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IN BRIEF

Wi-Fi chipset revenue to reach $6.1 Billion in 2015

The Wi-Fi chipset market continues to march forward at a brisk pace as a growing number of consumer electronics are integrating Wi-Fi. As the demand for devices with Wi-Fi connectivity grows, and as prices for chipsets decrease, new markets for Wi-Fi are opening in areas traditionally dominated by other wireless connectivity standards.

According to the latest NPD In-Stat research, new markets such as smart meters, wireless mice, automobiles, and home automation will help drive sales of Wi-Fi chipsets to $6.1 billion in 2015.

Research findings included: the introduction of low-power Wi-Fi chipsets presents a challenge to Bluetooth in certain markets; 802.11ac will grow rapidly with chipset shipments to surpass 650 million by 2015; by 2015, the three biggest markets for 802.11ac will be smartphones, notebooks, and tablets; all of the chips shipping in the automotive market will be Bluetooth/Wi-Fi combo chips.

www.in-stat.com

LTE expected to dominate spending by 2013

The wireless technology known as 4G Long Term Evolution (LTE) is expected to claim the lion's share of wireless infrastructure capital spending next year as mobile carriers definitively migrate to that next-generation standard. Global capital spending on LTE technology is projected to reach $24.3 billion in 2013, nearly triple the $8.7 billion of 2012, according to an IHS iSuppli Wireless Communications report.

LTE infrastructure spending in 2015 will rise to $36.1 billion, compared to just $9.0 billion for 3.5G. This rapid growth is expected to allow LTE to overtake 3.5G, which will end its five-year run this year as the dominant category in wireless infrastructure gear spending.

www.isuppli.com

Active antenna can increase cell capacity by 40 percent

A U.S. network trial for the LTE 700-MHz active antenna from startup Ubidyne GmbH (Ulm, Germany) has demonstrated a 40 percent increase in cell capacity, the company said. The result, which exceeded Ubidyne's own predictions, could delay the need to invest in small cells to extend coverage. Ubidyne said the trial was conducted at multiple sites with a leading U.S. mobile operator but declined to name the operator.

The uB700 Antenna Embedded Radio enables beam forming and tilting and thereby was able to deliver doubled data throughput at the cell edge and an increase of 40 percent cell capacity overall at comparable output power, Ubidyne said. The Ubidyne integrated active antenna systems are compatible with CPRI and OBSAI optical interfaces and support current and next-generation standards including GSM, UMTS, HSPA+ and LTE.

"The trial shows that active antennas can significantly increase cell capacity using vertical sectorization and double the uplink throughput at the cell edge as well as increase the coverage area with independent uplink and downlink tilting," said Michael Frankle, CEO of Ubidyne, in a statement. "This successful independent verification shows that operators can now get maximum coverage and capacity from their macrocells using active antenna technology before investing in costly small cells."

www.ubidyne.com

Graphene mixer targets very high frequencies

Researchers at Chalmers University of Technology have for the first time demonstrated a novel subharmonic graphene FET mixer at microwave frequencies. The mixer provides new opportunities in future electronics, as it enables compact circuit technology, potential to reach high frequencies and integration with silicon technology.

Future applications at THz frequencies such as radar systems for security and safety, radio astronomy, process monitoring and environmental monitoring will require large arrays of mixers for high-resolution imaging and high-speed data acquisition. Such mixer arrays or multi-pixel receivers need new type of devices that are not only sensitive but also power-efficient and compact.

The ability in graphene to switch between hole or electron carrier transport via the field effect enables a unique niche for graphene for RF IC applications. Thanks to this symmetrical electrical characteristic, the researchers at Chalmers have managed to build the G-FET subharmonic resistive mixer using only one transistor. Hence, no extra feeding circuits are required, which makes the mixer circuit more compact as opposed to conventional mixers. As a consequence, the new type of mixer requires less wafer area when constructed and can open up for advanced sensor arrays, for example for imaging at millimetre waves and even sub millimetre waves as G-FET technology progress.

"The performance of the mixer can be improved by further optimising the circuit, as well as fabricating a G-FET device with a higher on-off current ratio", says Jan Stake, professor of the research team. "Using a G-FET in this new topology enables us to extend its operation to higher frequencies, thereby exploiting the exceptional properties of graphene. This paves the way for future technologies operating at extremely high frequencies."

In addition to enabling compact circuits, the G-FET provides potential to reach high frequencies thanks to the high velocity in graphene, and the fact that a subharmonic mixer only requires half the local oscillator (LO) frequency compared to a fundamental mixer. This property is attractive especially at high frequencies (THz) where there is a lack of sources providing sufficient LO-power.

Moreover, the G-FET can be integrated with silicon technology. For example, it is CMOS compatible (Complementary Metal Oxide Semiconductor) and among other things it can be used in CMOS electronics for backend processing on a single chip.

www.chalmers.se

IMS2012 MONTRÉAL

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International Microwave Symposium
IEEE 17-22 June 2012, Montréal, Canada MTT-S
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Biosphère, Environment Museum

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Credit : © Festival International de Jazz de Montréal, Jean-François Leblanc

Montréal International Jazz Festival

About the conference:

The IEEE Microwave Theory and Techniques Society's 2012 International Microwave Symposium (IMS2012) will be held on 17-22 June in Montréal, Canada as the centerpiece of Microwave Week. IMS2012 offers technical sessions, interactive forums, plenary and panel sessions, workshops, short courses, industrial exhibits, application seminars, historical exhibits, and a wide array of other technical and social activities including a guest program. Colocated with IMS2012 are the RFIC symposium (www.rfic2012.org) and the ARFTG conference (www.arftg.org), which comprise the Microwave Week 2012 technical program. With over 9,000 attendees and over 800 industrial exhibits of the latest state-of-the-art microwave products, Microwave Week is the world's largest gathering of Radio Frequency (RF) and microwave professionals and the most important forum for the latest and most advanced research in the area.

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IN BRIEF

Qualcomm, Ericsson demo LTE-to-3G handover

Qualcomm has announced that, working with Ericsson AB, it has completed a voice call handover from an LTE mobile network to a WCDMA network using Single Radio Voice Call Continuity (SRVCC) technology. SRVCC is a 3GPP specified feature that enables continuity of service by seamlessly switching to a WCDMA network when a consumer on voice-over-LTE call leaves the LTE network's coverage area.

The successful LTE-to-WCMDA transfer occurred on December 23, 2011 using a handset based on Qualcomm's Snapdragon S4 MSM8960 application processor that is 3G/LTE multimode capable. Qualcomm plans to repeat the demonstration at the Mobile World Congress in Barcelona, Spain.

SRVCC follows on from the launch of circuit-switched fallback (CSFB) technology on smartphones in 2011.

ww.qualcomm.com
www.ericsson.com

Movidius and Toshiba co-operate on 3-D camera

Fabless mobile multimedia chip company Movidius has announced it has partnered with Toshiba Electronics Europe and developed a reference design of 3-D image capture system for integration by camera module makers.

In the design the MA1178 video processing chip from Movidius operates with two MIPI standard streams from Toshiba image sensors at up to 8-Mpixels resolution. The chip works with extended depth of field (EDoF) cameras and can compensate for camera sensor differences or minor misalignments. EDoF cameras offer advantages over autofocus cameras in terms of 3-D synchronisation.

The system solution, including the Myriad 3-D software, offers flexibility for customers to implement a symmetric or asymmetric set up of either two 8-Mpixel or a combination of 8- and 3-megapixel EDoF cameras.

www.movidius.com

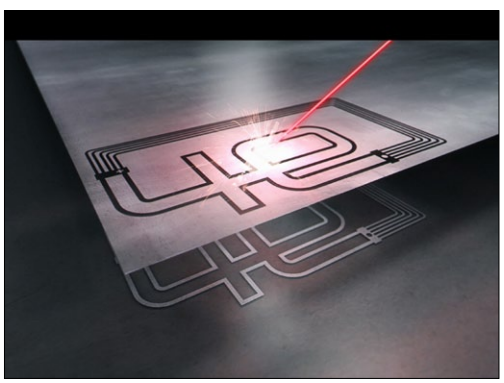
RFID antennas laser cut from aluminium and paper laminate

The manufacturing of RFID antennas through the process of etching is now being challenged by a new patented technology: Walki-4E, an efficient way of producing flexible circuit boards. This is possible through a dry production process, involving no liquid chemicals and using paper as the substrate. Producer of technical laminates Walki looked for ways to simplify the RFID antennas manufacturing process. The idea is to make a special laminate of aluminium and paper substrate, the aluminium foil is then patterned using a laser.

The technology can be used for any production of flexible circuits boards, ranging from RFID antennas to boards for radiators and flexible displays. The first product to be launched using Walki-4E technology is Walki-Pantenna, a UHF RFID antenna.

The four E's of Walki-4E stand for efficient, exact, economical and ecological. Compared with etching, the technology eliminates a whole step from the tag production process or from the converter's process, thus combining efficiency and economy.

"Since paper is used as a substrate, the RFID manufacturers can leave out the insertion of the PET inlay into paper, a necessary step when the antenna has been produced by etching. Moreover, the computer to antenna production method speeds up design and development, an



advantage especially when it comes to producing short series, involving a fewer number of antennas," Sami Liponkoski says.

Cost efficiency comes hand-in-hand with environmental benefits. The dry process does not involve any chemicals, thus resulting in process residue that is easily recyclable. The absence of liquid chemicals also leaves the RFID manufacturers with a product, the ready antenna, that is 100% recyclable.

The laser cutting precision allows for smaller chips, greater repeatability in the production process and higher accuracy of the antenna. According to the manufacturer, the antenna production could become completely digital.

www.walki.com

Texas Instruments shows off Pico HD projector that fits into a smartphone

Texas Instruments was keeping its eye on the big picture, through its littlest chipsets. The firm was literally beaming as it showed off its latest generation of DLP projector chipset, the Pico HD, capable of HD WXGA resolution projections from up to 100 inches away.

TI, which provides cinema chips to some 85 percent of the world's digital cinemas has managed to shrink those powerful chips down to a size able to fit snugly inside a cell phone, desktop robot or pocket projector, for those who like to project their media on the go.

The 1280 x 800 mirrors on the device create each individual pixel and each one is microscopic. Indeed, TI explained the size as being "about one tenth of a human hair." Each DLP chip can feature an array of those microscopic mirrors, up to 2.2 million, which switch at ultra-high speeds to generate a visible image.

As well as managing to make the multitude of mirrors smaller and smaller, TI said the chips now also operated in a much lower heat environment, despite producing the brightest projections yet.

This Pico HD chipsets power products that are purportedly some three to five hundred lumens of brightness, an "amazing accomplishment," according to the firm's spokesman, seeing as the previous generation was only capable of powering devices in the 50-100 lumen range.

www.ti.com

This month's cover depicts the evolution of modern networks towards 4G and in particular LTE. However, earlier technologies will remain in play for a very long time, invoking the need for seamless handover between a multitude of different standards.

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IN BRIEF

SiGe platform for 4G RF front-end modules

Microsemi Corporation claims to have developed a breakthrough technology platform for 4G RF front-end modules (FEMs) based on silicon germanium (SiGe) technology. The company is already developing next-generation IEEE 802.11ac wireless LAN FEM on this platform. IEEE 802.11ac is now being referred to as fifth-generation WiFi or 5G WiFi by the industry.

This latest platform integrates multiple filters, switches, LNAs and power amplifiers onto a single monolithic SiGe die, and supports multiple input/multiple output (MIMO) functionality. The high level of integration allows substantial reductions in cost and printed circuit board footprint.

www.microsemi.com

Intel details Medfield for smartphones

Intel has provided details of its Medfield 32-nm platform for smartphones claiming that the main SoC consumes less than 800-mW worst case. It has also announced that it has deals in place with Lenovo and Motorola for products based on Medfield to appear in 2012.

Lenovo is scheduled to introduce the K800 smartphone based on Medfield for the Chinese market in the first half of 2012, Intel said. The second partnership — with Motorola Mobility — is due to bear fruit in the second-half of 2012 but the Intel executives declined to say whether that would be for smartphones only, or would also include tablet computers.

The Medfield platform is based on a 32-nm CMOS SoC called Penwell — part numbered Atom Z2460 — which has as its CPU the single-core Saltwell implementation of the Atom processor architecture. However, it appears that a number of other companies have chips in the Medfield platform including Texas Instruments.

www.intel.com

Huawei leapfrogs LTE leaders in Europe

China's Huawei won the lion 's share of the business for LTE macro base stations in Europe last year, narrowly beating traditional leaders Ericsson and Nokia Siemens Networks who ranked second and third. Huawei's rise marked a surprising turnaround from 2010 when it sold less than half the number of European LTE base stations as Ericsson, according to a new report by NPD In-Stat. Together, Huawei, Ericsson and NSN accounted for more than 90 percent of the European LTE base station market.

"Almost of half of Huawei's 2011 success was the result of Huawei's work with Vodafone in Germany," said Chris Kissel, a senior analyst for NPD In-Stat.

Alcatel-Lucent, Ericsson and Huawei had roughly similar shares of the Western European LTE base station market in 2011. In Eastern Europe, however, Huawei dominated almost half the market, NPD said.

The market watcher forecasts that Nokia Siemens Networks will grab the top spot in the European LTE market in 2015 estimated to consist of more than 400,000 LTE installations. Ericsson is projected to grab the top spot in Eastern Europe that year. Among other suppliers, Alcatel-Lucent and ZTE are expected to make market share gains in the future.

www.instat.com

Wireless implantable MEMS sensor powered by music

Researchers at Purdue University have developed a MEMS sensor that uses the low bass sounds of rap music to selectively power the device when implanted in the body. Music within frequencies 200-500 hertz causes the micro-electomechanical system's cantilever to vibrate, generating electricity and storing a charge in a capacitor.

"The acoustic energy from the music can pass through body tissue, causing the cantilever to vibrate and effectively recharge the pressure sensor," said Babak Ziaie, professor of electrical and computer engineering and biomedical engineering, in a statement.

In operation, when the frequency falls outside of the proper range, the cantilever stops vibrating, automatically sending the electrical charge to the sensor, which takes a pressure reading and transmits data as radio signals. Because the frequency is continually changing according to the rhythm of a musical composition, the sensor can be induced to repeatedly alternate intervals of storing charge and transmitting data.

The technology offers potential benefits over conventional implantable devices, which either use batteries or receive power through inductance. Batteries have to be replaced periodically, and data are difficult to retrieve from devices that use inductance.

www.purdue.edu

MIPI announces RF standards for mobiles

The MIPI Alliance has announced two specifications targeting the digital modem and the front-end radio. These are the DigRF v4 and the RFFE v1.10 specification.

The DigRF v4 interface supports HSPA+, LTE, Mobile WiMax, and existing 3GPP standards including 2.5G and 3.5G. DigRF v4 is based on the MIPI Alliance M-PHY physical layer specification. The specification enables a single, integrated Link between a baseband IC and RFICs, with options for additional RFICs and BBICs using separate links.

The RFFE v1.10 specification defines a standardized control architecture for RF front-end devices, and offers an approach for multi-mode, multi-band and multiple antenna configurations. It offers a method for controlling power amplifiers, low-noise amplifiers, filters, switches, power management modules, antenna tuners and sensors. It supports point-to-multi-point connectivity, controlling simple to complex RF systems.

www.mipi.org

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LTE Spectrum bands foxing networks and devices alike

The global deployment of LTE is radically changing the mobile space. But the rapid deployment of LTE is not without its challenges. As carriers and handset providers navigate the path to 4G mobile services, not only do they have to cope with multi-technology networks, but also multiple frequency bands.

Global LTE frequency allocation will differ because of diverse national regulatory positions on the issue. Current 3GPP specifications for LTE define over 30 potential bands for the technology. This is an inheritance of the different allocations issued by regulators and the ability of LTE to be deployed in a much wider range of frequencies than prior mobile standards. Informa's recent LTE Spectrum Strategies report revealed that roughly 10 different bands were being used for LTE. However, even this small amount of bands will generate challenges for operators and vendors alike.

Incorporating technology to cope with multiple LTE frequencies and supported bandwidths presents a major challenge to operators and manufacturers. One example of the complex problems that LTE brings is the ability to roam onto different international LTE networks, each with their own varied make-up and performance nuances. For instance, French incumbent operators are in the process of bidding for 4G spectrum in the 2.6 GHz band, whereas networks in the USA have deployed LTE in the 700 MHz – 800 MHz frequencies. Networks utilising 2.6 GHz or 700 MHz - 800 MHz frequencies for LTE could mean that subscribers may have problems connecting to the network when roaming.

According to Paul Beaver, Products Director at Anite, the wireless device testing company, operators and manufacturers will be able to overcome the challenges of supporting multiple LTE frequency bands by developing a comprehensive quality assurance system, based on laboratory based device testing. However, Beaver believes that field testing LTE devices alone is not a practical solution, as it requires a significant amount of time, prohibitively high cost levels and is not repeatable.

A key requirement will be the development of a comprehensive quality assurance system, based on standardized lab-based device testing, to significantly reduce the possibility of launching LTE devices that don't interoperate

There are significant cost savings, operational advantages and performance benefits that can be generated by testing LTE devices in the lab

Paul Beaver
Anite
www.anite.com

Conveniently analyze embedded systems with mixed signal oscilloscopes

By Dr. Wolfgang Herbordt, Rohde & Schwarz

The more tasks that embedded systems take on, the more complex these systems become. At the same time, both the variety and number of interfaces between digital and analog components are increasing. A single design might use 1 bit signals, clocked and unclocked parallel data buses and serial data buses, standardized or proprietary transmission formats and a variety of data rates.

Anyone who wants to get a handle on the increasing complexity has to analyze all of these interfaces at different levels of abstraction. This usually requires complex test setups with multiple instruments, each of which is operated differently: Analog waveforms are studied using an oscilloscope, digital signals with a logic analyzer and transmission protocols with a protocol analyzer.

In the past, the oscilloscope was primarily used to visualize electrical voltages over time. Today it has developed into a universal test instrument. In its new configuration as a mixed signal oscilloscope, it now provides digital channels for analyzing digital states and protocol details in addition to the analog channels. As a result, users can analyze the circuits at the various levels of abstraction with only one instrument and therefore only one user interface. This makes mixed signal oscilloscopes useful during hardware development for analyzing signal integrity and increasingly also during software development for studying the content of signals.

This paper investigates the range of functions for a mixed signal oscilloscope and how they are used based on the example of the Rohde & Schwarz RTO family of oscilloscopes with the integratable R&S RTO-B1 mixed signal option. See Figure 1.

Two-phase principle: acquisition and analysis

The functioning of a digital oscilloscope can be split into two sequential phases, the acquisition phase followed by the analysis phase. During the acquisition phase, the sampled test signals are saved to a data memory. The acquisition phase is characterized by the sampling frequency, the acquisition depth and the trigger options.

During the analysis phase, the acquired waveforms are analyzed and output over the user interface; i.e., to the instrument screen or to files. The data analysis functions on a digital oscilloscope include the Zoom, Test, Cursor, Math and Search functions.

Mixed signal oscilloscopes use this two-phase principle for both the analog and digital channels. The instrument must continue to serve as a conventional oscilloscope and the functionality of the analog and digital channels must integrate cleanly. The many channels and the resulting range of setting options make a simple and clear user interface even more important.

With its flat menu structure and signal flow diagrams, the R&S RTO together with the mixed signal option is very easy and intuitive to use. Operating menus are transparent and the test windows remain visible. As a result, every change to the settings that will affect the waveforms becomes immediately obvious. For even more clarity, waveforms can be grouped on the screen in separate windows.

Time synchronization

Analog and digital channels are acquired synchronously on the same instrument so that analog waveforms, digital signals and protocol details are time-correlated and can be analyzed in one location.

A delay compensation between the analog and the digital channels is needed for synchronous signal acquisition. With the mixed signal option, this delay compensation takes place between the digital channel probe boxes and the analog probe connectors inside the instrument. As long as the delay between the analog probes and the probe tips on the digital channels is not important to the user, then no further settings are needed.

Time resolution and acquisition cycle

A high time resolution for both the analog and digital channels is preferred because the events within the digital signals are analyzed with a high degree of temporal accuracy and even narrow glitches are reliably detected. Even when digital channels are used as the trigger source, the trigger time is determined with a high degree of accuracy, ensuring that waveform jitter is minimal during visualization.

Figure 1: RTO oscilloscope with integrated RTO-B1 mixed signal option.

The R&S RTO-B1 mixed signal option therefore offers a sampling frequency of 5 Gsample/s for the 16 digital channels, as compared to 10 Gsample/s for the analog channels. The resulting time resolution for the digital channels is 200 ps. This time resolution over the entire acquisition depth of 200 Msample is a rarity in this instrument class. Even events that occur long after the trigger occurrence are displayed with a high degree of temporal accuracy. The data memory for the mixed signal option is separate from the base unit. The acquisition depth of 200 Msample therefore remains unaffected by the number of analog and digital channels being used.

If the time resolution in the analog channels exceeds that in the digital channels, as is the case at a sampling rate of 10 Gsample/s or during interpolation, sample & hold

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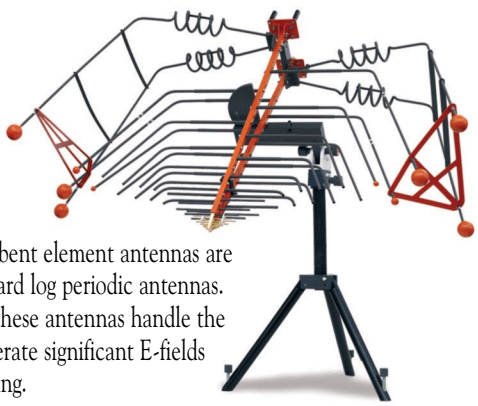

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interpolation is used to adjust the digital channels to the sampling rate of the analog channels. Joint analysis of analog waveforms and digital signals is thereby ensured.

The maximum acquisition depth of 200 Msample per digital channel is suitable for acquiring long data sequences from serial buses in many applications. A bit rate of 400 Mbps and a sampling frequency of 5 Gsample/s, for example, results in an acquisition depth of 16 Mbit.

The storage depth can be used to both acquire long data sequences and to acquire a large number of sequential waveforms.

Trigger options

Oscilloscope trigger types for which a single amplitude threshold (i.e. the threshold for the logical transition) is sufficient are frequently offered for digital channels. The R&S RTO-B1 mixed signal option includes the trigger types Edge, Width, Timeout, Pattern, State, Data-to-Clock and Serial Pattern with Holdoff functionality, Time, Event and Random Time. Trigger sources are individual digital channels, bus signals, or any logical combination of all digital channels using logical operators such as AND, OR and XOR. All signals that the user can select as a trigger source, in particular logically combined digital channels, are available during the analysis phase for visualization.

High measurement speed

A typical challenge in the design of digital oscilloscopes is the reduction of its “blind time”. This is the time during which no data acquisition takes place and therefore potentially interesting events are not seen. How can the blind time be reduced so that rare events are detected more quickly?

The blind time is shortened by optimizing the analysis phase. The RS& RTO oscilloscope family contains an application-specific integrated circuit (ASIC) in which data acquisition and analysis take place simultaneously. The result is an instrument speed of up to one million visualized waveforms per second.

With the mixed signal option, the digital channels are also well integrated. Signal processing takes place within a single field programmable gate array (FPGA) over the entire process, from acquisition and triggering to visualization, cursor functions and measurements. Analysis is performed in parallel for all 16 digital channels. This is done at a speed of up to 200 000 visualized waveforms per second. This maximum speed is independent of the number of analog and digital channels being analyzed. See Figure 2.

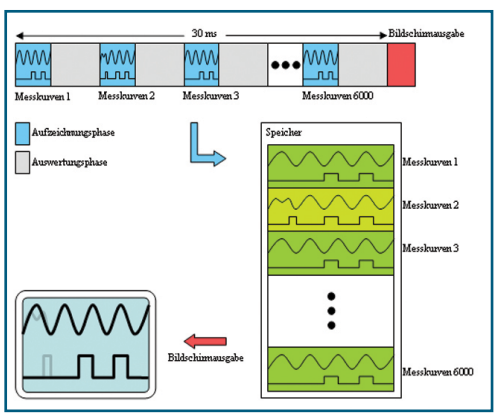
Signal-based visualization

A screen dump takes place every 30 ms to match the visual perception of the human eye. Therefore, between two screen dumps, the R&S RTO family of oscilloscopes hardware-superimposes the waveforms from the analog channels in order to display all waveforms on the screen. The mixed signal option also uses this display method for the digital channels.

Binary signals from all acquisitions between two screen dumps are superimposed. At an acquisition rate of 200 000 waveforms per second, all 6 000 acquired waveforms are visualized simultaneously on the screen. This provides the user with an overview of the frequency of the binary states and of the edge transitions over the entire time period. The user can then use the search functions to read individual waveforms back out from memory and analyze them more precisely.

Bus signals, on the other hand, are not superimposed because they include data content from multiple combined binary signals. To allow a clear analysis of bus signals, the user can adapt the display format to the bus format. A distinction is made between unclocked and clocked data buses. With unclocked data buses,

Figure 2: Visualization of all acquired waveforms with the frequency of events at an acquisition rate of 200 000 waveforms/s.



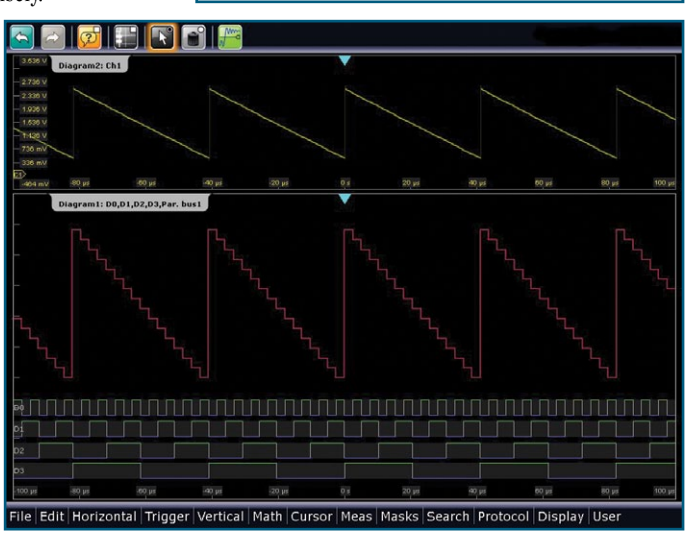


Figure 3: Display of a parallel bus signal as an analog waveform.

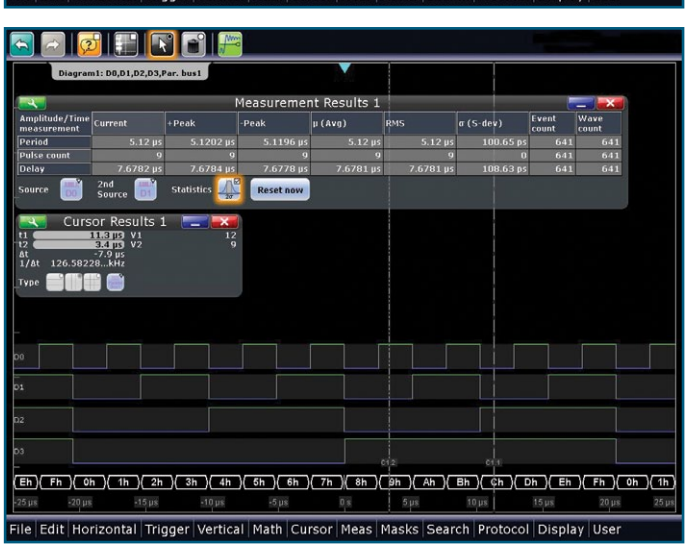


Figure 4: Measurements and cursor functions on digital channels.

the logic state is determined for each sampling period. With clocked data buses, it is determined only for valid edges. Display is in bus format, in table format, or as an analog waveform in binary, hexadecimal, decimal and fractional number formats. See Figure 3.

Signal analysis

Critical factors for the effective and efficient study of waveforms are the number and quality of the analysis functions provided by the oscilloscope. In particular, automated amplitude and time measurements, including their statistical analysis, math functions and cursor functions are provided. For digital channels, only time measurements and the associated statistical analyses are used. Math functions are reduced to logic operations for binary signals.

The mixed signal option offers a broad selection of time measurements and their statistical analysis. The math signal can be any logical combination of all 16 digital channels. This is also used as the source signal for measurement functions. Cursor functions can be used on binary signals, on bus signals and on logically combined digital signals. See Figure 4.

Market outlook

Today's mixed signal oscilloscopes expand the basic oscilloscope functionality to include logic and protocol analyzer elements. Users benefit from the simplified test setups, uniform operation and synchronous visualization of analog waveforms, digital signals and protocol details within a single instrument. This allows the user to focus more quickly on the actual task of analyzing the circuit. Hardware developers use mixed signal oscilloscopes to analyze signal integrity, while software developers use them to analyze signal contents.

Mixed signal oscilloscopes will keep pace with the increasing complexity of analog and digital circuits in the future as well. The digital channel bandwidth will continue to increase, allowing users to analyze interfaces with higher data rates. Functionality from logic and protocol analyzers will be added and the number of test functions and analysis options will increase. Regardless of what enhancements are made, however, the focus will always remain on simple and intuitive operation.

New mixed signal option at a glance

In addition to the analog channels provided by the base unit, a mixed signal option can be inserted into the R&S RTO family of oscilloscopes to provide 16 digital channels. These are sampled at 5 Gsample/s with a time resolution of 200 ps. At a sampling frequency of 5 Gsample/s, the storage depth is 200 Msample. Otherwise it is 100 Msample per digital channel. The maximum input frequency is 400 MHz at a minimum signal deviation of 500 mV. In normal operation, up to 200 000 visualized waveforms per second are acquired over analog and digital channels. The 16 digital channels are split between two probes with up to 8 digital channels each. The measured input impedance of the probes is 100 kΩ‖4 pF. The threshold values can be set in the range of ±8 V at 25 mV intervals. The hysteresis can be set to one of three levels to suppress noise influences.

About the author

Dr. Wolfgang Herbordt studied at the Institut National des Sciences Appliquées de Rennes and at the University of Erlangen-Nürnberg, where he obtained his doctorate degree in the field of digital signal processing. Today he works in project management and oscilloscope design at Rohde&Schwarz. He can be contacted at: wolfgang.herbordt@rohde-schwarz.com.

Carrier aggregation in the LTE-Advanced physical layer: concepts and test challenges

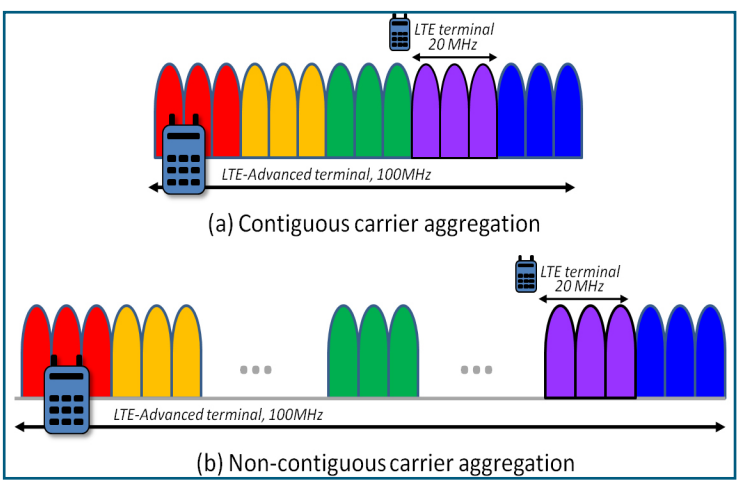
Martha Zemede, Applications Expert, Microwave and Communications Division, Agilent Technologies

LTE-Advanced is an emerging mobile communications standard that boasts a number of significant benefits, including the ability to take advantage of advanced-topology networks and achieve target peak data rates of 1 Gbps in the downlink and 500 Mbps in the uplink. Specified as part of Release 10 of the 3GPP specifications, the standard has been approved for 4G IMT-Advanced. To a large extent, LTE-Advanced builds on top of LTE parameters and maintains some of its basic structures. However, it also introduces new features consisting of several LTE Release 8/9 physical-layer enhancements and other technologies that will be developed in LTE Release 10 and beyond.

One major enhancement in LTE Release 10 is carrier aggregation, the mechanism by which LTE-Advanced specifies spectrum allocations of up to 100 MHz through aggregation of two or more component carriers (CCs). Because the maximum 20 MHz bandwidth specified in LTE Release 8/9 is not sufficient for reaching IMT-Advanced target peak data rates, and because most operators do not have larger amounts of contiguous bandwidth available in their spectrum resources, IMT-Advanced allows the use of carrier aggregation to create wider bandwidths.

As a result, LTE-Advanced defines three carrier aggregation scenarios in Release 10: single band (or intra-band) contiguous, single band non-contiguous, and multiband (inter-band) non-contiguous carrier aggregation. Component carriers of different bandwidths (1.4 MHz to 20 MHz) may be aggregated, and the resulting signals can be of different sizes. Because Release 10 CCs are the same bandwidths as defined in Release 8/9, LTE-Advanced maintains backward compatibility with LTE in the following way. Release 10 (UE) with carrier aggregation reception or transmission can simultaneously receive or transmit on multiple CCs corresponding to multiple serving cells. However, Release 8/9 UE can only receive or transmit on a single CC corresponding to one serving cell.

Figure 1: Carrier aggregation.



Contiguous versus non-contiguous aggregation

Figure 1 illustrates the concepts of contiguous and non-contiguous carrier aggregation, contrasting the potential bandwidth support requirements of the LTE and LTE-Advanced user equipment. In the first example, five adjacent CCs, each 20 MHz wide, cover the maximum 100 MHz LTE-Advanced bandwidth. Although this scenario is not achievable for most operators today, such contiguous allocation of CCs could become a possibility when new spectrum bands such as 3.5 GHz are made available in some countries.

Non-contiguous aggregation in which the CCs are separated within a single frequency band could be applied if multiple operators share a network or if the frequency band allocated to an operator is fragmented. Non-contiguous aggregation in which CCs belong to different frequency bands (for example, the 1.8 GHz and 2.6 GHz bands in some parts of Europe) is a more realistic scenario today for the downlink (base station to UE) as spectrum allocation for operators is often scattered across multiple frequency bands. However, for the uplink (UE to base station), this scenario would be very challenging since it would require multiple transceivers in the UE.

Technical challenges

Aggregation is not new to LTE-Advanced and is used, for example, in HSPA and 1xEV-DO Release B. Nevertheless, carrier aggregation brings new technical challenges to LTE-Advanced system design, particularly in regard to the UE. Consider that the RF front-end implementation of the LTE-Advanced UE can vary greatly with carrier aggregation, depending on the supported scenarios. Since contiguous carrier aggregation is the least complex scenario, and in Release-10 devices contiguous carrier aggregation won't exceed two CCs (40 MHz maximum), it may be possible to support this configuration with a single wideband transceiver in the UE. Non-contiguous allocations, however, will require UE with multiple transceivers or a single, very wide wideband transceiver. Using multiple transceivers increases the size and cost of the mobile device, while a wider bandwidth translates into receiving more undesired signals from other services and an increase in effective noise. For non-contiguous aggregation, most current proposals prefer the use of multiple transceivers over the single wideband approach.

In addition to RF front-end issues, the use of simultaneous non-contiguous transmitters create a highly challenging radio environment in terms of spur management and self-blocking. Simultaneous transmit or receive with mandatory MIMO support increases the difficulty of antenna design. Also, the number of test cases for carrier aggregation will rise dramatically if all combinations (contiguous,

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non-contiguous, intra-band, inter-band) have to be explored. Specific RF requirements for LTE-Advanced are being discussed in 3GPP.

The presence of multiple simultaneous transceiver chains means that multiple transmitters must now be tested simultaneously. In the case of inter-band aggregation, synchronization must be maintained between the multiple transceivers to allow simultaneous error vector magnitude (EVM) measurements on multiple CCs. It has therefore been proposed to specify EVM only for those cases in which the power density is the same for both carrier allocations.

With intra-band non-contiguous carrier aggregation, a gap exists between the CCs in which other technologies (for example, GSM or W-CDMA) could be transmitted. Physical-layer transmit and receive measurements must be extended across the gap to assess the interference caused by the co-existing, uncoordinated systems. This increases the difficulty of defining limits to out-of-band emission tests such as adjacent channel power and spectrum emission mask.

Other challenges include defining a specification for testing multicarrier in-band emissions and finding appropriate methods of characterizing the power amplifiers used in LTE-Advanced, which will be stressed in different ways by the different carrier aggregation configurations. Overcoming all the technical challenges of designing and testing LTE-Advanced equipment is critical to a successful deployment.

Signal generation and analysis

To test aggregated signals, design and test engineers require advanced instruments that can capture and analyze all CCs simultaneously. This is a challenge, particularly in the case of inter-band carrier aggregation, since no signal analyzer on the market today has a bandwidth wide enough to cover the multiple frequency bands. Existing instruments can analyze only one CC at a time. The problem can be solved by using two signal analyzers, each tuned to a relevant frequency band and synchronized. The analyzers are controlled with software developed specifically for LTE-Advanced testing. The software acquires the inter-band signal from the two analyzers and performs simultaneous analysis on all CCs.

Figure 2 shows a test signal with three CCs: two at the 800 MHz band and one at the 2100 MHz band. The software acquires the components simultaneously from the two bands through the synchronized signal analyzers and analyzes all three CCs simultaneously. Engineers can select from dozens of waveform, spectrum, error, and summary trace types and arrange up to 20 traces on the display to see exactly what is needed.

To test power and modulation characteristics of LTE-Advanced components and transmitters, Release-10-compliant downlink and uplink signals are required. In Figure 3, signal generation software is used to create an aggregated signal with five CCs. The software's built-in tools such as CCDF and spectrum- and time-domain graphs can be used to investigate the effects of power ramps, modulation formats, power changes, clipping, and other effects on device performance.

Conclusion

Carrier aggregation introduces complex changes to the existing LTE physical layer. When implemented, it will lead to asymmetric uplink and downlink allocations with different combinations of CC number and bandwidth in aggregated signals of different sizes. The resulting number of test cases could become unmanageable. How to limit the allowed allocations is the business of the 3GPP today. In the meantime, test vendors are working hard to provide advanced tools that can handle the need for simultaneous capture and analysis of the CCs, whether inter-band or intra-band, so that these tools can quickly and effectively deployed for testing various LTE-Advanced scenarios.

About the author

Martha works in the Microwave and Communications Division of Agilent Technologies, as an applications expert for 3GPP LTE /LTE-Advanced Signal Analysis solutions. She graduated from San Jose State University in 2000 with a Bachelors Degree in Electrical Engineering and has taken postgraduate studies in wireless communications at Stanford University. In the last 11 years with Agilent, Martha has worked in supporting the cellular communication technologies in Agilent's signal analyzers as well as product marketing positions.

Figure 2: Agilent 89600 VSA software acquires the inter-band signal from two signal analyzers and analyzes all CCs simultaneously.

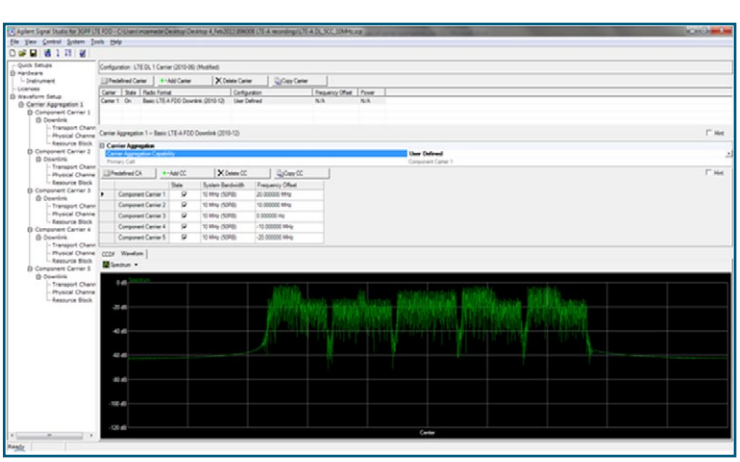


Figure 3: Agilent Signal Studio software generates an aggregated signal consisting of five contiguous CCs.

No magic bullet for crosstalk

By Dylan McGrath, EE Times

There is no perfect solution to the problem of crosstalk in modern communications ICs, an increasing concern as chip designers push devices into the realm of 28-Gbps and beyond, according to a panel of experts at DesignCon 2012.

Crosstalk — unintended interference of communication channels — can wreak havoc on a comms IC. But panelists, including representatives from test and measurement equipment vendors Tektronix, Agilent Technologies, and LeCroy — acknowledged that there are currently no tools that enable designers to adequately measure the effects of various types of crosstalk, thus preventing them from modifications that mitigate the problem.

To make matters worse, panelists said, there is a major disconnect between what communications standards such as PCI Express specify and what is actually needed to build chips that send and receive at cutting-edge speeds. "There is a fundamental difference between a silicon implementation and the reference equalizers you see in these emerging standards such as PCI Express," said Mark Marlett, director of engineering responsible for serdes development at IP vendor Analog Bits Inc.

While there is no fail safe solution for measuring the effects of cross talk on a chip, Mike Peng Li, principal architect and distinguished engineer at Altera, said the best existing solution is decision feedback equalizer (DFE), a type of circuit that can be inserted into a design to minimize crosstalk. "The DFE is the best medicine we have," Li said.

DFE is "a medicine that doesn't have the side effect of amplifying noise," said Martin Miller, chief scientist at LeCroy.

Panelists generally agreed with Li that DFE represents the best hope currently. But the method has its limitations. DFE has a problem with "avalanching" errors, said Ransom Stephens, a tech consultant and writer who served as the panel's moderator. "When it stumbles, it falls," Stephens said.

At one point, Stephens commented that panelists were working on solutions for the problem of crosstalk that they were reluctant to mention publicly. "There are proprietary solutions being developed," Stephens said after the panel concluded.

"We do have some ideas and some concepts on how to measure crosstalk and what we can do about it," said Pavel Zivny, a domain expert for serial data at Tektronix.

Panelists admitted that the ultimate solution to the crosstalk problem is a move to channels based on silicon photonics.

Li said the fundamental limit for comms chips using current CMOS technology is probably around 50- to 60-Gbps. After that, he said, some type of photonics scheme must be implemented for comms chips to push the envelope further. Li lamented the fact that only a very few companies, chiefly Intel and IBM are doing the fundamental research needed to move silicon photonics onto chips, but he predicted that "gradual changes" over the next three to four years would move that technology into semiconductors, much sooner than many observers think that it will happen.

Extreme wideband digital VGA with high power gain over band, smart lead routing and power save mode

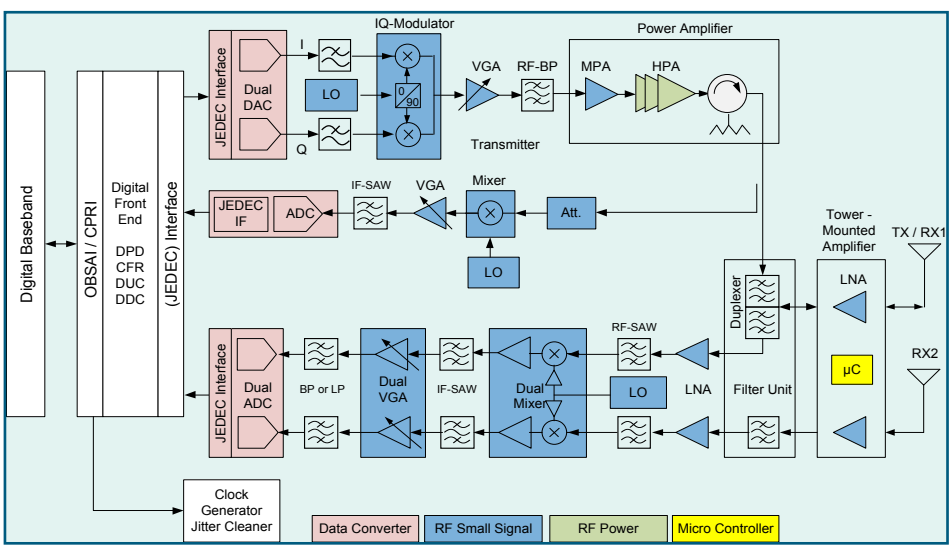
By Randy Cochran, Marketing Manager Infrastructure, NXP semiconductors, www.nxp.com

As wireless air interface standards continue to occupy multiple frequency bands globally, and operate across wider instantaneous bandwidths, engineers continue to select components and technologies that may be used for many frequency bands and modulation types. Beyond that, differentiated higher performance products are chosen for the final design.

What differentiates one variable gain amplifier from another in today's competitive device market? To answer that question, the entire transmit system of the base station transceiver block diagram must be taken into account.

Higher output power, higher peak gain and smaller attenuator step sizes enables engineers to use fewer components and provides greater control to maintain and optimize transmit chain performance. Devices that operate over more than 2 GHz of bandwidth also stand out as allowing the same device to be populated for several frequency bands. Devices with pin-outs that do not cross other connections to the package make for a simpler design and as well as reduced footprint size. Further, devices that offer higher performance while consuming lower dissipated power tend to stay near the top of the decision tree.

NXP has recently introduced several new products, which offer the enhanced performance required by today's RF engineers. The BGA7204 and BGA7210 are two good examples that provide these key advantages. These VGAs deliver 21 dBm and 23 dBm of output power at 1 dB compression, respectively, at their maximum gain setting with high output IP3, respectively 38 dBm and 39 dBm. The BGA7204 offers a maximum gain of 18 dB, while the BGA7210 provides 28 dB of max gain. Both devices deliver over 31.5 dB of gain control with a 6-bit 0.5 dB digital step attenuator. The BGA7204 supports operation across 0.4 GHz to 2.75 GHz while the BGA7210 operates over the extremely wide bandwidth of 0.7 GHz to 3.8 GHz. These devices are implemented in a single monolithic device, which enables simpler routing of board traces as well as high quality standards required by the most demanding wireless systems. This simpler routing results in a layout that is



25% smaller than that of the competition. Also, the BGA7204 and BGA7210 consume 10% less current than competitors while offering superior linearity performance and higher output power at 1 dB compression.

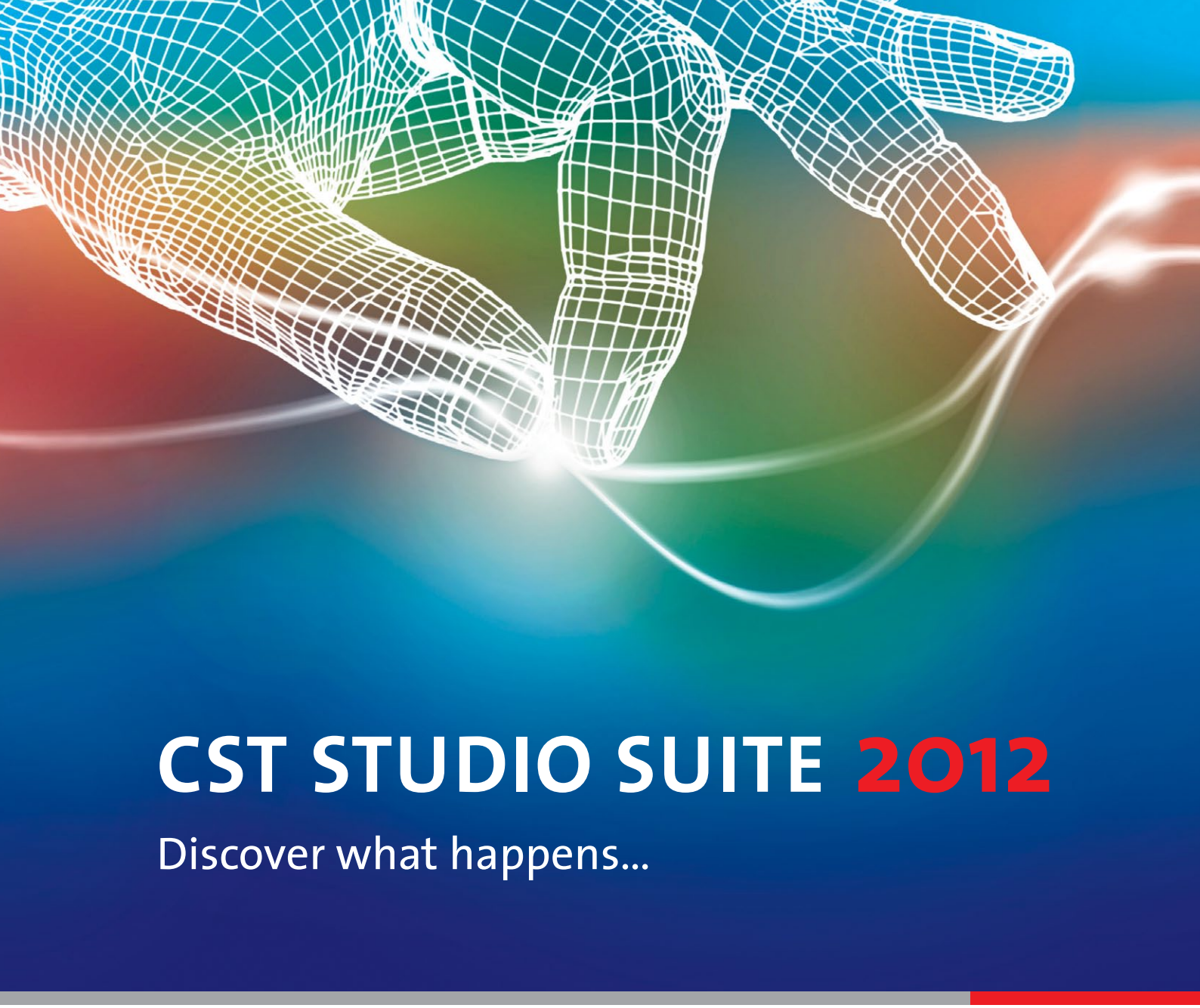
The BGA7210 provides a flexible current setting allowing even lower current consumption. For instance, if linearity is not as critical in the application, the current consumption may be reduced. Both products offer a power down mode that allows the current to be reduced to 15 mA, which is beneficial in Time Domain Division (TDD) systems. The BGA7210 supports fast switching on and off which dramatically saves current in the overall application based on the duty cycle. Also special care is taken inside the device to avoid the spurs during fast on and off switching. Last but not least, the customer evaluation kit provides executable control software on a USB flashdrive, which does not require installation.

These unconditionally stable devices offer ESD protection at all pins and meet moisture sensitivity level 2. The RoHS compatible devices are housed in 5 x 5 mm^2 leadless HVQFN packages. These VGAs are well suited for GSM, W-CDMA, WiMAX, LTE Wireless Base stations, Wireless Point to point, Wireless repeaters, cable modem termination systems and temperature compensation circuits.

What enables these VGAs' high performance is NXP's innovative SiGe:C QUBiC4 process, which allows more functionality on-chip with less space. Smaller devices also mean more competitive costs, and added functionality on a single chip improves reliability and gives significant manufacturing advantages.

NXP's state-of-the-art QUBiC4 technology speeds the migration from GaAs to silicon by offering best in class linearity, power consumption, immunity to out-of-band signals, spurious performance and output power. Available since 2002, this process continues to upgrade to meet today's system performance requirements. This extensively tested process and widely deployed in the field offers consistent parameter performance.

Beyond these VGAs, NXP is one of the very few companies that can actually supply products for the complete signal chain (i.e. analog mixed signal components such as ADC/DAC + RF Small-Signal + High Power RF), allowing engineers to purchase products that work well together as part of the overall system design. This systems approach is certainly one that gives design engineers an edge when purchasing RFICs and MMICs from a supplier such as NXP. Clearly, it is an important strategy for semiconductor companies to take when designing and developing ICs for today's high performance wireless infrastructure.



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CHANGING THE STANDARDS

Wireless infrastructure trends for 2012

By Phil Sorsky, CommScope

Phil Sorsky, CommScope's VP Wireless Sales, Europe gives an insight into what he expects will be three of the biggest wireless infrastructure trends in 2012.

These include the emergence of micro networks to support the core network, the growing demand for energy efficient solutions and reducing operating costs by managing infrastructure remotely.

Emergence of heterogeneous networks

As far as mobile users are concerned, data is data is data. Whether they stream or download content over one technology or another isn't important to them, their main concern is having a connection capable of delivering the service they want, wherever and whenever they want it. Operators are well aware of this and are introducing the concept of heterogeneous networks (Het Nets) to help provide ubiquitous high-bandwidth connectivity.

Het Nets combine numerous micro networks, consisting of multiple low power technologies such as picocells, microcells, distributed antenna systems (DAS) and Wireless LANs, to reinforce high-usage hotspots. The micro networks seamlessly interlink with an operator's core cellular network - or macro network - to deliver widespread coverage alongside additional capacity where it's really needed.

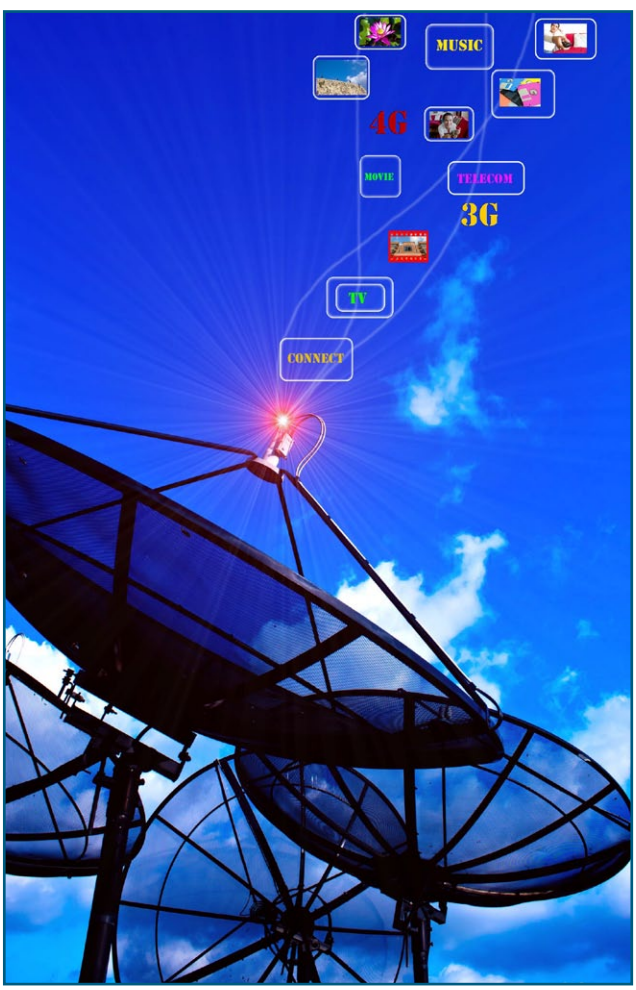
The stakes are high to provide consumers with a flawless 4G experience, with European mobile broadband revenues expected to jump from approximately €10 billion in 2011 to nearly €16 billion by 2016 [i]. As a result, Het Nets will play an integral role in next-generation deployment strategies across the continent next year.

Remote controlling the network

One major area of expense that mobile operators will streamline in 2012 is their dependence upon network site visits. Currently, experienced technicians must regularly visit each site to configure equipment, perform maintenance and implement repairs. This inefficient use of a technician's time can be considerably costly, especially for large networks with numerous sites in remote and distant locations.

Operators can be warned through "soft alarms" when equipment begins to fall below optimum performance, as opposed to simply being alerted when equipment fails, which is often the case. This not only allows network managers to solve minor problems before they become major issues, but to choose the best time to respond and solve multiple problems in one visit.

In addition, the ability to make remote adjustments, like altering thermostat settings, completely negates the need for visits to make simple changes to infrastructure settings. Base station efficiency can be further improved by using remote monitoring software to switch-off non-essential services when traffic is low, ensuring they only consume power as and when it's needed.



Gathering green momentum

From an infrastructure perspective, the move towards energy efficient solutions was undoubtedly one of the biggest trends of 2011. The benefits operators have seen so far not only justify their initial investment but can clearly maximise a network's long term profitability. With global telecoms revenue expected to fall by 5% by 2015, as predicted by Analysys Mason, [ii] green solutions will continue to be adopted progressively throughout 2012 to offset this.

To achieve many of their "green" goals, wireless operators will be investing more in clean and reliable backup power generators, remote shelter monitoring, amplifier upgrades, shelter cooling and hybrid cooling systems, and greater network intelligence.

As an example, switching to hydrogen fuel cells for backup power from traditional energy sources, such as diesel generators or batteries, illustrates just how far operational expenditure can be trimmed through 'green' solutions. In addition to their inherent energy efficiency, fuel cells require considerably less maintenance than diesel generators whilst taking up roughly 50 percent less space on site – which can help to reduce leasing costs. On average, the maintenance cost of fuel cells is 77 percent lower than diesel generators and the operational cost is 37 percent lower. [iii]

References

[i] Source: Analysys Mason: LTE - a Potential Drive for Subscriptions Growth in Europe.
[ii] Source: Analysys Mason, Western European telecoms market: trends and forecasts 2010–2015.
[iii] Source: CommScope White Paper, Advanced Fuel Cell Solution for Telecommunications Networks.

Wi-Fi to enhance tablets and tackle small cells

Chip makers and consumer electronics manufacturers are working to improve the tablet user experience within the home, turning to newer versions of Wi-Fi to improve connectivity and the ability to stream content from tablets to TVs, according to Michael Hurlston, senior vice president of Broadcom's Home and Wireless Networking business unit.

Broadcom is pushing what it calls 5G Wi-Fi, based on the 802.11ac version of the Wi-Fi spec. Broadcom recently rolled out a family of chips based on the 802.11ac, which promises higher speed and better reliability than the current mainstream, 802.11n.

Down the road, the next major innovation in Wi-Fi will be the emergence of the 802.11ad standard, which operates in the 60-gigahertz band and offers tremendous speed improvements, though has a shorter transmission range, Hurlston said. He called 802.ad a "revolution," as opposed to the "evolution" offered by 802.11ac.

Though some companies may have chips supporting 802.11ad available this year, Hurlston said Broadcom doesn't believe the market is ready for them yet. He expects more meaningful adoption of 802.11ad in the next few years. Meanwhile, Hurlston said he expects consumer electronics companies to bring to market products that feature 802.11ac, or 5G Wi-Fi, toward the middle of this year.

Wi-Fi: Small cells — a solution to a 'big' problem

With the proliferation of mobile devices harbouring the latest capacity hungry applications, operators are feeling the strain of the ever accelerating demand for mobile data. The idea that the integration of small cell technology (short range radio access nodes able to operate in licensed and unlicensed spectrum) to augment existing macro networks will enable operators to reduce congestion has attracted some support within the telecoms industry. In reality, however, this proposed solution actually creates further problems by exacerbating the stress on backhaul connectivity: It is confounded by the necessity to place small cells in close proximity to subscribers trying to access the network.

Whilst fibre is the preferred backhaul choice for many mobile operators, it's unlikely that existing fibre points-of-presence (PoPs) will be in place to serve the prospective small cell sites, and provisioning new fibre runs quickly makes the endeavour costly, disruptive and time consuming. Microwave point-to-point is another alternative, but whilst the technology has come down in cost in recent years, it generally requires a line-of-sight (LOS) link with the connecting backhaul hub.

David Callisch, VP of Marketing at Ruckus Wireless, proposes an alternative approach: backhauling licensed small cell traffic through Wi-Fi. With recent technical advances such as smart meshing, predictive channel management and integrated adaptive directional antennas – all of which can be used both for LOS and non-LOS applications within the unlicensed and channel-rich 5 GHz 802.11n spectrum – David argues that Wi-Fi has evolved to become an affordable and ideal solution to this small cell backhaul problem.

18 GHz cable assembly

reduces cost of high throughput test applications

W. L. Gore & Associates has added a rugged 18 GHz cable assembly to its GORE® PHASEFLEX® Microwave/ RF Test Assemblies line. This cable assembly is engineered for high throughput production test applications in the wireless infrastructure market.

Its increased durability reduces total costs for testing because it lasts longer, decreasing the frequency of cable assembly replacements. Stable performance ensures precise measurements and repeatability, which reduces the risk of testing errors and the need for time-consuming troubleshooting and system calibration. In addition, the ergonomic design of this cable

assembly eliminates the need to use a torque wrench to connect and disconnect accurately.

Robust connectors on these assemblies minimize failure by incorporating maximum strain relief at the point where the cable and connector meet.

These cable assemblies come in 1.0 and 1.5 meter lengths with both SMA and N-type male connectors.

www.gore.com/electronics

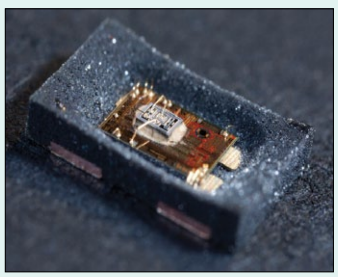
High-precision MEMS frequency synthesizer

competes directly with quartz

NXP Semiconductors has developed a high-precision silicon MEMS-based frequency synthesizer that it sees competing directly with quartz crystal-based timing devices.

Using MEMS technology replaces a quartz crystal with a bare silicon die that is more than 20 times smaller than the smallest crystal available today and does not require any dedicated, quartz-like, ceramic or metal-can hermetic package. Instead, it can be merged with other ICs into a standardized, low-cost plastic package.

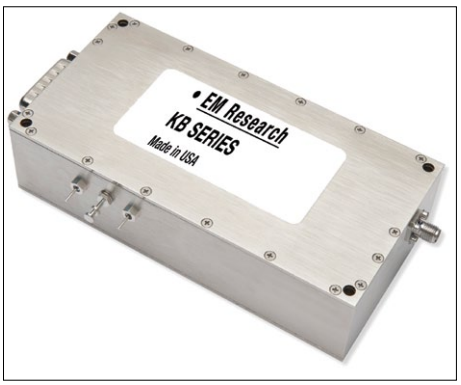
NXP's proprietary resonator technology for MEMS-based timing devices features higher frequency stability, lower timing jitter and lower temperature



drift compared to other CMOS oscillators. The first prototype currently released for production enables a highly stable clock reference that is ideal for communications equipment using Gigabit Ethernet, USB, PCI-Express and S-ATA, plus CPU timing, memory and control in consumer electronics devices.

www.nxp.com

39.5 GHz Ka-band frequency synthesizer receiver test applications



The KB-39500 39.5 GHz Ka-band frequency synthesizer from EM Research is ideal for radar, fixed/mobile (VSAT), satellite communications, digital radio and millimeter wave. Custom units are available in fixed and programmable frequencies from 12 GHz to 40 GHz.

The Ka-band frequency synthesizer features a low phase noise of under -80 dBc/Hz at 10 kHz, less than -90dBc/Hz at 100 kHz and also under 112 dBc/Hz at 1 Mz. It locks to external 10 MHz reference. Output poser is +18 dBm. The KB-39500 also exhibits harmonics of less than -20 dBc and spurs of under -50 dBc. The frequency synthesizer requires a power supply of +12 V at 650 mA with a specified operating range of -30 to 70 °C.

www.emresearch.com

Low phase noise VCOs with electrical tuning at 8 to 12 GHz

Z-Communications has introduced the DRO Series of high performance oscillators designed to meet the demands of any up/down converter system requiring an ultra-low phase noise LO solution. The high frequency oscillators use high-Q dielectric resonators and are currently available at 8 to 12 GHz.

The electrical tuning option for the DRO operating at 10 GHz has a control range of 0 to 12 Vdc, providing ultra-fine tuning precision. The electrical tuning provides ±3 MHz of frequency control allowing the oscillator to be quickly and easily phase-locked.

DRO Series oscillators provide a low phase noise and an exceptional spectral purity as good as -110 dBc/Hz, typically, at 10 kHz from the carrier. DROs minimize power consumption by operating off a 5 Vdc bias while drawing only 20 mA, typically, and are available in a surface mount packages measuring 0.91 x 0.91 x 0.40 inches.

For rugged applications, DROs are available in a connectorized metal enclosure measuring 1.25 x 1.25 x 0.85 inches. In addition, the oscillators deliver 0±3 dBm of output power into a 50 ohm load.

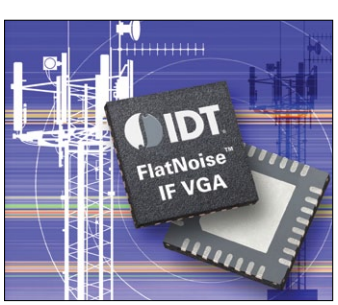
www.zcomm.com

Dual IF VGA

supports multi-mode 4G base station transceivers

Integrated Device Technology is claiming the industry's first FlatNoise dual intermediate frequency (IF) variable gain amplifier (VGA) for multi-mode 2G/3G/4G wireless base station transceivers. The IDT F1240 and F1241 are dual-channel digitally-controlled IF VGAs that feature a noise figure of 4 dB for maximum gain and virtually no degradation when gain is reduced, improving quality-of-service (QoS) and easing the SNR requirements of the downstream data converter to reduce system cost.

FlatNoise technology virtually eliminates noise figure degradation for the critical top 13 dB section of a wide 31 dB gain control range – a stark



contrast to other IF VGAs which typically exhibit a dB for dB degradation in noise figure as gain is reduced.

The IF VGAs feature extremely low distortion (OIP3 = +49 dBm), allowing for higher front-end gain, improving the receiver's sensitivity and resulting in additional QoS enhancement.

www.idt.com/go/RF

Low noise Fractional-N wideband PLLs

with integrated VCOs

Hittite Microwave has launched two SMT packaged wideband PLLs with integrated VCOs, the HMC833LP6GE and the HMC834LP6GE. These devices deliver industry leading phase noise and spurious performance and are ideal for a wide range of applications including high performance cellular/4GWiMax infrastructure, repeaters and femtocells, communications test equipment, CATV equipment, very high data rate radios, phased array and DDS replacement applications.

The HMC833LP6GE is a low noise, wide band, Fractional-N phase-locked-loop (PLL) that features an integrated voltage controlled oscillator (VCO) with a fundamental frequency of 1500 MHz to 3000 MHz, and an integrated VCO output divider (divide by 1/2/4/6.../60/62) and doubler. These features allow the HMC833LP6GE to generate

frequencies from 25 MHz to 6000 MHz.

The HMC834LP6GE is a low noise, wide band, Fractional-N PLL that features an integrated VCO with a fundamental frequency of 2800 MHz to 4200 MHz, and an integrated VCO output divider (divide by 1/2/4/6.../60/62) and doubler, that together allow the HMC834LP6GE to generate frequencies from 45 MHz to 1050 MHz, from 1400 MHz to 2100 MHz, from 2800 MHz to 4200 MHz, and from 5600 MHz to 8400 MHz.

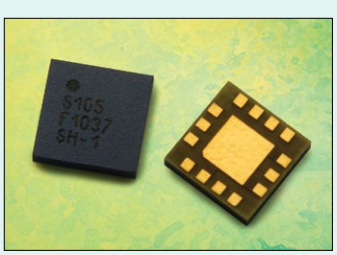
www.hittite.com

WiFi front-end module

for 5 GHz band in small footprint

Avago Technologies has launched the AFEM-S105, a front-end module for WiFi access points that integrates a power amplifier, directional coupler, and SPDT antenna switch in a 3.2 x 3.2 x 0.6 mm package. The power amplifier is optimized for IEEE 802.11a/n WiFi modulation, helping the module streamline design of mobile and fixed wireless data applications in the 5.15 to 5.85 GHz frequency range.

The AFEM-S105 module leverages the company's proprietary 0.25 µm GaAs enhancement-mode pHEMT process technology to achieve robust RF performance across voltage and temperature levels, as well as low current



consumption. The module exhibits flat gain and good match while providing linear power efficiency to meet stringent 802.11a/n mask conditions. All the module's RF ports are matched to 50 ohms for simplified design. The unit features high Tx - Rx switch isolation, a gain of 28 dB and is stable under all loads or conditions.

www.avagotechwireless.com

60-GHz real-time bandwidth oscilloscope driven by 36 GHz SiGe chipset

LeCroy Corporation has announced its highest bandwidth (36 GHz) and highest sample rate (80 GS/s) silicon technologies in the LabMaster 10 Zi oscilloscopes. This advanced chipset represents technology capability well beyond that offered by other oscilloscope companies. When combined with the company's Digital Bandwidth Interleave (DBI) and LabMaster ChannelSync™ architecture, it delivers five times more channels, more silicon-based bandwidth, nearly double the silicon-based bandwidth using DBI, and pricing comparable to oscilloscopes with far less capability.

The LabMaster 10 Zi povides four oscilloscope channels, all at silicon-based 36 GHz bandwidth (the highest available) and 80 GS/s sample rate in a single acquisition module, providing twice the bandwidth density of competitive oscilloscopes.

LeCroy's patented Digital Bandwidth Interleave (DBI) technology allows extension of the silicon-based 36 GHz bandwidth and 80 GS/s sample rate to 60 GHz and 160 GS/s by combining two 36 GHz channels. The 60 GHz real-time bandwidth is also an industry first, and is nearly twice the bandwidth rating of competitive 32 and 33 GHz oscilloscopes with an equivalent number of channels.

Furthermore, LeCroy's proprietary ChannelSync technology in the LabMaster 10 Zi oscilloscopes permits precise synchronization of up to twenty silicon-based 36-GHz / 80-GS/s channels and up to ten 60-GHz /160-GS/s DBI channels.

Trigger bandwidth is 30 GHz — twice that of the earlier WaveMaster 8 Zi-A and LabMaster 9 Zi-A oscilloscopes, and far more than is provided by competitive oscilloscopes. Jitter Noise Floor is a very low 100 fs(rms) for the 50 and 60 GHz models. Rise time (20-80%) is 5.5 ps for the 60 GHz model, and 9.75 ps for the 36 GHz model.

LeCroy's silicon bandwidth advantage is due to years of accumulated experience with

SiGe processes, most recently by obtaining 20 GHz of silicon bandwidth using 7HP SiGe. The latest ground-breaking LeCroy 36 GHz chipset is based on 8HP SiGe. SiGe is a widely adopted, mainstream, commercial process backed by chip technology leader IBM Semiconductor, with years of collective implementation knowledge and experience.

www.lecroy.com

Broadband signal analyzers reduce test costs by up to 55 percent

Aeroflex has launched a family of three low-cost broadband signal analyzers that locate, record, and analyze complex communications signals for commercial, military, and aerospace applications. Based on the company's Broadband Signal Analyzer (BSA) family, the Scout, Hunter, and Explorer signal analyzers are claimed to reduce the cost of their signal analysis capability by at least 55 percent.

The signal analyzer family consists of a portable signal analyzer, the Aeroflex Scout CS1104, and two rack-mountable signal analyzers, the Aeroflex Hunter CS1207 and the Aeroflex Explorer CS1247. All products have an intuitive user interface based on the Aeroflex BSA software, which is familiar to current BSA users and easy to navigate for new users. The Scout CS1104 is a portable signal analyzer designed for the user who wants to go out in the field. Scout's RF coverage extends from 20 MHz to 3 GHz with 40 MHz instantaneous bandwidth, an 8 GB signal capture RAM, and a 1 TB removable data storage disk.

The Hunter CS1207 and Explorer CS1247 are rack-mountable signal analyzers. Hunter is well suited for users who wish to search for a specific signal, hone in on a narrower frequency range around that signal of interest, and to analyze it. Hunter's RF coverage extends from 10 MHz to 6 GHz with 70 MHz instantaneous bandwidth, a 32 GB signal capture RAM, and an 8 TB removable data storage disk. It is designed for applications that need greater RF bandwidth than Scout and adequate memory for longer signal recordings.

The Explorer CS1247 combines Hunter's existing narrowband capability with additional wideband capability. The Explorer is designed for the user who needs to explore, record, and analyze across a wide frequency range. Explorer's RF coverage extends from 10 MHz to 6 GHz with operator-selectable 70 MHz or 400 MHz instantaneous bandwidths, a 32 GB signal capture RAM, and an 8 TB removable data storage disk. Explorer excels in all of the Hunter applications as well as adding capability for wideband signals such as radar, communications, and EW. The GPS hardware module option provides positioning and time stamp for the collected data. This option is standard on Scout and can be ordered as an option for Hunter and Explorer.

www.aeroflex.com

Dual band 2-18 GHz 300 W TWT amplifier

comes in a single package

Model dB-4409 from dB Control is a pod-mounted, dual-band Traveling Wave Tube Amplifier (TWTA) in a single, self-contained package. The TWTA provides 300 W of continuous wave power and operates in the 2 to 18 GHz frequency range with fast switching between two standard bands (2 to 8 GHz and 7.5 to 18 GHz). Custom frequency bands are also available.

"The TWTA is one of the most critical elements affecting the performance of ECM and EW systems. Our dB-4409 TWTA is designed to address both current and future EW threats. Combining the bandwidth of 2 to 18 GHz into one high-power product gives tremendous benefits to the ECM system designer," said dB Control Vice President of Technology and Business Development Meppalli Shandas.

The dB-4409 TWTA operates at altitudes of up to 55,000 feet and at temperatures between -40° to 70°C. It is ruggedized to withstand humidity, vibration and shock. Periodic permanent magnet (PPM)-focused, conduction-cooled TWTs are used for power amplification. The high-voltage power supply section uses modular architecture and low-noise power supply topology utilizing high-efficiency solid state power conversion circuits.

www.dbcontrol.com

Reference design for radio microphones

licence-free, based on DECT

Cambridge Consultants has launched a reference design for low cost, high performance radio microphones using the Digital Enhanced Cordless Telecommunications (DECT) platform. By taking advantage of DECT, the radio microphone design delivers higher audio quality with no interference and quadruples the range of existing radio microphone technology, whilst also lowering the total bill of materials (BOM) costs to under $12 for each microphone.

The microphone design deploys the company's DECT-based Salix audio distribution platform, delivering high quality 15 kHz audio bandwidth with automated set-up and frequency management. DECT has a dedicated license-exempt band in most countries worldwide and also ensures that the microphone platform has high spectral density, allowing up to 40 microphones in a single space without mutual interference or spurious effects. It also extends the range of radio microphones up to 100 metres without requiring line of sight to the transmitter, as opposed to existing technologies that typically allow a range of 25 metres. DECT's automatic frequency band allocation ensures that the the microphones can be 'paired' with the receiver(s) with a simple button press.

www.cambridgeconsultants.com

CALENDAR

Mobile World Congress
27th February - 1st March 2012
Fira Barcelona
Barcelona, Spain
www.mobileworldcongress.com

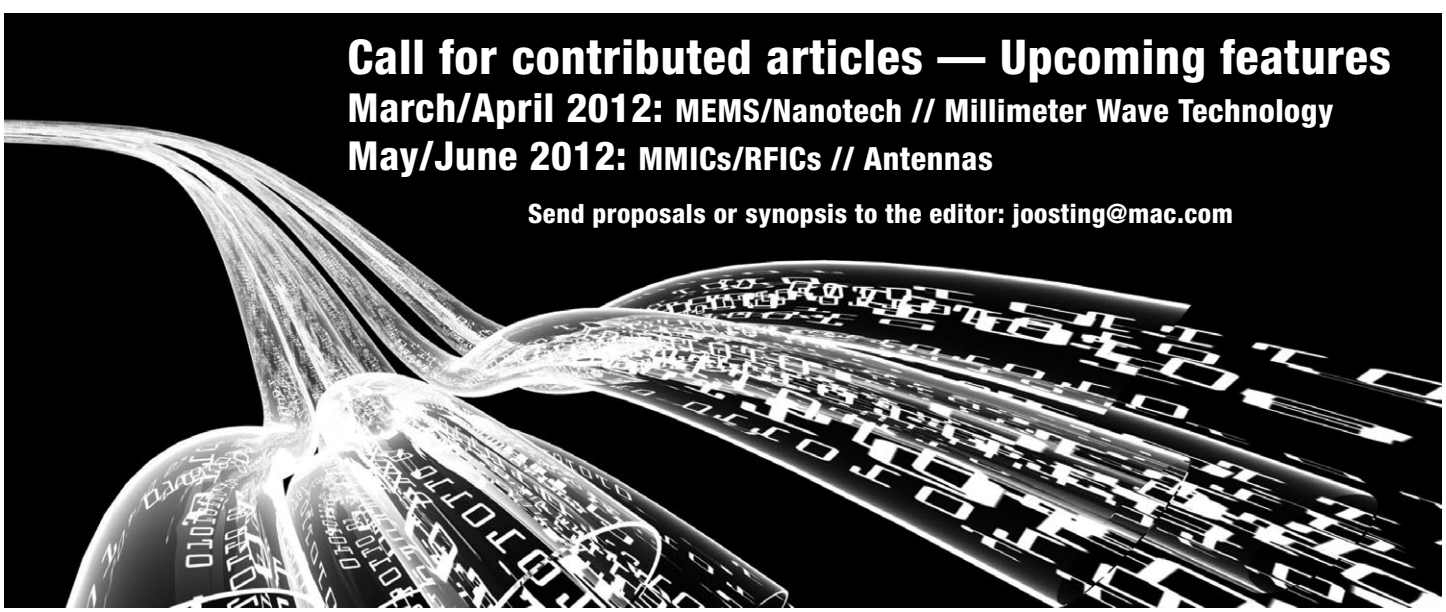
Embedded World 2012
28th February- 1st March 2012
Nürnberg Messe
Nürnberg, Germany
http://www.embedded-world.de

EuCAP
26th - 30th March 2012
Prague Congress Centre
Czech Republic
www.eucap2012.org

Microwave & RF
3rd - 5th April 2012
Pavilion 5, Paris Expo
Porte de Versailles
France
www.microwave-RF.com

CTIA Wireless
8th - 10th May 2012
Ernest N. Morial Convention Center
New Orleans, Louisiana, USA
www.ctiawireless.com

MTT-S International
Microwave Symposium
17th - 22nd June 2012
Palais de Congrès de Montréal
Montréal, Canada
http://ims2012.mtt.org



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