mirror, outer frame and actuator combs lay on one plane). However, in this case, the resonating frequency is set, and changing the horizontal frequency, for example, is hardly possible. Further, the high scan frequencies which are bound to the double resonant principle are contrary to the trend toward increasing pixel counts in the projected image – right up to full HD.

These disadvantages are overcome with the new quasi-static scanner concept from Fraunhofer IPMS, called LinScan. It requires one subsequent micro-assembly step, along with a small modification to the mechanical design to permanently tilt the actuator combs toward each other. The Institute was able to show that the combination of a resonant actuator on the quick horizontal axis and LinScan on the slower vertical axis is possible for a two-dimensional scanner like those necessary for pico-projectors.

www.ipms.fraunhofer.de

Operator service revenues to top $1 trillion over five years

A new report from Juniper Research finds that the cumulative 4G LTE mobile broadband service revenues over the next five years will account for over $1 trillion, representing approximately 17% of the cumulative operator billed service revenue from all mobile services.

4G LTE revenues are set to grow rapidly and will reach more than $340 billion globally in 2017, reflecting the continued success of LTE in serving higher value subscribers.

The demand for high bandwidth services from end users and the availability of Wi-Fi on most mobile devices has compelled operators to address consumer expectations around quality and user experience while creating new opportunities for the industry. "Along with the 4G network roll-out, the 4G/Wi-Fi combination will continue to provide a scalable and cost effective solution. It offers long term benefits, with the present offload platforms supporting future network infrastructures, and is now a priority for many operators", added report author Nitin Bhas.

The Mobile Broadband: 4G LTE & Wi-Fi Strategies and Opportunities 2013-2017 report also notes that operators need to integrate Wi-Fi offload with other monetisation opportunities such as location based services (indoor and outdoor), to generate additional revenues. The report finds that with 4G LTE having gained momentum over the past 12 months, it is now critical that operators get their pricing models right, thereby avoiding a slowdown in adoption and revenue generation.

For example, in the UK, EE felt obliged to cut its initial LTE pricing by approximately 14% within weeks of its network launch, while Three UK announced 4G access at no extra cost.

www.juniperresearch.com

Bosch highlights radar technology for driver assistant systems

Having already manufactured one million of automotive radar sensors, Bosch expects that the significance of the radar technology for automotive safety and intelligent driver assistance systems will significantly increase in the years ahead. Demand will be driven among other factors by stricter criteria for the Euro NCAP safety assessments.

Radar sensors are at the core of many driver assistant systems, mainly for adaptive cruise control and blind spot detection. Bosch produces such sensors since 2000. In the first years, their acceptance was low and it took 13 years to reach the first million units, Bosch now sees a steeply rising demand: it will take just about one year to reach the 2 million units mark, said Wolf-Henning Scheider, general manager for Bosch's Chassis Systems Control and Electrical Devices unit.

Scheider sees two main reasons for the steep climb in demand: first, carmakers increasingly equip their vehicles with Advanced Driver Assistance Systems (ADAS). Second, the Euro NCAP (New Car Assessment Programme) has raised the criteria for its top safety rating: only cars with a radar-equipped ADAS will be eligible to get the five stars top rating.

Currently Bosch is about to ramp up production for a new 77 GHz mid-range radar sensor which offers a comparable performance to its predecessor at significantly lower price and smaller size. It tracks objects at distances of up to 160 meters and will complement Bosch's third-generation long range sensor which features a measurement range of up to 250 meters. In this device, Bosch for the first time utilizes a new SiGe RF module (provided by Infineon) which also enabled the company to reduce the sales price.

www.bosch.com

Micro fuel cell based water-activated charger for mobile phones

The world's first water-activated charging device developed at KTH Royal Institute of Technology in Stockholm claims to be able to use ordinary water to extend KTH Royal Institute of Technology life for devices of up to 3 W. Based on micro fuel cell technology, the MyFC PowerTrekk device now means that a power source for your mobile phone can now be as close as the nearest tap or stream.

Anders Lundblad, KTH researcher and founder of MyFC, said that the device can be powered by fresh or seawater. The water need not be completely clean.

A USB connector attaches the compact PowerTrekk charger to the device. When plain water is poured onto a small disposable metal disc inside the unit, hydrogen gas is released and combines with oxygen to convert chemical energy into electrical energy. The resulting charge is enough to power an iPhone to between 25 and 100 per cent of its battery capacity.

www.kth.se

Satellite-tracking ICs find fix with GALILEO

STMicroelectronics' Teseo II single-chip satellite-tracking ICs were successful in the first ground location test using Europe's own independent navigation system, Galileo. The tests were conducted in collaboration with the European Space Agency (ESA).

In March 2013, the first position fix of longitude, latitude and altitude using the four Galileo satellites currently in orbit was performed by the European Space Agency at its Technology Centre in the Netherlands and by ST at its GNSS (Global Navigation Satellite System) software development labs in Naples, Italy.

ST and ESA conducted the historic static and dynamic tests using a rooftop antenna with a clear view of the satellites (static) and from a mobile test-bed unit travelling in a normal user environment (dynamic). The Teseo II receiver was able to track and produce a 3D fix over the entire path of the mobile unit, using only the 4 Galileo IOV (In-Orbit Validation) satellites.

www.st.com

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AR's Bent-Element Approach Provides A Size Reduction Of Up To 75%, Along With Great Performance.

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LTE small cell base station antenna matched for maximum efficiency

Pulse develops unique, software-based, highly efficient design optimization process

By AWR/Pulse/Optenni

Introduction

When designing antennas for base stations and mobile devices, an essential step of the design process is to ensure that the antenna resonates at the correct operation frequencies. Traditionally, the input impedance of an antenna is tuned by changing the antenna dimensions until the desired operational frequencies have been obtained. This is a time-consuming, costly, and inefficient approach. The input impedance of the antenna can be tuned much more quickly and efficiently than changing the actual dimensions of the antenna by using an external circuit-matching tool for the inductors, capacitors, and transmission lines.

This application note demonstrates how Pulse Electronics (Pulse) was able to design, tune and optimize their antenna systems through a combination of AWR's Microwave Office® circuit design software and Optenni's Optenni Lab™ matching circuit generation and antenna analysis software. The end result of this cross-company design flow yielded a higher performing product, a more cost effective design, and faster time-to-market.

While the thought of matching circuit design sounds simple and quite appealing, there are a few guidelines that must be followed. First, it is important to optimize for efficiency and not for best possible impedance match. Second, realistic component models of inductors and capacitors should be used in the matching circuit design, as the differences between an ideal and a real component are often substantial. Third, the sensitivity of the matching circuit with respect to component tolerances should be well accounted for and verified.

Novel antenna design

The antenna design showcased in this article is based upon Pulse's work on small cellular base station antennas using directional patch radiators with two feed ports that have vertical and horizontal polarizations. The operating frequency for the antenna system is LTE Band 8, 880-960 MHz. While patch antennas are commonly known and widely used throughout the antenna industry, Pulse's use of modern design tools has introduced a new antenna design optimization process and work flow.

Prototype antenna

One of the first design challenges Pulse faced was how to integrate the feed structure into the constraint space. To start, an aperture coupling structure was selected because of its traditionally good port-to-port isolation characteristics due to the orthogonal port excitation resonant modes. However, because of the low operating frequency of 880-960 MHz, the physical size of the feeding aperture was deemed too large (exceeded constraint space requirement) if made symmetrical. Therefore an asymmetric configuration resulted: Port 1 feed aperture was of optimal length and Port 2 feed aperture was short, yet tuned to frequency by widening the arms at the end of aperture (Figure 2).

Note that the traditional iterative process for design optimization of this feed structure would have been one in which multiple prototypes were constructed,

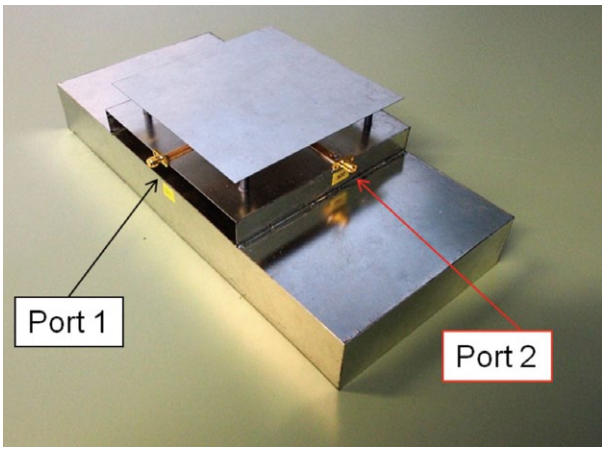


Figure 1: The initial prototype was built and tested by Pulse to collect baseline data prior to starting the simulation work.

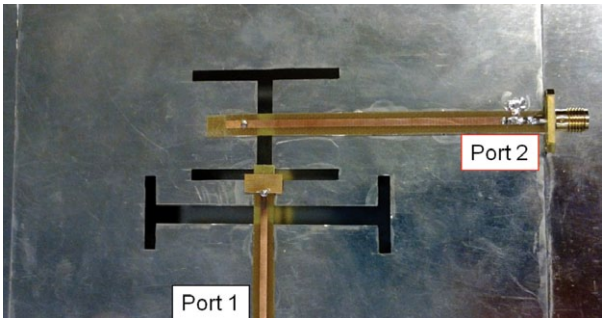


Figure 2: Port 1 and Port 2 asymmetrical feeding aperture configuration.

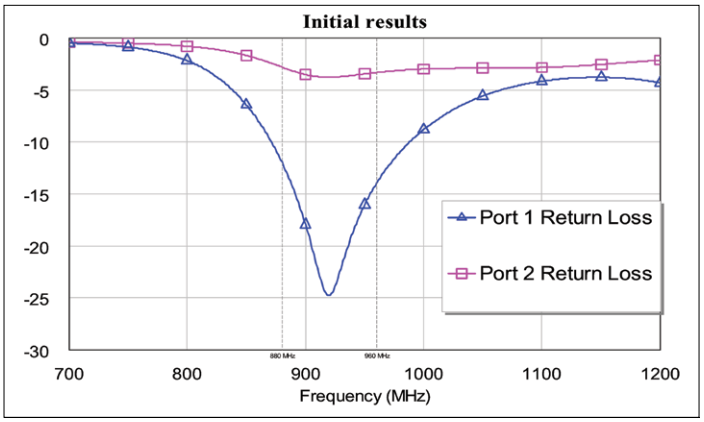


Figure 3: Port 1 and Port 2 return loss of the initial antenna design.

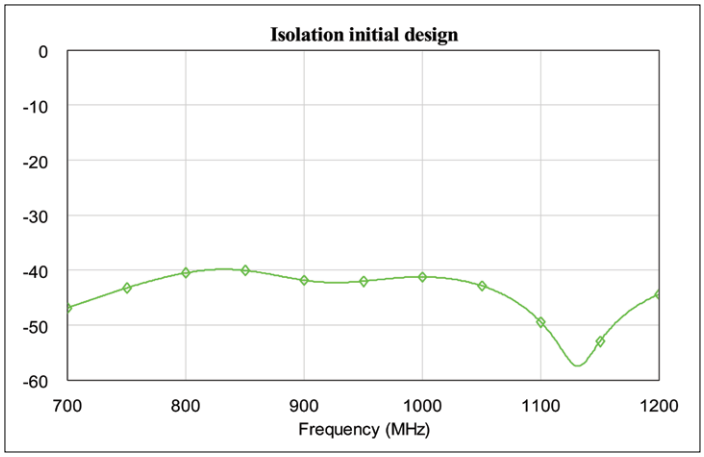


Figure 4: Isolation between Port 1 and Port 2 of the initial antenna design.

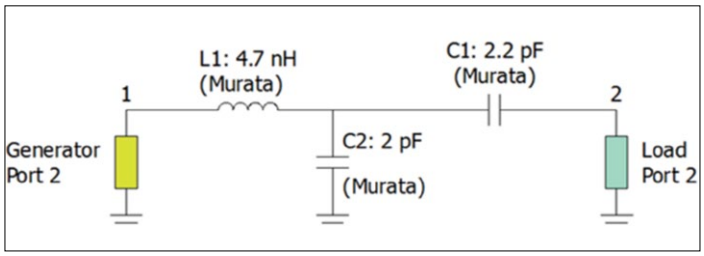


Figure 5: The optimized three-element matching circuit for Port 2 using the Murata GJM15-series capacitors and LQW18-series inductors.

measured, and tweaked through a trial-error-correction process. The way in which the Pulse final asymmetrical design was uncovered is novel in and of itself. The alternative approach relied upon virtual prototyping, i.e., the use of simulation (synthesis and analysis) software. Through simulation, Port 2 matching was accomplished simply by adding an LC-matching circuit and the original antenna and feed element designs were not impacted nor altered at all. Suffice it to say this saved significant design time.

Antenna simulation

The antenna itself was simulated with a target bandwidth of 880-960 MHz using AWR's Analyst™ 3D electromagnetic (EM) simulator within Microwave Office. For this design, a full 3D EM simulator was necessary given that the feed lines were supported by a narrow printed circuit board (PCB) substrate with such finite dielectrics that edge couplings had to be accounted for.

The initial results (Figure 3) revealed that while Port 1 was inherently well matched, Port 2 required a matching circuit to tune the resonance. The isolation between the ports was very good, in the -40 dB range (Figure 4).

Matching circuit design

Next, Optenni Lab software was employed for the matching circuit design

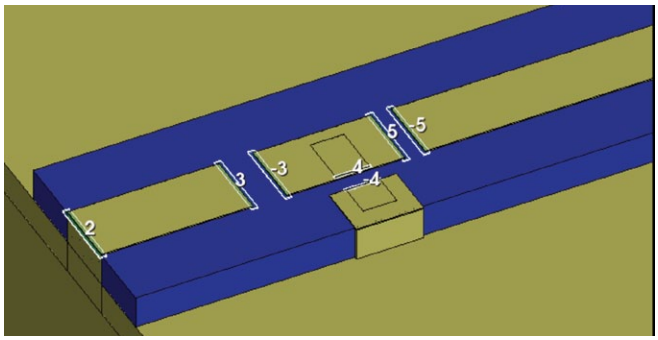


Figure 6a: Layout detail of the matching components placement.

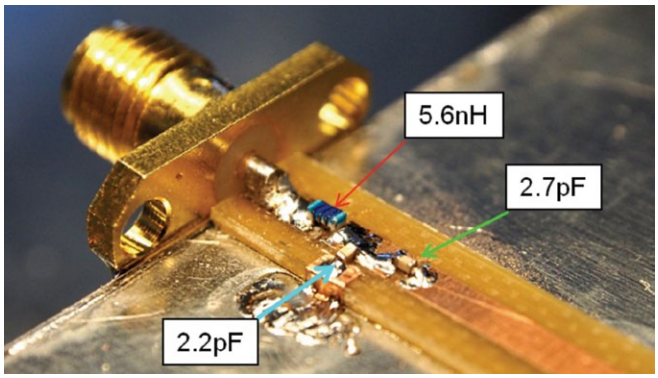


Figure 6b: Construction of realized matching circuit in measured prototype.

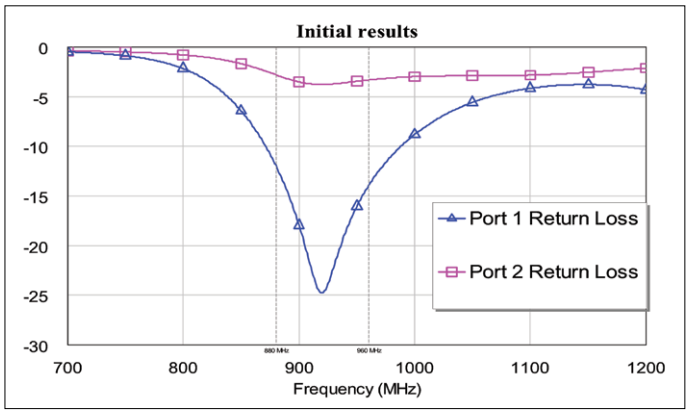


Figure 7: Optimized Port 2 return loss **with** ideal versus real connectivity of the matching components.

for Port 2. Optenni Lab provides an easy-to-use interface for direct optimization of antenna efficiency that accounts for optimization over a wide range of vendor libraries, tolerance analysis, and more.

The antenna impedance data was read from a Touchstone file, the operation frequency ranges were input, and the desired number of components and the desired component series were selected. Within a matter of seconds, Optenni Lab provided multiple optimized matching circuit topologies. The resultant matching circuit (Figure 5) was synthesized to maximum efficiency over the band. The remaining fine-tuning steps involved included the layout details for placement of the discrete components.

The parallel-series layout near Port 2 (Figure 6a) was grounded by folding a strip around the edge of the PCB and soldering it to the ground plane. This, however, changed the matching because the shunt capacitor grounding involved inductance as well, and there was a delay of a couple of degrees between the first and last elements (Figure 6b). The final implemented matching circuit of the prototype shown in Figure 6b reflects the change in the matching due to these effects (Figure 7).

While the ideal versus real connectivity difference appeared to be rather small, the power delivered to the antenna (Figure 8) dropped by 0.2 dB over the band. Further fine-tuning of the design identified a more suitable and appropriate choice of components, which resulted in a reduction of the efficiency loss to 0.1 dB. The matching component values

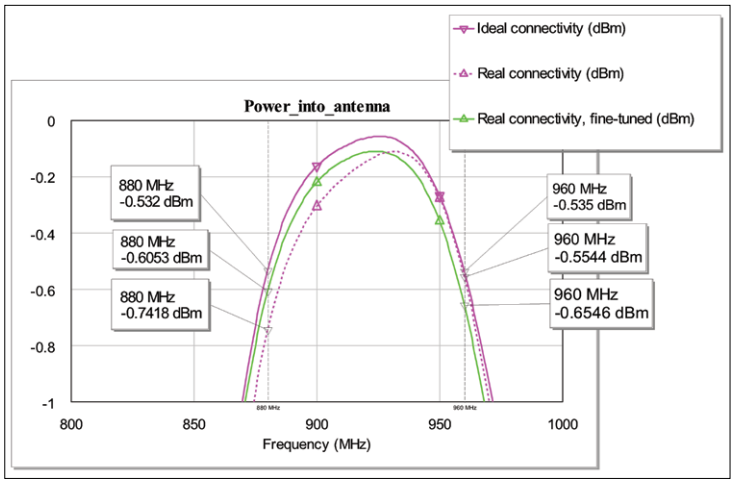


Figure 8: The layout arrangement of the matching components reduces the efficiency by 0.2 dB (dashed line). Re-optimization of the component values corrects the situation by 0.1 dB (green line).

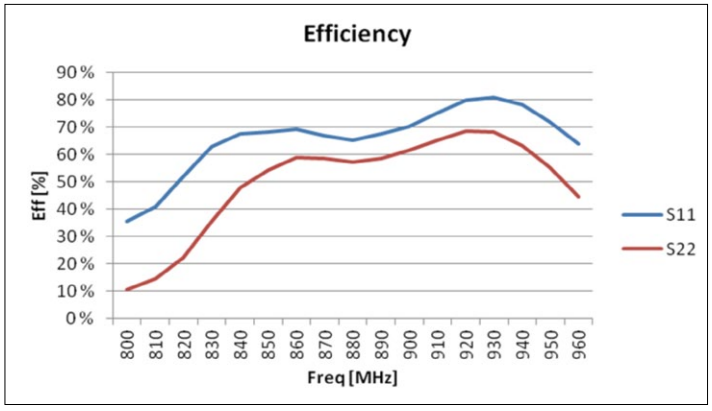


Figure 9a: Measured prototype efficiency **with** matching circuit.

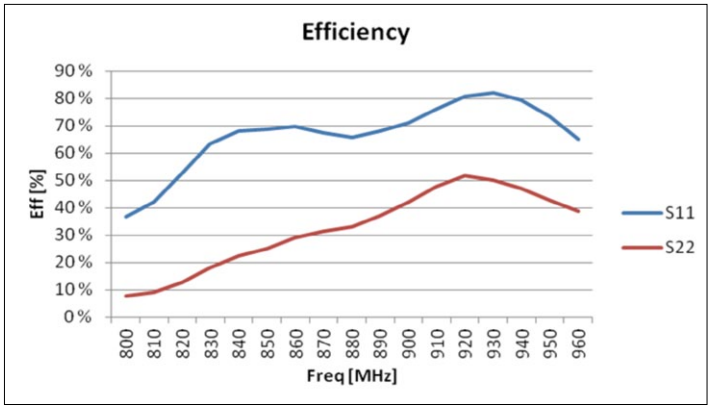
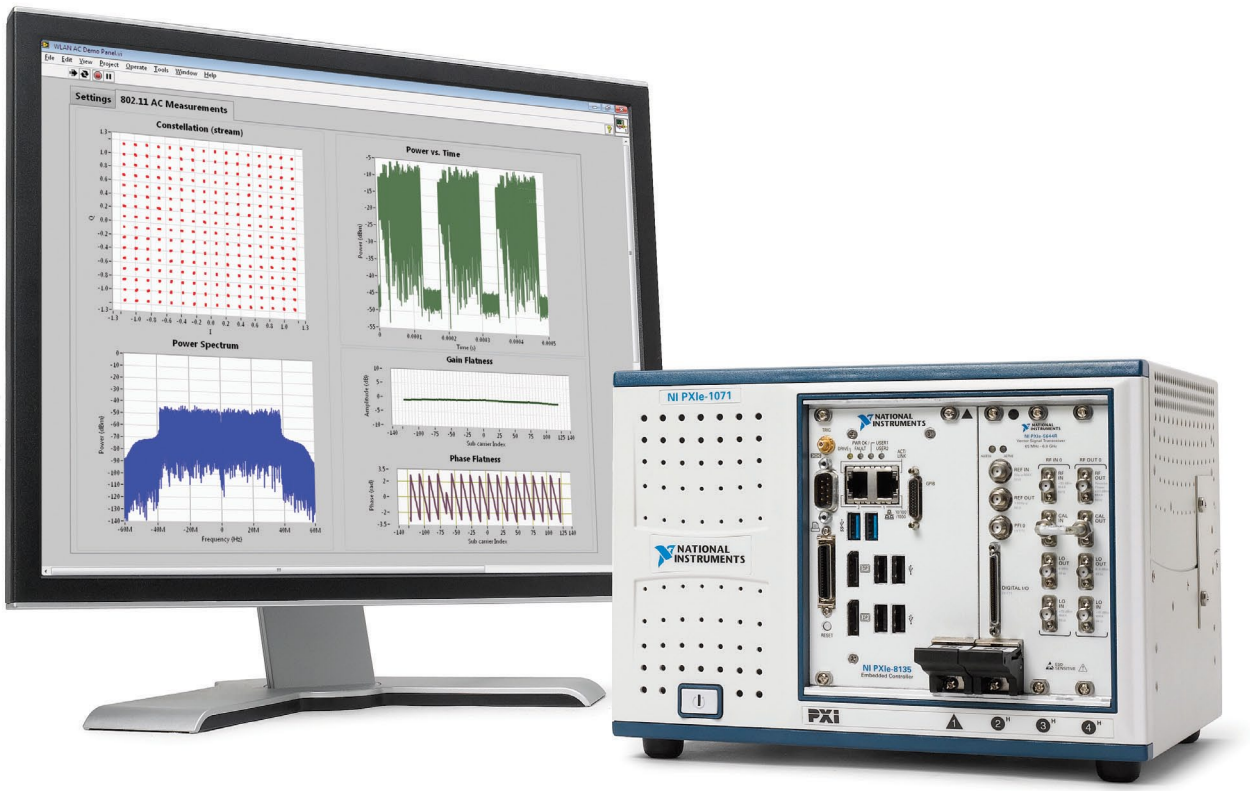


Figure 9b: Measured prototype efficiency **without** matching circuit.

Introducing the World's First Vector Signal Transceiver

VSA + VSG + User-Programmable FPGA = RF Redefined



Combining a vector signal analyser and a vector signal generator with a user-programmable FPGA for real-time signal processing and control, this vector signal transceiver is a fraction of the size and cost of a traditional solution. More importantly, the NI PXIe-5644R is the first software-designed instrument. With NI LabVIEW system design software, you can modify its software and firmware to create an instrument that meets your exact needs.

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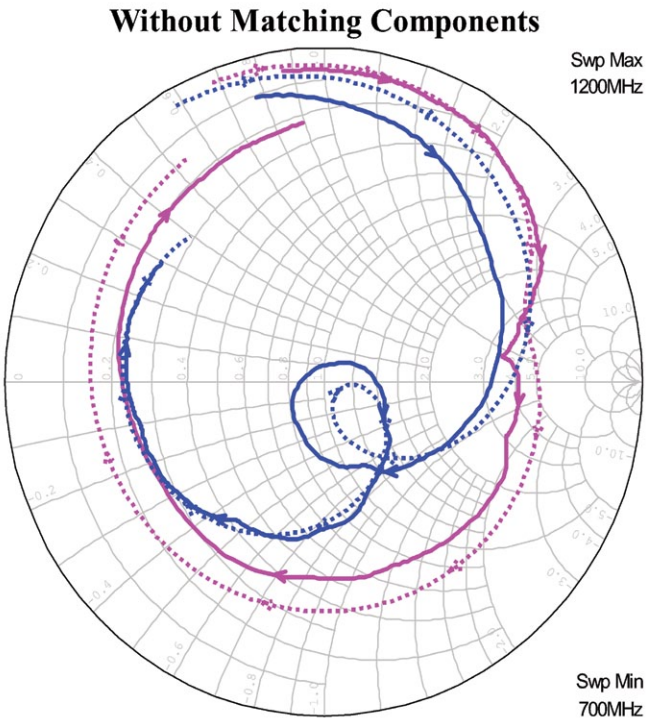


Figure 10: Simulated (dashed line) and measured (solid line) port impedances **without** the matching circuit.

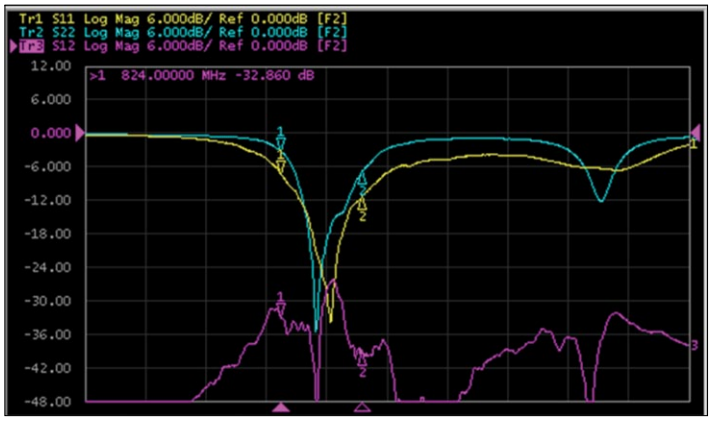


Figure 11a: Measured Return loss and isolation with matching circuit.

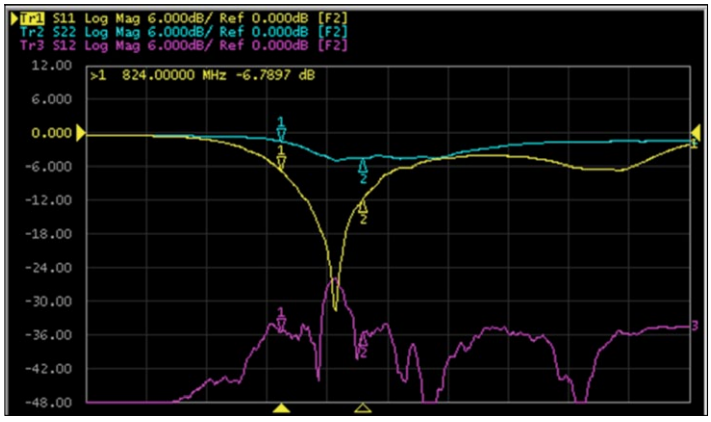


Figure 11b: Measured Return loss and isolation without matching circuit.

after this fine-tuning were determined to be 5.6 nH series, 2.2 pF parallel, and 2.7 pF series from the same Murata component series as before.

Figures 9a and 9b depict the measured prototype antenna efficiencies with and without the matching circuit at Port 2.

Measurements

Finally, the antenna prototype was manufactured and measured at Pulse. Figure 10 shows the simulated and measured port impedances on a Smith Chart without the matching circuit. Here, Port 1 is neatly matched over most of the ideal bandwidth.

Figures 11a and 11b show the measured prototype return loss and isolation with and without the matching circuit. Figure 12 shows the corresponding results with the matching circuit, and Figure 13 shows the isolation worsens as the resonance for Port 2 enhances.

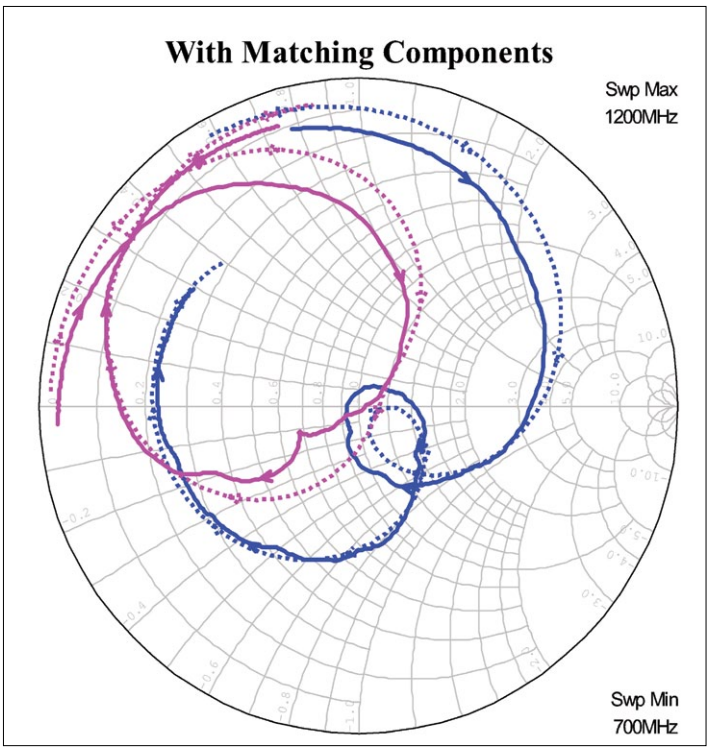


Figure 12: Simulated (dashed line) and measured (solid line) port impedances **with** the matching circuit.

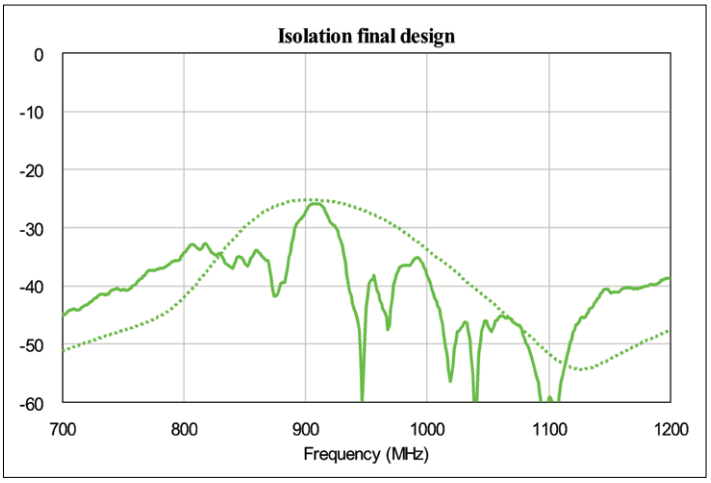


Figure 13: Isolation of the ports in the final design. Dashed line = simulation, solid line = measurement.

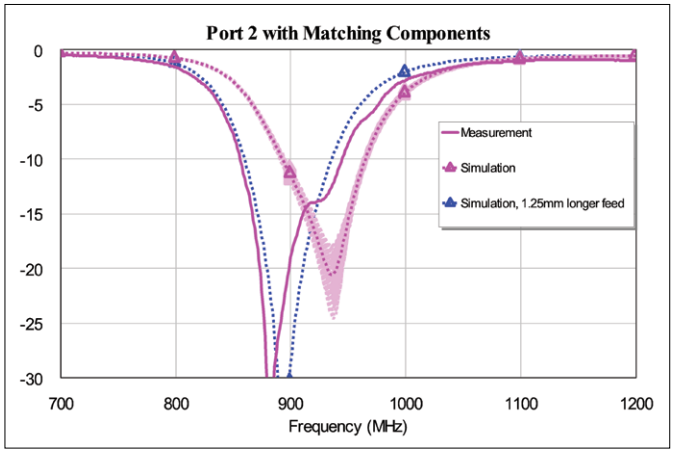


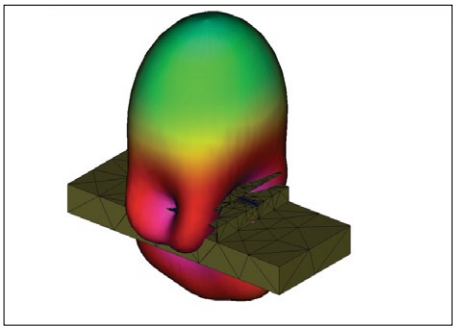
Figure 14: Port 2 return loss with matching components. Solid line is the measurement. Dashed magenta line is simulated result showing the statistical analysis due to component tolerances. Dashed blue line is simulated result with 1.25 mm longer feed line.

The agreement between the simulations and measurements overall was good.

A closer look at the frequency shift between the simulated and measured data, as shown in Figure 14, led to a further investigation, largely for educational sake. Statistical analysis of the discrete component tolerances showed a relatively stable performance. Yet, a change of 1.25 mm – or two degrees – in the feed line length could sufficiently explain the difference. This then revealed that care should be taken to account for the dimensions of the structure and how this feed line length serves as a straightforward means to tune the matched antenna frequency, often by several tens of MHz. In the end, the measurements confirmed that the designed matching circuit improved the efficiency of Port 2 radiation by more than 20 percent and the antenna gain by about 2 dB.

Conclusions

The virtual software design methodology described in this application note provides a "first-time-right" matching circuit design flow that is more efficient and cost effective than traditional methods, and equips antenna designers with quantitative guidelines for antenna frequency tuning that ensures a higher quality product. It was particularly insightful for the design of Pulse's novel dual-feed single radiator aperture-coupled patch antenna for LTE small cell base stations.



Total radiation pattern of port 1.

GapSense unclogs WiFi channels

By R Colin Johnson, EE Times

The Wireless Association—formerly the Cellular Telephone Industry Association (CTIA)—claims that there are more WiFi enabled smartphones, laptops and tablets in the U.S. than there are people—321 million compared to a population of 315 million. And that doesn't even count the millions of Bluetooth and ZigBee devices all competing in the same 2.4-GHz band. As a result, what is becoming an epidemic problem—interference among these devices—threatens to slow adoption of wireless devices. However, help is on the way in the form of a proposed new technology called GapSense—a new collision avoidance technique that was proposed at the IEEE International Conference on Computer Communications 2013.

The software, GapSense, lets these devices that can't normally talk to one another exchange simple stop and warning messages so their communications collide less often. GapSense creates a common language of energy pulses and gaps. The length of the gaps conveys the stop or warning message. Devices could send them at the start of a communication, or in between information packets to let other gadgets in the vicinity know about their plans.

In his paper entitled "GapSense: Lightweight Coordination of Heterogeneous Wireless Devices," University of Michigan EE professor Kang Shin, describes a universal protocol that monitors the energy pulses and gaps on the 2.4-GHz band in order to reduce collisions by as much as 88 percent.

"These devices don't have a direct means of communicating, since they use different protocols," said Shin. "That could be the Tower of Babel for an increasingly diversified world of wireless devices."

Even among 2.4 GHz wireless devices that already use the carrier sense multiple access (CSMA) protocol, which listens for radio silence before transmitting, collisions are still commonplace. The problem is that with so many devices in operation, each has a different time delay between listening and transmitting. Thus despite their use of CSMA, collisions are inevitable as each delays by a different amount of time before transmitting into a previously clear channel. In fact, with just moderate WiFi traffic, the researchers estimate that 45 percent of wireless data transmissions involve a collision. However, by switching to its GapSense method, collisions can be reduced to under 8 percent, according to the researchers published results.

Energy is also reduced by as much as 44 percent when using GapSense, according to the researchers, since it separates faster-clocked WiFi transmitters from low-speed units to which it sends a wake-up signal, thus allowing them to catch intended information packets without having to standby listening for as long.

The software could also address the so-called "hidden terminal" problem. Newer WiFi standards allow for faster data rates on wider bandwidths than the standard 20 MHz, but devices on different bandwidths can't hear one another's communications to avoid talking over them. GapSense could enable these devices on different standards to talk in turn. At moderate WiFi traffic, the researchers detected around 40 percent collision rate between wider- and narrower-bandwidth devices and GapSense reduced it to virtually zero.

www.umich.edu

IMEC, radio startup launch impulse-RF location chip

BlinkSight SA (Caen, France) a fabless chip company has released a single-chip transceiver for real-time location system (RTLS) and wireless sensor network (WSN) applications.

The chip uses an impulse-radio technology developed by the IMEC (Leuven, Belgium) and Holst Centre (Eindhoven, The Netherlands) research institutes that enables real-time 3-D location information that is accurate to within 10 centimeters, IMEC said.

Impulse radio is a form of ultra-wide band radio in which pulses of short duration, typically nanoseconds, are transmitted with their energy spread out from dc to a few gigahertz. The BlinkSight IC combines DSP and analog radio functionality and operates in both the 3.1- to 4.8-GHz and the 6 to 10-GHz bands. The chip is manufactured for BlinkSight by Taiwan Semiconductor Manufacturing Co. Ltd., in a standard 90-nm RF CMOS process.

The claim for the technology is that it has high accuracy at long range and with low power consumption. The chip includes a software-programmable 128-bit vector DSP that consumes less than 16-picojoules per cycle. It operates at ranges up to and beyond 60 meters with line-of-sight and at up to and beyond 20-meters with no line of sight, IMEC said. More than five years operation is projected from a standard coin battery.

The chip operates over a voltage range of 1.5 to 3.6-V and is suitable for battery-powered applications in tags, wireless sensors, basestations and mobile devices. A basestation containing the BlinkSight IC could keep track of thousands of fast-moving tags in real time, IMEC said.

"A lot of effort went into minimizing power consumption, and we expect to have tags powered by energy harvesting available soon. We aim to bring a complete turnkey system to market and want to work with industry leaders to bring accurate indoor GPS capabilities to connected devices," said Stephane Mutz, CEO of BlinkSight, in a statement issued by IMEC.

BlinkSight was formed in 2011 by engineers with experience gained at Philips, NXP and ST-Ericsson.

www.blinksight.com

Small cells with Wi-Fi to reshape wireless communications market

The use of Wi-Fi functionality in small-cell base stations will be a game changer for cellphone service providers, easing heavily congested data pipes while linking together billions of devices into a single network architecture, according to IHS.

Small cells—also known as metro cells—are low-power base stations each supporting approximately 100 to 200 simultaneous users. Intended to augment wireless coverage and capacity in dense urban areas, the small cells will likely be installed in public facilities such as malls, railway and subway stations, the sides of public buildings, and on street or traffic lights.

IHS expects large-scale deployment of small cells to start in 2014.

Small cells will communicate with the core network through a radio network controller to ensure that available wireless spectrum resources are properly managed and distributed between the macro or micro network and the small cells, maximizing available capacity in the process.

In general, small cells will be outdoor solutions that address capacity issues, while residential and enterprise femto base stations will be indoor solutions. Both solutions will coexist alongside each other, as well as with macro and micro base stations and also with Wi-Fi access points—all in order to provide a heterogeneous networking architecture.

"By combining the different elements of just such an architecture, wireless carriers can use small cells to deploy optimized solutions tailored to the coverage and capacity requirements of networks and their different locations," said Jagdish Rebello, Ph.D., director for consumer & communications at IHS. "For entrepreneurs, intellectual-property firms and wireless providers, the offloading approach also affords them an opportunity to develop a unique 'network of networks,' which can deliver seamless handoffs as users move from cellular to high-bandwidth personal networks like Wi-Fi."

The rise of these new types of base stations is being propelled by the massive and growing installed base of Wi-Fi connected system worldwide.

"Wi-Fi is becoming ubiquitous and spurring new opportunities, including the capability for wireless service providers to offload chronically clogged 3G and 4G cellular networks into heterogeneous architectures," said Steve Mather, senior principal analyst and subject matter expert for wireless at IHS. "Such architectures will involve a combination of macro and micro base stations, coupled with low-powered small cells and enterprise femto cells. This approach overall will reshape the connected world by linking billions of devices with free, high-speed links."

Wi-Fi everywhere

Shipments this year of Wi-Fi chipsets will reach a projected 2.14 billion units, up a robust 20 percent from 1.78 billion in 2012. This year's anticipated increase continues the impressive run of double-digit growth that started at least five years ago and will persist for three more years until 2016, after which expansion dips to a still-strong 9 percent. By 2017, Wi-Fi chipset shipments will amount to 3.71 billion units.

Overall, approximately 18.7 billion Wi-Fi chipset units will be shipped from 2011 to 2017—nearly all of which will belong to the high-performance 802.11n version. To put that number in context, the entire planet has 7 billion people—which means that Wi-Fi chipset shipments will outnumber the earth's population by more than two-and-a-half times.

The devices containing embedded Wi-Fi chipsets are many, but mobile handsets stand out in particular. By 2015, nearly 1.2 billion handsets out of a total of 1.9 billion cellphones produced that year will include Wi-Fi functionality.

www.ihs.com

ZigBee IP — an open standard for IPv6-based wireless mesh networks

A new specification brings end-to-end IPv6 control to low-power, low-cost devices, according to the ZigBee Alliance, the ecosystem of companies creating wireless solutions for use in energy management, commercial and consumer applications.

Zigbee has announced the completion and public availability of its third specification, ZigBee IP, the first open standard for an IPv6-based full wireless mesh networking solution, that provides seamless Internet connections to control low-power, low-cost devices.

The ZigBee IP specification extends the IEEE 802.15.4 standard by adding network and security layers and an application framework. ZigBee IP offers a scalable architecture with end-to-end IPv6 networking, laying the foundation for an Internet of Things without the need for intermediate gateways. It offers cost-effective and energy-efficient wireless mesh network based on standard Internet protocols, such as 6LoWPAN, IPv6, PANA, RPL, TCP, TLS and UDP. It also features proven, end-to-end security using TLS1.2 protocol, link layer frame security based on AES-128-CCM algorithm and support for public key infrastructure using standard X.509 v3 certificates and ECC-256 cipher suite.

ZigBee IP continues the ZigBee tradition of self-organising and self-healing mesh networking to enable robust communications over the globally available 2.4 GHz frequency as well as over the 868/915/920 MHz frequencies in certain countries.

www.ZigBee.org/IP

UltraCMOS® semiconductor technology platforms have changed the way RF is designed

By Rodd Novak, Chief Marketing Officer, Peregrine Semiconductor Corporation

Silicon-on-Sapphire (SOS) technology—an advanced form of Silicon-on-Insulator (SOI) processing—has been used in semiconductor manufacturing for over 20 years. Within the past seven years, SOS in the form of UltraCMOS® has been designed into high-volume applications that have made it the technology of choice for several of the most demanding RF applications. With decades of research into the use of a highly insulating substrate with CMOS processing, Peregrine Semiconductor continues to deliver high-performance, high-volume RF devices that meet the cost and performance goals of the most competitive markets.

UltraCMOS entry and impact on the market can be felt by the rapid transition from the historic dominant use of compound semiconductors in the RF Front End (RFFE) to SOI processes. At its present rate of incursion, RF SOI could potentially displace Gallium Arsenide (GaAs) based devices in the RFFE of cellular handsets as early as 2016.

It took more than a leap of faith to make the transition from SOS being a laboratory curiosity, to becoming the RFFE process of choice, including two decades of process development, breakthrough innovations and key inventions.

Choosing the technology

The use of sapphire as a replacement substrate to silicon resulted from a few visionaries who, rejecting conventional wisdom, took advantage of sapphire's exceptional properties and overcame the limitations that previous researchers had encountered.

The properties of synthetic sapphire, or aluminum dioxide (alumina), include 10^{14} ohm/cm resistivity—a near-perfect insulator—as well as very good thermal characteristics. Together, these characteristics provide a rather unusual but highly welcome combination for semiconductor materials.

The problem that frustrated previous researchers was mating the silicon to the sapphire without incurring major defects. With patented and proprietary approaches, Peregrine Semiconductor's UltraCMOS technology (Figure 1) solves the defect problem and provides a highly-manufacturable semiconductor process. This process can be implemented in any standard CMOS foundry without concern of contamination on the same equipment used for high-volume silicon ICs. This leverages existing CMOS capacity and avoids substantial investment while maintaining technology leadership.

In addition to its entry-level success with initial products, UltraCMOS technology has proven to be highly scalable. It is also capable of continuously achieving performance targets necessary to keep up with the toughest roadmaps, including those of the cellular, test-and-measurement, aerospace, and other industries. UltraCMOS technology is also poised to address the burgeoning wireless applications that will help create the 50 billion devices that are expected to be connected to the Internet by 2020—a phenomenon known as the "Internet of Things (IOT)." [1] As of 2012, Peregrine was the number one supplier of the main RF antenna switch in cellular handsets, with more than 70% market share, according to market research firm Navian Inc. [2]

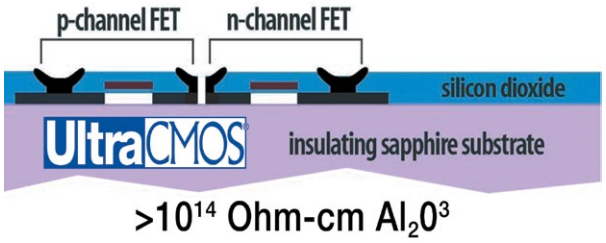


Figure 1: The UltraCMOS process, which utilizes a sapphire substrate, can be implemented in any standard CMOS foundry.

Figure 2: The UltraCMOS® Loop demonstrates how continuous process and product improvements are achieved.

Establishing the platform

The first use of UltraCMOS technology was for Phase-Locked Loop (PLL) products designed for the infrastructure market, as well as space applications that relied on the inherent radiation tolerant (rad-hard) performance of sapphire, and the latch-up and Single Event Upset (SEU) immune UltraCMOS process. Following this initial success, Peregrine's design team targeted high-volume applications that used GaAs technology. Markets where an inflection point—a major change in the industry that allowed the entry of a new player with a new technology—proved quite receptive to the performance advantages of UltraCMOS.

The key to developing the platform that has provided a more than 20% year-over-year (YOY) performance improvement is attributed to adapting Moore's Law, plus internal knowledge of device physics. To accomplish this, process, product design and modeling engineers at Peregrine work closely together to understand how to improve

the performance of SOS RFFE products. This closely-linked relationship is visualized in Figure 2.

As opposed to simple scaling, significantly improving the basic Field Effect Transistor (FET) performance is achieved by reducing the on-resistance of the channel, or improving the breakdown voltage, or the linearity, of the device. One performance metric for the FET is based on the product of the resistance from the "on" state and capacitance from the "off" state that provides a Figure of Merit (FOM) for the process technology, called "$R_{on}C_{off}$". For UltraCMOS-based products, an improvement in $R_{on}C_{off}$ directly relates to the improvement of the device performance and size reduction.

For Peregrine, high-volume production began with RF switch products based upon its Semiconductor Technology Platform 2 (STeP2). As shown in Figure 3, the 0.5-µm STeP2 process has $R_{on}C_{off}$ performance of 768. While the $R_{on}C_{off}$ performance of GaAs was around 380, design techniques that could not be implemented in GaAs and the outstanding capabilities of the sapphire substrate allowed UltraCMOS to deliver products with an insertion loss near levels achieved by the incumbent technology. Additionally, integration of the control logic with the RF switch meant that a single flip-chip package could provide the RF switching solution.

The UltraCMOS switch has a 4 kV Human Body Model (HBM) Electrostatic Discharge (ESD) capability—a magnitude higher than that of GaAs technology—which eliminates the additional ESD protection that GaAs designs require. As a result, manufacturers of Low-Temperature Co-fired Ceramic (LTCC) modules could use a single, easily installed flip-chip with single-pole, 4-, 5-, 6-, or 7-throw switches in their assembly, and achieve higher yields, as well as significantly smaller size, as they transitioned from pin diodes to ICs.

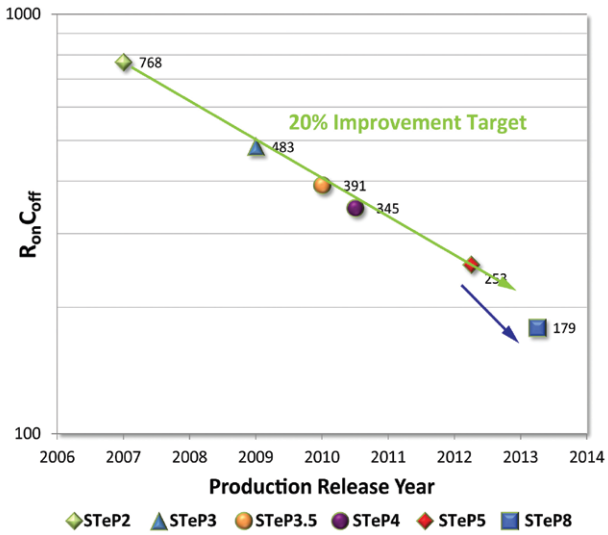


Figure 3: The progressive improvement in $R_{on}C_{off}$ established by the STeP2 process technology is maintained, today.

Increasing linearity

The use of Wideband Code Division Multiple Access (WCDMA) for 3G requires a significant increase in linearity over 2G networks. In 2004, cell phone manufacturer Nokia identified Peregrine as providing one of two viable technologies (the other was GaAs) that might be able to meet the 3GPP linearity specification. As a partner and technology driver, as well as a market leader, Nokia provided essential real-world feedback to validate when the market requirements were met, as well as the status versus competing technologies.

The industry and 3GPP standards body specified the input third order intercept point (IP3) as the required degree of linearity, which helps to avoid interference with other devices on the network. Using the feedback loop shown in Figure 2, the modelers, process engineers and designers at Peregrine determined where the non-linearities were occurring and invented HaRP™ technology to significantly improve the harmonic performance of their products. This device-level technique increases the IP3 linearity and improves the switch linearity of UltraCMOS products by more than 10 dB (an order of magnitude), on average. Figure 4 illustrates the performance improvements that HaRP technology enhancements enable.

This major inventive breakthrough established Peregrine as a leading provider of high-performance RF switches in the market. Since the technology is applied to GSM/WCDMA switches, this rapidly led to very high-volume production. Realizing that the HaRP invention could be applied to all products, not just switches, Peregrine initiated the implementation of the device-level technology into its RF product portfolio. This capability led to an accelerated STeP process roadmap designed to optimize and advance HaRP technology performance.

As shown in Figure 3, when HaRP technology was implemented on STeP3 0.35 µm in 2008, it achieved initial R_{on}-C_{off} performance of 529. Subsequent refinements reduced this level to 483 in 2009 without modifying the channel length.

While the $R_{on}C_{off}$ FOM was not quite as good as that of GaAs, UltraCMOS with HaRP technology enhancements achieved nearly equal insertion loss performance—and with smaller size and lower power consumption. GaAs met the linearity requirement by adding a separate CMOS chip to provide a DC-DC converter to increase the drive voltage to ~9V. GaAs also required a decoder for more complex switches, such as SP 9-throws that required 18 control lines implemented with wire bonds to turn the switch and ground lines on and off. Because UltraCMOS uses CMOS and not GaAs processing, this circuitry is easily integrated directly with the RF switch.

In this same timeframe, transitioning the process technology from the initial fabrication facility in Australia to manufacturing partner OKI Semiconductor in Japan provided increased volume capability and inherent well-known Japanese semiconductor quality. OKI, a leader in SOI technology, recognized the value of applying the ultimate SOI technology using the sapphire substrate. OKI's continued and trusted support has allowed Peregrine to focus resources on development, rather than supporting its own internal fab, and has allowed Peregrine to attain its fabless semiconductor status.

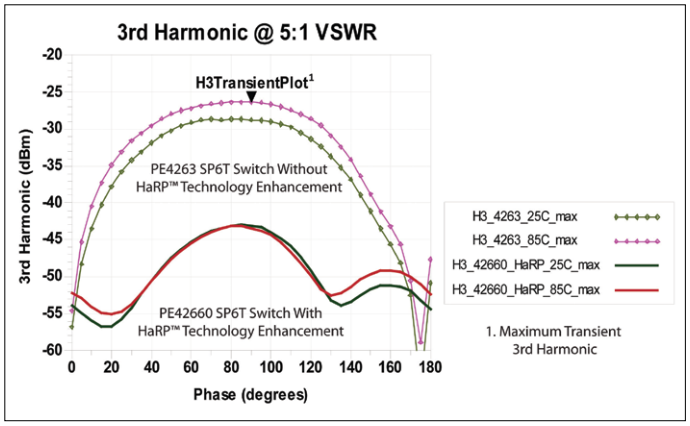


Figure 4: The first HaRP™ technology-enabled prototype RF switch versus a switch without HaRP technology enhancements demonstrate the technology's ability to achieve 3rd harmonic phase requirements at 5:1 VSWR. Conditions: 3fo, Tx1, 33.5 dBm, 2.6V, 915MHz.

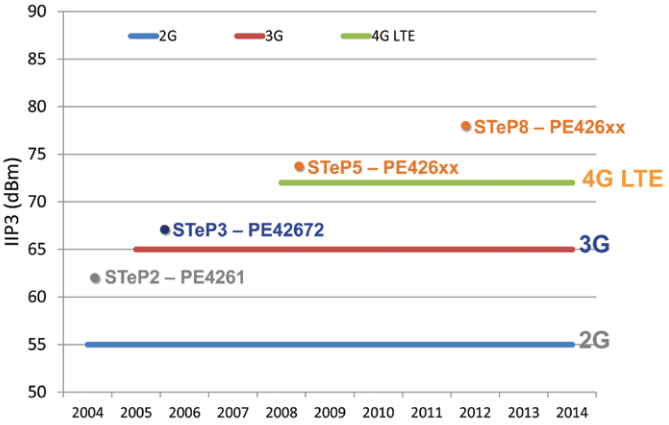


Figure 5: UltraCMOS® STeP capabilities meet the ever-increasing IIP3 linearity requirements of 2G, 3G, and 4G networks.

The next step

With STeP5 processing, UltraCMOS technology implemented a bonded wafer technique. The use of bonded technology dramatically reduced the $R_{on}C_{off}$ performance to well below that of GaAs, enabling the best overall RF performance and robustness, as well as the lowest size and power consumption RFFEs.

Using patented process technology, STeP3 has an epitaxially-grown, thin layer of silicon attached to the top of the sapphire substrate. STeP5 has a bonded interface that is an adhesion layer and not a true molecular connection. Developed with Soitec, a leading supplier of SOI wafers, the bonded process enables an IC size reduction and a performance increase of as much as 30% in Peregrine's products.

As shown in Figure 3, STeP5 also provides a significant reduction in $R_{on}C_{off}$ for increased performance and improved linearity. From STeP2 in 2004 to STeP5 in 2012, Peregrine has been able to maintain a 20% YOY improvement in $R_{on}C_{off}$. In contrast, GaAs has improved about 20% over 20 years, or less than 1% per year.3 Once again, the combination of the process, device, and modeling capabilities that allow fabrication in any standard CMOS facility has proven to be a successful, sustainable strategy for RF performance, enabling fast-track RFFE performance and an accelerated roadmap.

With STeP5, UltraCMOS production capacity was significantly expanded through process transfer to a second fab, which is operated by Mag-

nachip Semiconductor in Korea. This completely separate channel partner enabled the fabrication of high-performance RFFEs in two distinct channels. By taking advantage of the standard CMOS manufacturing capability, the added production location supports market requirements for second sourcing, and it provides expanded production capacity.

The new channel ramped from zero to 80 million units produced in the first year—a rather amazing increase in higher-performance RF manufacturing capacity that demonstrates the ease of bringing online a new channel, including a new process, a new fabrication facility, and a new substrate provider. Introducing technology on older, generational CMOS nodes that are fully mature, and using depreciated lines in semiconductor fabs readily allowed a rapid expansion of UltraCMOS that supported the doubling of the company's highest production rates, quarter-over-quarter.

A major step forward

Continuing down the process roadmap of Figure 3, 0.25 µm, bonded STeP8 technology provides the largest improvement in $R_{on}C_{off}$ performance for a 12-month window. Instead of obtaining a 20% YOY reduction, the development team's efforts achieved a 36% YOY decrease within one year of the announcement of the previous generation of STeP technology, STeP5. In addition to greatly exceeding expected performance targets after ten years of process of development, this demonstrates that the STeP roadmap is sustainable for even further improvements. With STeP8 process technology at 250 nm, there is a long runway led by digital technologies that are now at 22 nm.

Broadband linearity requirements impact capacity. According to the Shannon limit (the theoretical maximum information transfer rate of the channel), the more linear the components are, the higher the data rates that can be achieved in the communication channel. As shown in Figure 5, STeP8 has demonstrated input IP3 (IIP3) performance that exceeds 77 dBm. With the communication industry's demand for improved linearity, the ability of STeP2 to meet/exceed 2G requirements of 55 dBm, STeP3 to meet 3G requirements of 65 dBm, STeP5 to exceed 4G LTE 72 dBm requirements, and STeP8 to provide even greater performance allows continued progress in this critical area.

To meet the industry's projected 78% compound annual growth rate (CAGR) from 2011 to 2016, expanded network capacity is expected to come from improved radio link performance, Multiple Input/Multiple Output (MIMO), Carrier Aggregation (CA), new infrastructure, and new spectrum. Peregrine Semiconductor expects to deliver UltraCMOS RFFE products to meet all of these requirements.

Future STePs to higher RF performance

Although past history does not guarantee future success, Peregrine has demonstrated a path for advancing UltraCMOS STeP technology to meet market requirements. STeP10 devices are currently in laboratory evaluation and the results look promising to follow this path, with no foreseen limits to advancing the technology further.

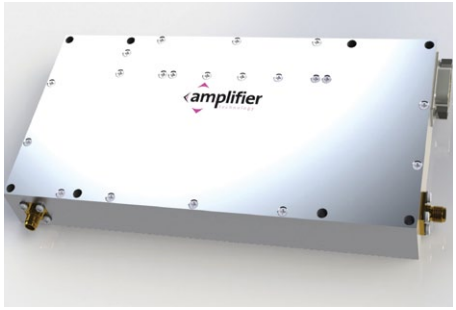
Using the scalability and digital capabilities of CMOS combined with the RF performance of UltraCMOS, smart RF techniques can be added to future designs. These added capabilities support the simplification of now very complex RFFE architectures through programmability, self-calibration, temperature compensation, and self-tuning. Dynamic RFFEs with digital smarts, combined with the scalable performance capabilities of UltraCMOS technology, are expected to provide the RF connection for everything from the next generation of handsets to the Internet of Things.

References

[1] Ericsson whitepaper, "More Than 50 Billion Connected Devices – Taking Connected Devices to Mass Market and Profitability," © February 2011.
[2] Andoh, Yoshiyasu (Navian Inc.). RF Devices/Modules For Cellular Terminal Quarterly Market Report CY2012 2Q, Oct. 5, 2012: page 153.
[3] Peregrine Semiconductor internal research, 2012.

100 W RF amplifier

designed for jamming applications



A broadband, 100 W RF amplifier designed for jamming applications, from Amplifier Technology combines the benefits of COTS availability for a lower installed cost with a rugged and reliable design. Designated 8813, the broadband amplifier covers frequencies from 0.5 GHz to 2.5 GHz. The compact form factor makes it suitable for installation in both fixed and mobile applications.

Designed to boost the power of jamming units, the 8813 provides 55 dB of gain across the frequency range, with minimum saturated output power (P_Sat) of 100 W and minimal harmonics (-8 dBc typical) or spurious signals (-80 dBc typical). Built on Gallium Nitride (GaN) technology, the 8813 provides excellent power density and overall efficiency, with improved thermal transfer.

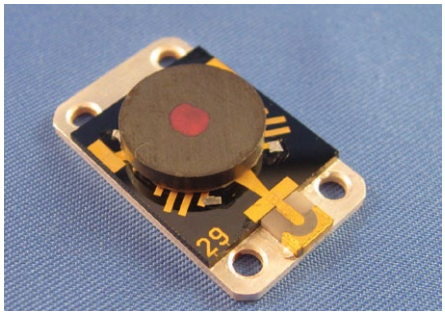
Of particular interest in military jamming applications, the 8813 covers the 3G, 4G, Wi-Fi and other mobile data communications standards, suiting it to use in jamming detonation signals to the improvised explosive devices that threaten military troops and convoys around the world, as well as terrorist attacks on civilian infrastructure and high profile events.

www.amplifiertechnology.com

Microstrip isolators and circulators

cover 1.7 to 36 GHz

RDKF microstrip isolators and circulators from Raditek cover the range from 1.7 to 36 GHz and are FDK footprint compatible.



These devices are designed to meet all microstrip requirements and can be optimized to a customers's exact frequency needs, including up to 24% bandwidth option, 2 to 25 W of forward power and loads with rated power from 0.25 W up to 25 W are available..

The model shown covers 1.9 to 2.6 GHz. Standard dimensions include drop-in replacements for FDK and TDK. All thin film circuits are gold on copper, suitable for soldering (silver solder preferred), or gold thermo-compression bonding.

www.raditek.com

Internet of Things development kit

wireless internet connectivity for embedded devicess

Broadcom Corporation has continued the expansion of its Wireless Internet Connectivity for Embedded Devices (WICED) product family with the announcement of the immediate availability of its latest WICED Smart Development Kit through strategic distribution partners.

The hardware development kit opens the door for original equipment manufacturers (OEMs) to develop products for the "Internet of Things" with ease. It provides access to a low-power client device with an integrated Bluetooth Smart (formerly Bluetooth Low Energy) software stack and application profiles, offering OEMs an easy-to-use, cost-effective embedded wireless solution with a small footprint to inspire connectivity in a new range of devices.

Broadcom's WICED platform eases development and simplifies implementation of Wi-Fi connectivity in an array of consumer devices, particularly in "headless" products without sophisticated user interfaces or existing networking capabilities. By adding the BCM20732 Bluetooth smart system-on-a-chip (SoC) to its existing WICED platform, Broadcom helps OEMs develop products that effortlessly pair battery-operated devices to smartphones and tablets, delivering even more mobility to consumers' on-the-go lifestyle.

www.broadcom.com

Sub-GHz radio

extended temperature and frequency range

Microsemi Corporation has announced the ZL70251 ultra low-power (ULP) radio frequency transceiver with an extended temperature operating range of -40 °C to 85 °C for short-range wireless sensor products used in industrial applications.

In addition, the next-generation transceiver now can be used in unlicensed frequency bands ranging from 779-965 MHz, which broadens the scope of operation from the previously supported North American (915 MHz) and Europe (868 MHz) bands to include China's 779-787 MHz radio frequency spectrum.

The ZL70251 is fully functional over the industrial temperature range, while still delivering the industry's lowest peak power at 2 mA in both transmit and receive mode. This performance enables extremely low-power wireless nodes to operate in harsh environments. It is offered in a compact 3 mm x 2 mm chip scale package (CSP) and requires only two external components, which makes it ideal for products with space constraints.

www.microsemi.com

Highly integrated processor SoC

for 5G WiFi enterprise access points

Broadcom Corporation has announced a highly integrated processor system-on-a-chip (SoC) for enterprise access points (EAPs). Designed to optimize 5G WiFi, the latest IEEE 802.11ac standard, the ARM®-based StrataGX™ BCM58522 series combines up to 10x more processing power with advanced architectural features to enable a secure, application-aware unified wired and wireless enterprise network.

The StrataGX BCM58522 series delivers high-performance Wi-Fi for large venues such as stadiums, arenas and convention centers. Integrated dual-core ARM CPU, Ethernet switch, accelerator engines, high-speed I/O and memory interfaces meets power requirements and size constraints of EAPs — reducing power consumption up to 80 percent. Further, a programmable packet and protocol accelerator enables high-performance offload of control and provisioning of wireless access points (CAPWAP) and generic routing encapsulation (GRE) tunneling, and low-power modes allow EAPs to be powered by IEEE 802.3af Power over Ethernet (PoE).

Linux Development Kit (LDK), reference designs and standard open source software tools are available to reduce engineering development and time-to-market. The BCM58522 series is now sampling with volume production slated for Q413.

www.broadcom.com

Multistar multi-tone instrument

tests RF radiated immunity faster

The MT06000 from AR Europe is a state-of-the-art RF radiated immunity system that tests up to ten frequencies (tones) at once, reducing your test time by a factor proportional to the number of tones used. IEC/EN 61000-4-3, EN 501304 and EN 55024 are just a few standards that benefit from using the multi-tone tester.

By testing multiple frequencies (tones) at once, test times can be reduced by a factor equivalent to the number of tones selected. The number of tones is only limited by the signal generator bandwidth (150 MHz) and the size of the amplifier used with the system.

The MT06000 contains all the instruments needed to perform radiated immunity testing for IEC 61000-4-3 specification except the required amplifiers, antennas and directional couplers. Amplifiers can be sized and selected based on your required field levels and testing needs. Up to 4 RF amplifiers and directional couplers can be controlled and monitored and power can be delivered to up to 4 antennas to generate the desired fields. The system contains a vector signal generator, a vector signal analyzer, a RF pre-amplifier, a RF field probe and monitor, an RF switch matrix, and automated radiated immunity test software.

Everything is contained in a single housing, which eliminates setup issues. The software includes automated routines to calibrate the field and maximize the speed of test (most tones possible) while still meeting the Linearity and Harmonics requirements of the specification.

www.arww-rfmicro.com

Low-PIM cable assemblies

improve stability and repeatability

San-tron has made design and manufacturing enhancements to its series of high-performance/low-PIM cable assemblies that improve both stability and repeatability. The SRX™ cable assemblies serve PIM-sensitive environments though 6 GHz and military/avionics environments through 20 GHz, meeting requirements for robust survivability in high-frequency applications. Designed to support systems integrators, the SRX low-PIM cable assemblies combine the company's low-distortion eSeries coaxial connectors with high-quality SRX coaxial cables.

"San-tron has carefully selected materials and fabrication techniques to minimize PIM," explained San-tron Director of Engineering Fred Hull. "For example, we combined Teflon™ with Rexolite™ to improve holding capability and added a solder step in manufacturing to improve stability. Also, the use of heat-treated BeCu center contacts enables us to achieve strong mating forces with positive wiping action, minimizing current saturation."

San-tron now offers seven complete SRX cable assembly deployment scenarios: in-cabinet, plenum-rated, short runs and jumper applications, long-haul cable runs, indoor use, outdoor use, and riser, with interconnect options for SMA, Type N, 7/16, and TNC mating.

www.santron.com

Portable PIM tester

ideal for network and DAS applications

As UK the representative for US firm AWT-Global, Link Microtek is now able to offer a portable PIM (passive intermodulation) test system that will enable telecoms companies to improve the quality of their networks.

Providing a powerful yet compact tool for testing and analysing telecoms network infrastructure, the AWT PIM-P is a self-contained unit that is designed to detect sources of PIM in an installation, thereby helping to avoid any loss of capacity due to signal degradation.

This accurate and competitively priced instrument is available in a number of different models covering various frequency bands from 698 to 2690 MHz, and its wide transmit power range of 15 to 44 dBm makes it ideal for DAS (distributed antenna system) installations. It has a typical dynamic range of 96 dB.

As well as offering three test modes as standard – field diagnostic, analyser and sweep mode – the unit can be specified with an optional embedded module that provides accurate distance-to-fault and distance-to-PIM measurements.

Suitable for operation in ambient temperatures from -10 to 50°C and up to 90% humidity, the PIM-P is housed in a ruggedised case to withstand the harsh environmental conditions that can be encountered in the field.

www.linkmicrotek.com

LDA digital attenuators with N-Type connectors

feature calibrated operation up to 6 GHz

Vaunix Technology Corporation has announced additions to their LDA digital attenuators line. Five of their LDA digital attenuators are now available with N-Type connectors.

The LDA series of Lab Brick® digital attenuators includes 50 Ohm RF step attenuators with calibrated operation up to 6 GHz. These units connect to a USB port for control and power and require no additional DC supply voltage. They are easily programmable for fixed attenuation or swept attenuation ramps directly from the included GUI. Lab Brick

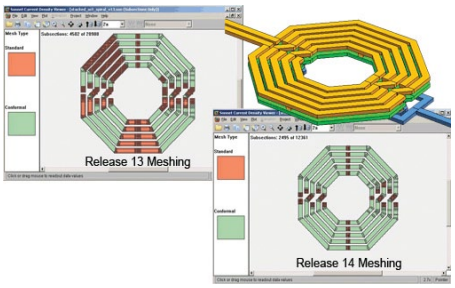
digital attenuator API DLL and LabVIEW-compatible drivers are also available for custom programming applications.

Lab Brick digital attenuators are ideal for engineering and production test laboratories as well as integration into high speed automatic-test-equipment (ATE) systems. They can also be used in development of low-cost fading simulators for multiple input multiple output (MIMO) and single input multiple output (SIMO) communication systems such as WiMAX, 3G and LTE. They are based on solid state attenuator technology for excellent repeatability of attenuation values.

www.vaunix.com

Sonnet Suites EM Software Release 14

offers more automation and faster simulation speeds



Sonnet Software introduces their latest version of software, the Sonnet Suites Release 14, featuring enhanced speed for Sonnet's 3D planar EM simulation engine, new technology to automate EM model extraction, and GUI enhancements for efficient use in enterprise computing environments.

Existing users will see faster simulations, especially on new generation multi-core computing platforms. In addition to allowing more CPU cores to be used in parallel over the previous release, the Sonnet meshing algorithms have been further tuned to yield faster simulations. Large-scale via arrays and via bar structures are more efficiently meshed

for accelerated simulation of deep-node silicon RFIC stacked metal inductors, baluns, transformers, and interconnects.

A new Stackup Manager has been added to the Sonnet Project Editor, providing an intuitive graphic interface for creating or editing the process stackup. The Stackup Manager also makes it easier for inexperienced users to edit or modify circuitry on a given drawing or process layer.

Sonnet's signature Co-calibrated™ Ports provide unprecedented accuracy for internal port calibration, enabling error-free access to internal connections for large passive circuits. In the past, to fully leverage this capability, an engineer needed to manually group the co-calibrated ports. In Release 14, Sonnet introduces Automatic Co-calibrated Port grouping, a feature that relieves the designer of manual work by giving the solver intelligence to group ports automatically.

Another new addition to the Sonnet Suites is the Inductor Model Extractor (IME), which extracts an intuitive equivalent circuit based on EM analyses of spiral inductors. Model topologies for both Center-Tapped and Untapped spiral inductors are available.

Sonnet Release 14 provides graphical user interface (GUI) updates to meet the growing need for deployment on Linux and Virtual Machine (VM) host hardware platforms. The Sonnet Suite Release 14 interfaces have been tuned for fast response over remote host and VM host networks—increasingly important for enterprise-level installations.

www.sonnetsoftware.com

Signal/spectrum analyzer

high power applications from 10 MHz to over 6 GHz

The latest high-end FSW50 signal and spectrum analyzer from Rohde & Schwarz is ideal in the development, testing, verification and production of transmitters and components such as those

used in radar applications and satellite and military communications systems. The analyzer covers the frequency range from 2 Hz through 50 GHz. Using harmonic mixers from Rohde & Schwarz, the frequency range can be extended to 110 GHz.

In addition, the company has doubled the analysis bandwidth of the FSW50 from 160 MHz to 320 MHz. This allows the demodulation of wideband signals such as radar chirps up to 50 GHz. In the past, measuring these kinds of wideband signals often required complicated test setups consisting of a digital oscilloscope and a downconverter. The FSW50 not only simplifies the test setup; it also offers significantly wider dynamic range and is easier to calibrate.

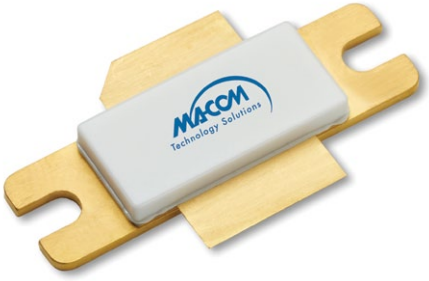
Featuring wide RF dynamic range, high measurement speed and numerous measurement functions, the FSW50 is an excellent microwave analyzer that is particularly useful in industrial and university R&D laboratories. Aerospace and defense calibration labs requiring a maximum input frequency of 50 GHz or high repeatability of results will also benefit from the instrument. The low DANL of –164 dBm/Hz in the microwave range with activated preamplifier allows even the smallest of spurious emissions to be detected such as those found in radar signals. The analyzer offers high sensitivity close to the carrier even at 50 GHz, featuring a phase noise of -114 dBc (Hz) at 10 kHz from the carrier.

The integrated multistandard radio analyzer (MSRA) function of the FSW50 makes it possible to measure spectrum and modulation parameters of differently modulated signals, including their correlation in time. This makes it very easy to analyze how different signals affect each other and provides an efficient means of identifying errors caused by this interaction

www.rohde-schwarz.com

GaN on SiC HEMT pulsed power transistor-

targets L-Band pulsed radar



M/A-COM Technology Solutions has introduced a GaN on SiC HEMT power transistor for L-Band pulsed radar applications. The MAGX-001214-500L00 is a gold-metalized pre-matched GaN on Silicon Carbide transistor optimized for pulsed L-Band radar applications. The MAGX-001214-500L00 provides 500 W of output power with 19 dB of gain and 55% efficiency. The device also claims high breakdown voltages, which allows for operation at 50 V under more extreme load mismatch conditions.

The device is assembled using state of the art design and packaging assembly, which enables the customer to reach higher gain and efficiency for today's demanding applications.

Operating between the 1200 MHz to 1400 MHz frequency range, the MAGX-001214-500L00 is a highly robust transistor, boasting a mean time to failure (MTTF) of 5.3 x10^6 hours, and is available as both flanged and flangeless packaged devices.

www.macomtech.com

Surface mount limiter diode

high power applications from 10 MHz to over 6 GHz

The CLA4608-085LF from Skyworks is a surface mountable, low capacitance silicon PIN limiter diode designed as a shunt connected PIN diode for high power limiter applications from 10 MHz to over 6 GHz. Maximum resistance at 10 mA is 1.2 Ω and maximum capacitance at 38 V is 0.65 pF. The combination of low junction capacitance, low parasitic inductance, low thermal resistance, and nominal 7 µm I-region width, makes the diode useful in large signal limiter applications. The threshold level is +20 dBm, nominal.

The device features a low thermal resistance of 50 °C/W, typical threshold level of +20 dBm, low capacitance of 0.60 pF, and comes in a low profile, ultra-miniature QFN (3-pin, 2 x 2 mm) package (MSL1, 260 °C per JEDEC J-STD-020).

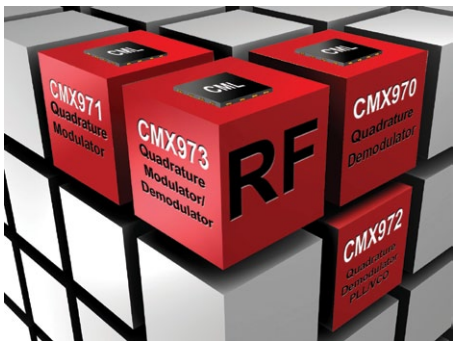
www.skyworksinc.com

Quadrature demodulator IC with PLL/VCO

wide frequency range and optimised power consumption

The CMX972 quadrature modulator/demodulator is the latest RF building block from CML Microcircuits, following on from the CMX970, CMX971 and CMX973 devices.

The device features a low-power IF/RF quadrature demodulator with PLL/VCO, a wide operating frequency range and optimised power consumption. The demodulator is suitable for superheterodyne architectures with IF frequencies up to 300 MHz and the device may be used in low-IF systems or in those converting down to baseband. An on-chip PLL and VCO, together with uncommitted baseband differential amplifiers, provide additional flexibility. Control of the CMX972



is by serial bus. The small, RF-optimised 32-pin VQFN package and minimal external components make the device ideal for space-constrained applications.

Features include; 20 to 300 MHz IF/RF Demodulator; 10 MHz Rx I/Q Bandwidth; under 1 degree I/Q Phase Matching; and under 0.5 dB I/Q Gain Matching. The chip offers a flexible RF building-block solution with excellent intermodulation performance, and phase/amplitude balance. Serial bus configuration is combined with simple interfacing to existing modem/baseband products.

www.cmlmicro.com

Service aware switch engine

tracks mobile and cloud access

Vitesse Semiconductor Corporation has expanded its Serval™ carrier Ethernet switch engine portfolio with Serval-2™ (VSC7438), which claims to be the first silicon optimized for high bandwidth IP Edge and Ethernet/MPLS access applications, including mobile backhaul, cloud access and business service delivery. Featuring the Vitesse Service Aware Architecture (ViSAA™), Serval-2 radically simplifies carrier delivery of MEF CE 2.0 services in packet-based mobile and cloud access Ethernet networks.

The Serval-2 family is MEF CE 2.0 ready with per connection feature control and resource allocation. Each Ethernet Virtual Connection (EVC) can utilize dedicated policers and shapers, statistics, queues, and tagging/marking schemes. Further, each connection may use built-in service activation testing when first provisioned; dedicated OAM functions ensure fault-free and SLA-compliant operation;

Serval-2 also delivers calable support of multiple 1 Gigabit Ethernet (GE) and 10 GE ports without the need for additional external components.

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