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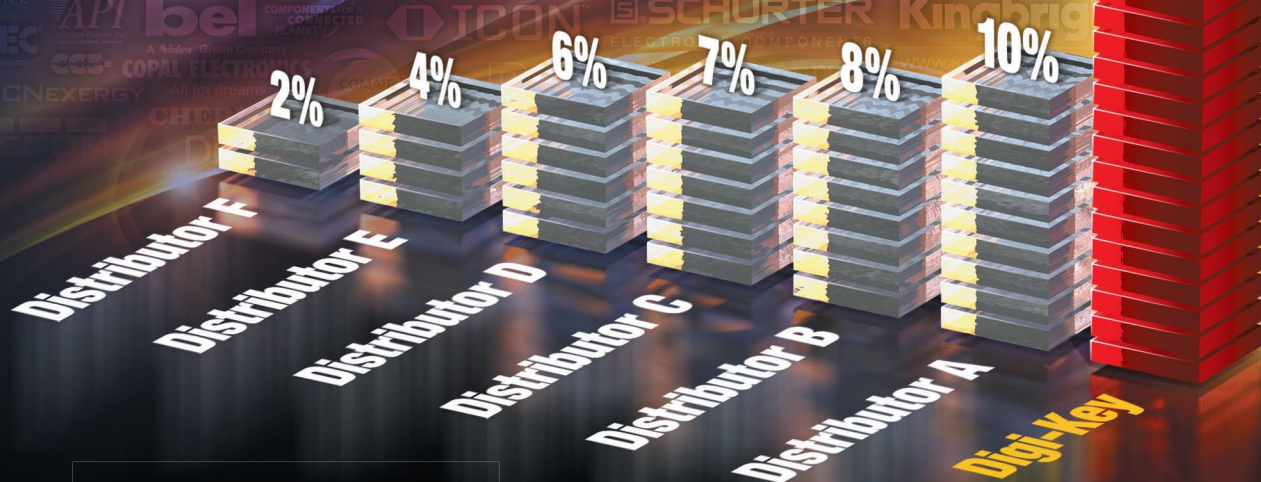
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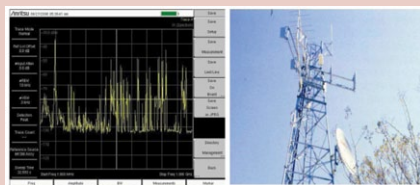
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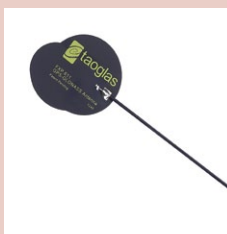
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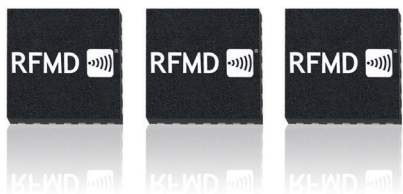
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Comment: The rise of the robots and the wireless fabric are only starting to change our way of life

The FT recently ran an article on “Obama must face the rise of the robots” where the author outlined the decline in manufacturing jobs across the world, even in China due to automation. Further, the article hinted at the next revolution by claiming that the effects of technology were just beginning to be felt in Education and Healthcare.

Significantly, the driver behind this is wireless and the wireless fabric for machines, or more importantly, apps to operate in a connected environment. Having lots of automation in itself only works for specialized applications, predominantly in manufacturing. To change the way the service or medical sector works requires a communications fabric.

As mobile operators move to LTE and LTE-A over the next few years this fabric is falling into place. Even in rural areas, WiFi-like data rates will be possible. This does not mean wireless will cover everything. In the end fibre optic lines will still be needed to backhaul a lot of data from homes, and in high density areas fibre optic to the home is still growing, especially with 4K TV on the horizon.

With the explosive use of apps and the rise of the smartphone, technology is on the edge of changing the way everything works from healthcare and transport to education, and even our homes. The robots that will have the most impact are the little ones, or even those that are disguised as something else, such as smart energy meters and those hiding in our cars. And, as we embrace apps, in many instances these programs themselves could be considered as ‘software robots’, even, in some cases, performing ‘their duties’ independently of the hardware they find ‘themselves’ on. As apps evolve, many will become more autonomous and ‘intelligent’.

Wireless is complex, but in its simplest form it is a communications medium. The myriad of protocols that make up this diverse technology are coming together to weave machines big and small together, whilst giving credence to the notion of ‘software robots’.

Based on 2012 shipment data, where M2M cellular module revenues grew 21% YoY, ABI Research expects to see a further increase in shipments, reaching

nearly 100 million units by 2015. In the teeth of the worst slowdown in economic activity since the Great Depression, we still see strong growth in wireless technologies. As we build out the Internet of Things (IoT) this is expected, the flip side is the reason behind this growth is that companies are looking to lower costs and these technologies can help.

As we put the communications fabric down, develop the apps, and enable the machines, are we heading to a machine dominated society, where humans no longer need to work in mundane jobs? Maybe it will be time to return to the arts and find a way to redistribute the wealth these machines will generate to pay for it all. Are we getting a step closer to a utopian society?

Food for thought: ‘Resistance is futile’ since we are all embracing this technology with open arms.

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

Telehealth to reach 1.8 million patients by 2017

In 2012 there was estimated to be 308,000 patients remotely monitored by their healthcare provider for congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), diabetes, hypertension and mental health conditions worldwide. The majority of these were post-acute patients who have been hospitalised and discharged. As healthcare providers seek to reduce readmission rates and track disease progression, telehealth is projected to reach 1.8 million patients worldwide by 2017, according to The World Market for Telehealth – An Analysis of Demand Dynamics – 2012, a new report from InMedica, part of IHS.

In addition to post-acute patients, telehealth is also used to monitor ambulatory patients – those who have been diagnosed with a disease at an ambulatory care facility but have not been hospitalised. However, telehealth has a much larger penetration in post-acute

care as compared to ambulatory care patients as the majority of patients are only considered for home monitoring following hospital discharge to prevent readmission. In the U.S., for example, 140,000 post-acute patients were estimated to have been monitored by telehealth in 2012, as compared to 80,000 ambulatory patients.

“A major challenge for telehealth, is for it to reach the wider population of ambulatory care patients. However, the clinical and economic outcomes for telehealth are more established for post-acute care patients. Indeed, even for post-acute care patients, telehealth is usually prescribed only in the most severe cases, and where patients have been hospitalised more than once in a year,” commented Theo Ahadome, senior analyst at InMedica.

CHF currently accounts for the majority of telehealth patients; in addition to

being one of the largest cost-burdens for hospitalisation, the clinical outcomes of telehealth for CHF patients are most established. The number of telehealth patients with COPD is also projected to grow strongly as telehealth focus continues to expand to respiratory diseases. The successful results of the Whole System Demonstrator (WSD) program in the U.K. are serving as strong evidence-base for the benefits of telehealth for COPD patients. However, by 2017, Diabetes is forecast to account for the second largest share of telehealth patients, overtaking COPD. Home monitoring of glucose levels for diabetes patients is more established through personal glucose monitors. There is an increasing drive to integrate these monitors with telehealth systems, allowing care givers access to patient glucose data.

www.ihs.com

Proprietary wireless technologies in home automation

A study from IMS Research projects that just 10 per cent of the smart home nodes that will be deployed during the period 2010 to 2017 will include proprietary wireless technologies.

Yet annual shipments of these technologies are projected to grow from less than 3 million nodes in 2012 to 6 million in 2017, as some high-end automation suppliers maintain closed systems, and some other smart home start-ups deploy with proprietary systems to keep certification costs down.

Despite annual shipments doubling, the proportion of smart home nodes that use proprietary wireless technologies is set to halve in the coming years, to just over 7 percent in 2017. This is indicative of a move towards open standards for the majority of smart home providers, particularly in the high-growth system segments such as managed home control. Managed home control systems enable consumers to access status alerts

and control home devices via online portals or smartphone apps.

Regardless of the movement towards open standards in some segments, there is still a market for proprietary solutions in the high-end home automation space. Lisa Arrowsmith, associate director of connectivity at IHS explains, "The uptake of proprietary solutions will be focused primarily on the more traditional home automation space, where whole-home solutions are fitted by a specialist installation company." Using proprietary solutions for these systems can enable these companies to maintain a closed system, and can offer freedom to design application-specific profiles. Further growth of proprietary wireless technologies are set to be driven by such companies moving away from wired alternatives, which typically have high installation costs in retrofit households.

www.imsresearch.com

Smartphone combines LCD and e-paper displays

Yota Devices has developed the first dual-screen phone with a full-color liquid crystal display (LCD) on one side and an electronic paper display (EPD) on the other.

The YotaPhone features a powerful Android based phone with LCD display on one side and EPD on the other, which is the user's personal space for receiving notifications, linking to social media, reading content-rich news or displaying favorite pictures. The two displays are linked together.

"This will be the first time that people will be able to personalize the information they want to receive on their phones in an effortless way," said Yota Devices CEO Vlad Martynov. "You tell YotaPhone what information you want and when you want it. Today if you want to check your email, calendar or social media page, you have to pick up your phone, turn it on, open the application and only

then can you receive the information. With YotaPhone, this information will appear on the electronic paper display effortlessly, continuously and updated in real time," Martynov explained.

The two displays have different functions and different purposes. The dual screen phone lets users watch videos, play games and perform other functions best suited on the LCD, but adds an electronic paper display for content that requires longer reading time, like reading a book or magazine. It also keeps important information visible without draining the battery. Boarding passes, maps, tickets and other important information are displayed even if the battery dies.

YotaPhone will be available for sale worldwide in the second half of 2013. It is a multi-band, LTE phone that will work anywhere in the world.

www.yotadevices.com

Intel says no LTE integration until 2014

Intel Corp., is making progress with its development of LTE modems but does not expect to have an integrated LTE modem and application processor until 2014, according to CEO Paul Otellini.

When asked specifically about integration of LTE modem circuitry with a mobile application processor such as the Atom during an analysts' conference call held to discuss Intel's fourth quarter 2012 financial results, Otellini said: "In terms of integrated solutions, you'll see higher levels of integration from us next year."

During the call, Otellini said Intel was shipping a data-only mode LTE modem IC to customers and that a data-and-voice multimode modem would ship during the course of 2013. He added that he expects the first mobile phones with Intel supplied LTE capability to have launched early in 2014 at about the time of the Mobile World Congress.

www.intel.com

Imec and Qualcomm extend collaboration

Nanoelectronics research centre imec and Qualcomm Technologies have extended their collaboration agreement to accelerate scaling technologies for logic and memory devices. The first fabless integrated circuit company to become a core partner of imec, Qualcomm Technologies will gain comprehensive insight into all advanced process technologies under investigation at imec to help shape future product roadmaps.

Increasingly, it is challenging to design advanced systems and applications for each new technology node. By gaining early information on CMOS advancements, the product design community in IDMs, fabless, fablite and system-design companies can better anticipate the future impact and potential of new technologies to shape development efforts.

"Strong collaboration between foundries, IDMs, fabless and fablite companies, packaging and assembly companies, and equipment and material suppliers at imec play a critical role in pushing forward the development of innovative solutions," stated Luc Van den hove, president and CEO at imec.

www.imec.com

Wireless ANT+ head-up display for runners shows live training data

Nordic Semiconductor ASA has announced that German navigation and sports specialist, o-synce, is employing a Nordic nRF24AP2-8CH 2.4 GHz transceiver to provide ANT+ wireless connectivity for up to eight ANT+ sensors in its sub-\$200 Screeneye X head-up cap-based display for runners and other outdoor sports enthusiasts.

The Screeneye X can display a full range of training data (current, average, and maximum) including elapsed time, heart rate, speed, distance, stop times, lap times, cadence, calories consumed, plus training zones, coaching tips, and ambient temperature.

This data is projected directly on to a fluorescent plastic display powered by UV light collected by the cap during the day such that it can auto-dim and -brighten in response to ambient lighting levels while

drawing a negligible amount of power. Indeed this combined with the use of the Nordic ultra low power nRF24AP2-8CH ANT+ transceiver, which operates at just 17 mA peak current, enables the cap to operate from an in-built 150 μ Ah rechargeable battery that is 33 percent lower capacity - and around 33 percent smaller and lighter - than a typical 225 mAh CR2032 coin cell (watch) battery.

In operation, the cap is set-up and controlled via three waterproof keys located in the visor and all training data is recorded to within 1s accuracy and can be exported to a PC at the end of a training session via a micro USB connection that will simultaneously recharge the on-board battery.

www.o-synce.com/en
www.nordicsemi.com/eng

CEA-Leti to validate cognitive radio in the TV white space

CEA-Leti, which has developed opportunistic radio technologies (or cognitive radio) since 2005, is the first research center in France to be granted a government licence to experiment with television white space equipment in the field.

In the U.S., unlicensed opportunistic spectrum usage has been authorized in the free channels of the television spectrum (the Television White Space – TVWS) by the Federal Communications Commission (FCC). The service envisioned by the FCC is a long-range WiFi system, called super-WiFi.

Ongoing studies have been evaluating whether a similar paradigm could be applied in Europe, for instance in the framework of the SE43 group of the European Conference of Postal and Telecommunications Administrations (CEPT). The technology developed by Leti can be applied in both Europe and the U.S.

www.leti.fr

First TV white space prototype based on IEEE 802.22

The National Institute of Information and Communications Technology (NICT), Hitachi Kokusai Electric Inc., and ISB Corporation have developed the world's first prototypes of base station (BS) and consumer premise equipment (CPE) based on the IEEE 802.22 standard operating in TV White Spaces (TVWS) (470 MHz - 710 MHz).

The developed prototypes will provide broadband wireless access to underserved and unserved regional areas around the world as well as bringing reliable backup broadband communications in emergency, which will follow the worldwide trend of promoting the TVWS for wireless communication systems.

The base station BS and CPE verify the physical layer (PHY) and the medium access control (MAC) layer design based on the IEEE 802.22 standard in the TVWS (470 MHz to 710 MHz). The PHY part developed by Hitachi Kokusai Electric allows the devices to use vacant TV bands over the frequency range from 470 to 710 MHz, the MAC layer part

developed by NICT provides a medium access method based on point-to-multipoint access with supporting the different QoS levels, and supports cognitive capabilities of interference estimation, geo-location and white space data base (WSDB) access over the IP. The WSDB provided by ISB Corporation avoids interference to incumbents of TV broadcasters from automatically selecting the non-interfering TV band.

IEEE 802.22 systems offer around 10 times the coverage of Wi-Fi as well as enable reliable backup broadband communications in emergency.

NICT, Hitachi Kokusai Electric and ISB Corporation in the future will develop the enhanced technologies based on the IEEE 802.22 standard and also work closely with WhiteSpace Alliance (WSA) to provide products for worldwide markets.

www.nict.go.jp/en/index.html
<http://whitespacetech.isbcorp.com>
www.whitespacealliance.org

Half a million outdoor small cells in 2013

In its latest issue of outdoor small cells and carrier Wi-Fi Market Data, ABI Research forecasts that outdoor small cells will reach 500,000 units in 2013.

"Outdoor small cell unit growth dropped slightly as 2012 actual shipments reached 278,000 - down from our previously forecast number and we expect meaningful growth to resume in the 2013/4 timeframe as the first street level small cells get deployed," says Nick Marshall, principal analyst at ABI Research.

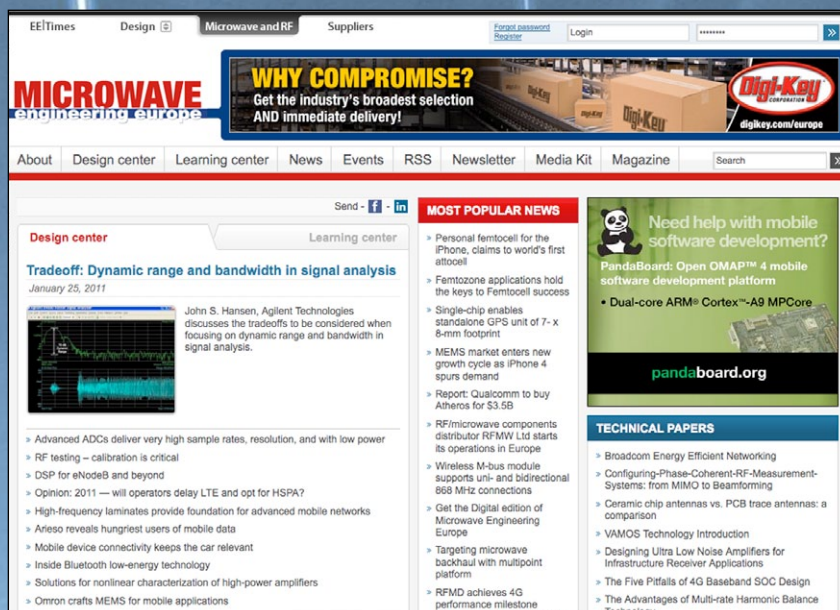
"We forecast that the 1 W and below small cell class, ideal for street level deployment, will exhibit the highest growth, represent almost two-thirds of unit shipments in 2013, and continue to grow to overtake the higher power 5 to 10 W microcell shipments during 2014," continues Marshall.

Outdoor small cell units will grow at 52.7% CAGR to reach over 3.5 million units by 2018. The fastest growing outdoor class of small cells are 4G LTE small cells which will grow to reach almost 1 million unit shipments in 2018.

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Wi-Fi offload and roaming using mobile account credentials

Accuris Networks claims only Wi-Fi offload and roaming using mobile account credentials Accuris Networks claims that its Wi-Fi offload and roaming platform, AccuROAM is the only solution using SIM-based account credentials to enable smart phone and laptop users to automatically connect to Wi-Fi hotspots, when roaming internationally.

It provides a secure authentication framework without the need to enter cumbersome usernames and passwords. AccuROAM enables any Wi-Fi to work as a full extension of GSM or CDMA networks for billing, policy, and authentication. This technology is currently being used by AT&T Mobility.

"The AccuROAM platform gives subscribers automatic and secure access to Wi-Fi hotspots globally by using subscriber SIM credentials as the means of authentication. Accuris

Networks is the only provider globally to provide this level of security and ease of access when connecting to Wi-Fi," stated Larry Quinn Chairman of Accuris Networks. "While we wait for Hotspot 2.0, Passpoint™ and Next Generation Hotspots (NGH) to give us the authentication and security we need, AccuROAM today gives us a seamless, secure Wi-Fi connection, without changing existing Wi-Fi networks already deployed around the world."

Accuris Networks' AccuROAM has both client and server capability to enable automatic authentication of users to Wi-Fi networks. It uses encrypted credentials from a users account in a similar way that authentication processes work when phone users roam to a new network.

www.accuris-networks.com

Global LTE subscribers to double in 2013

Just three short years after the technology's original deployment, worldwide subscribers to the 4G wireless standard known as Long Term Evolution (LTE) are projected to surpass the 100-million mark this year. LTE subscribers worldwide will reach 198.1 million in 2013, up a remarkable 115 percent from 92.3 million last year, according to an IHS iSuppli Wireless Communications Special Report.

Since being adopted in 2010 with just 612,000 users, the 4G next-generation wireless technology has grown by leaps and bounds, surging by an astounding factor of 22 to 13.2 million subscribers in 2011, and then jumping another 599 percent in 2012 to nearly 100 million subscribers. By 2016, LTE will claim more than 1.0 billion users, as shown in the figure attached, equivalent to a five-year compound annual growth rate of 139 percent.

www.ihs.com

Wi-Fi Alliance® and Wireless Gigabit Alliance to unify

Wi-Fi Alliance® and Wireless Gigabit Alliance to unify Wi-Fi Alliance® and the Wireless Gigabit (WiGig) Alliance have executed a Memorandum of Understanding (MOU) outlining their plans to consolidate activity in Wi-Fi Alliance.

The agreement builds on more than two years of collaboration between the organizations, in which WiGig Alliance developed the groundbreaking WiGig technology specifications including MAC-PHY and Protocol Adaptation Layers (PALs) and Wi-Fi Alliance initiated work to develop an interoperability certification for 60 GHz products. WiGig technology has continued to gain significant momentum, and will soon bring users closer to a future of truly seamless wireless connectivity complementing the traditional Wi-Fi® networking.

Under the terms of the MOU, the organizations will enter a period of diligence and planning, with the intent to complete transition of both the technology development activity and WiGig assets to Wi-Fi Alliance by the middle of 2013.

www.wi-fi.org
www.wigig.org

Cisco, NXP push commercial Car-to-X communication

Car-to-X communications is about to get ready for market entry, and the first players are preparing for a fast start: Network equipment manufacturer Cisco and chipmaker NXP both have invested in equipment maker Cohda Wireless, an expert company in automotive safety. The move brings together the expertise of the three organizations to make the Internet of Everything a reality for the automotive industry, creating a safer driving experience while improving traffic flow.

Car-to-Car (C2C) and Car-to-Infrastructure (C2I) communications enable active safety systems that can, according to U.S. Department of Transportation, affect 81 percent of all crash scenarios and as a result help to reduce fatalities and injuries on the roads. In addition to improving safety, (C2I) holds great potential for intelligent transport system (ITS) management and reducing greenhouse gas emissions. C2C and C2I communications require highly reliable and secure data exchange between fast

moving vehicles and infrastructure in a range of conditions – from rural highway to dense urban canyons.

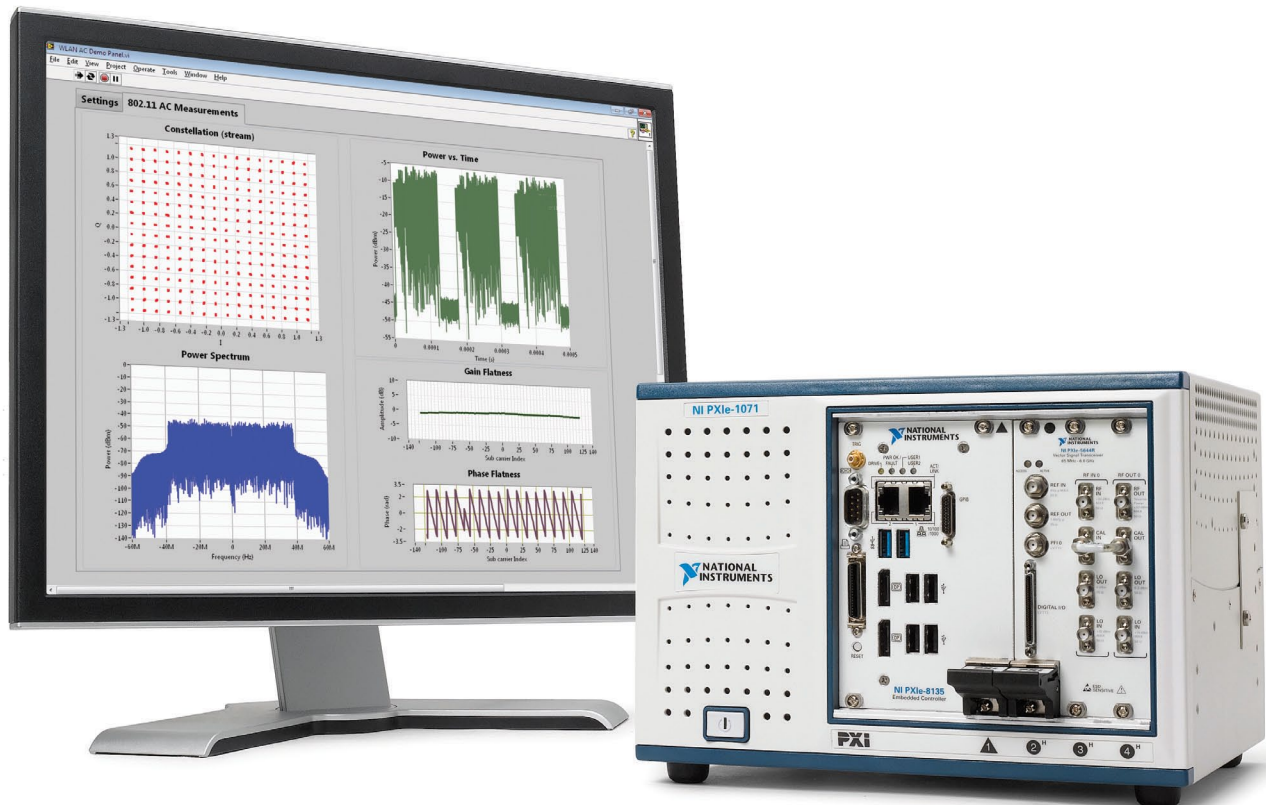
NXP and Cohda Wireless have built a market-ready, flexible wireless solution for onboard-units based on Cohda's existing advanced radio and NXP's market-proven software-defined radio technology. This makes it a key element to connect to Cisco's vision of a ubiquitous and highly-secure Internet of Everything.

NXP will exclusively license the Cohda 802.11p technology together with its chipsets as a one-stop shop to automotive customers. Cohda will be NXP's preferred partner for automotive 802.11p reference designs. Cohda's technology enhances wireless communications to quality levels far beyond commercial off-the-shelf IEEE 802.11p transceivers, allowing cars to more effectively "see" through obstacles or around corners.

www.nxp.com
www.cisco.com

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Measuring radio frequency interference

By Cyril Noger, Anritsu Corporation

The electromagnetic world that surrounds us is becoming increasingly congested by a multiplicity of radio frequencies (see Figure 1). These frequencies originate from our wireless communications systems and other electronic apparatus which often coexist in more or less the same frequency bands. This coexistence generates interference which limits the efficiency and the (geographical) coverage of these systems. It is therefore very important for us to think about the spectral environment and the quality of the signals transmitted and received so as to gain an understanding of the nuisance factors involved. The objective being to improve the quality of service and efficiency of our communications systems.

The frequency of an interfering signal is the most important parameter to be determined when attempting to identify its source. The interference disrupting the reception of a communication can be either inside or outside the band occupied by the signal itself. It propagates via the antenna to the receiver.

For this reason a spectrum analyzer should be used and connected to the antenna in place of the receiver of the affected system to display and measure the interference parameters.

By performing an analysis in the frequency domain, a number of essential parameters can be analysed including signal frequency, power, harmonics content, quality and type of modulation, distortion, noise, etc.

This paper will focus on 4 essential aspects:

- Identification of spurious signals and interference;
- Identification of unknown signals;
- Location of spurious signals and interference;
- Measurement of signal-to-interference ratio.

1- Identification of spurious signals and interference

These interferers originate from a number of sources:

- Hidden emitters;
- Unlicensed transmission on official bands;
- Emitters operating at frequencies very close to a power transmitter;

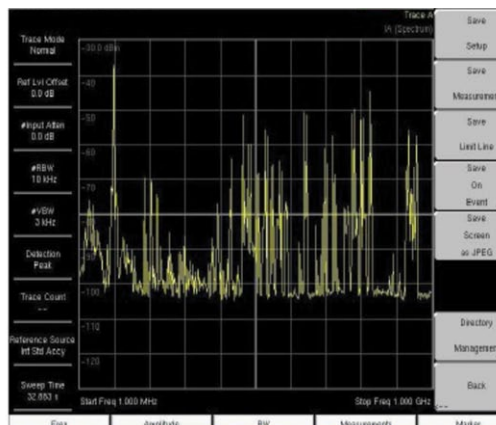


Figure 1: Spectrum measurement in the 1 MHz to 1 GHz band.

- Jamming designed to disrupt communications;
- Inadvertent emissions.

In all these cases the first task is to detect the unwanted signals, which is not always a simple matter. The main difficulty arises once the signals have been detected at the spectrum analyzer or displayed on the spectrogram.

The Anritsu family of spectrum analyzers offers a wide range of software options to provide an optimised solution for the measurement and identification of interference sources.

In order to successfully detect all of these interfering signals the equipment must include a number of important features such as:

- High sensitivity (floor noise) to be able to detect low level emitters;
- Good dynamic response and low phase noise to detect weak signals in proximity to strong signals.

Besides excellent detection performance, the analyzers include an optional interference measurement mode to aid the identification of known, unknown, permanent or random signals. This option includes the following display features:

- Spectrogram;
- RSSI (signal variation over time)
- Field measurement (needle display mode);
- Signal identification (signal types identified by their spectrum occupancy).



Spectrogram mode can be used to detect interference.

This mode is particularly useful for the detection of intermittent signals. A large number of spectra can be recorded for up to 72 hours with the desired time interval between each one. Playing back the 2D colour spectrogram (see Figure 2) thus enables intermittent signals to be identified directly in the analyzer or on a PC.

The spectrogram can be customised using a colour editor, the colour palettes

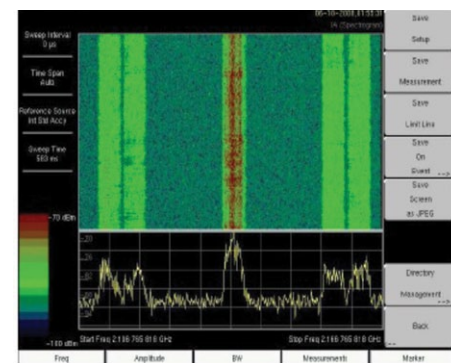


Figure 2: Measurement in spectrogram mode.

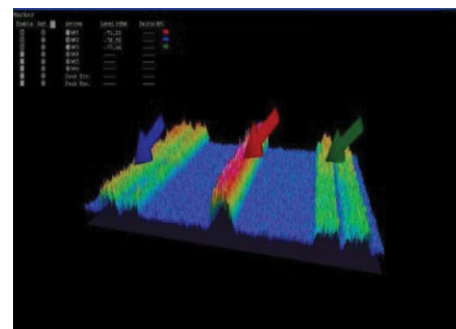


Figure 3: 3D spectrogram.

can be saved and reused, a zoom feature is provided to view small interference signals, plus which the display can handle up to 15000 traces.

3D spectrogram

The 3D spectrogram (see Figure 3) makes interference viewing easy. Instead of playing back all of the captured spectra, the user can identify the interference at a glance and place markers on particular frequencies in the spectrum.

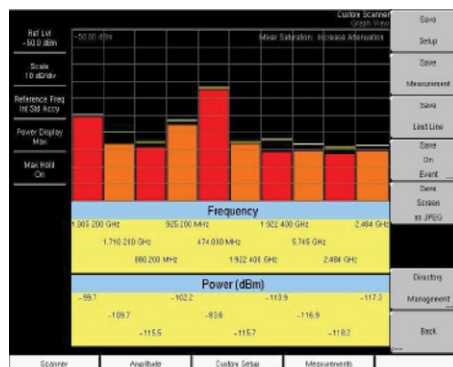


Figure 4: Scanner mode.

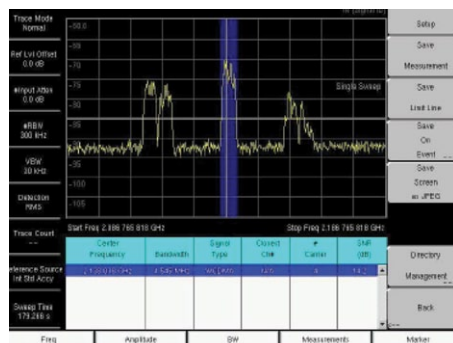


Figure 5: Identification in scan mode.

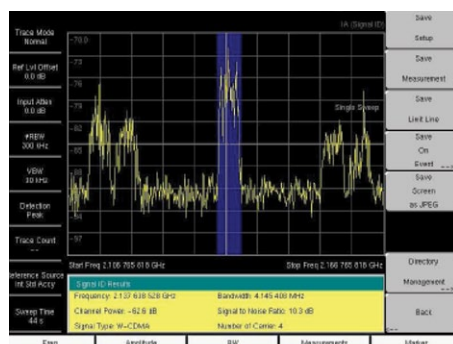


Figure 6: Identification in frequency mode.



Figure 7: YAGI directional antenna.

The strength of the 3D spectrogram view is its customisability:

- Spectrogram rotation on all 3 axes;
- Min/Max markers to identify all peak values on the traces;
- Spectrogram zoom for a close-up view of details.

Also, using the Scanner mode, a list of channel frequencies can be preset and measured continuously (Figure 4).

2 - Identification of unknown signals

The "Signal ID" feature resides in the Interference Analyzer mode menus in the same place as "Spectrogram", "Field Measurement" and "RSSI". The user can easily select an appropriate display type. "Scan All" mode (see Figure 5) is used to scan the whole of the selected band and to identify the signals by displaying their central frequency, bandwidth, signal type, channel number, number of carriers for multiple-carrier signals, plus the C/I ratio. The signal information is refreshed at the end of each sweep.

Recognition of multiple adjacent signals

Where multiple signals are tightly enmeshed together it is difficult to identify the signal types involved. The signal identifier can not only display the signal types but can also show how many carriers there are. By switching from "Scan All" to "Frequency Scan" mode (see Figure 6) the user can select a specific signal by moving a red dotted line over the chosen signal. When the instrument recognises the signal type, a blue bar is displayed to indicate the space occupied by the measured signal. If the standard is not recognised the blue bar is not displayed.

3 - Location of spurious signals and interference

With a Yagi directional antenna (see Figure 7) connected to the analyzer input, first find the maximum signal in field measurement mode and draw a line on a map in this direction. Then repeat this measurement twice more at different locations (different angles) to triangulate

the approximate geographical location (see Figure 8).

Use the field measurement mode to locate the emitter (see Figure 9). This mode features an audible beep which enables the direction to be found by ear with the aid of a directional antenna. By changing the direction of the antenna, the loudness of the beep increases or decreases depending on the origin and strength of the source.

4 - Measurement of C/I ratio: Signal to Interference

The performance of transmission systems ultimately depends on the ratio between the level of the signal and the interference to which it is exposed: the C/I ratio.

This radio measurement is performed in two stages: first the modulated signal level is measured, and then the signal is switched off so that only the level of interference and noise is measured.

Once these readings have been taken, the ratio can be computed (see Appendix 1) and displayed directly on the analyzer screen (see Figure 10). An important feature of the algorithm used in ANRITSU analyzers is that it allows for the existence of different types of interfering signals: a wideband signal for example will cause less disturbance to Wi-Fi than a frequency-hop signal.



Figure 8: Location by triangulation.

Conclusion

Experienced field engineers and technicians recognise that, with the proper test tools, the use of a good measurement sequencing methodology always leads to an effective solution for the identification of interference sources. While the MS272xB series of handheld spectrum analyzer series with optional interference measurement are perfectly suited to this task, other important parameters need to be taken into consideration to ensure good signal analysis:

- Channel power;
- Occupied band;

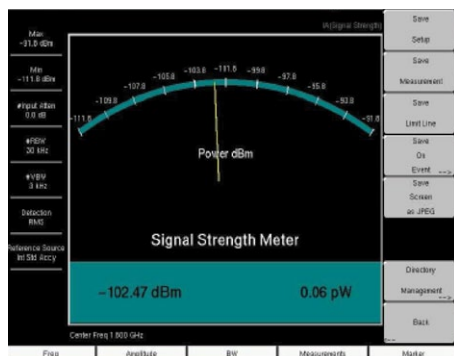


Figure 9: Field measurement with audible beep.

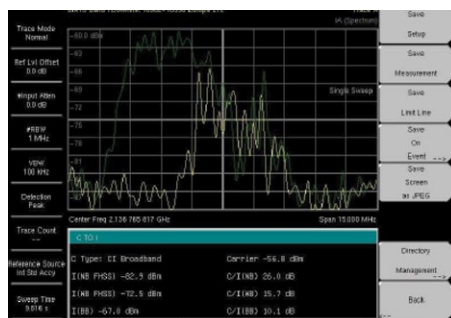


Figure 10: C/I measurement.

- Type of modulation (or spectrum);
- Resolution filter and video filter used;
- Type of detection used (Average, Peak or RMS);
- Signal-to-Noise ratio (C/N);
- Harmonics, intermodulation;
- Analogue demodulation;
- Demodulation and digital modulation analysis of radiocommunication standards (GSM, UMTS, WiMAX, and so on).

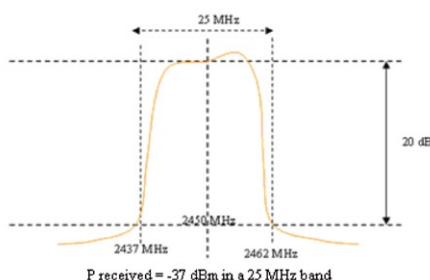
Bibliography: ANRITSU Application Notes

- Solving your Radio Frequency Interference problems – n°11410-00388
- Fundamentals of interference in Wireless Networks – n°11410-00302
- Practical tips on measuring interference – n°1141 0-00303

Appendix: C/I measurement

Measure the received radio signal (C). Using the “Channel BW” and “Channel Power” functions, determine:

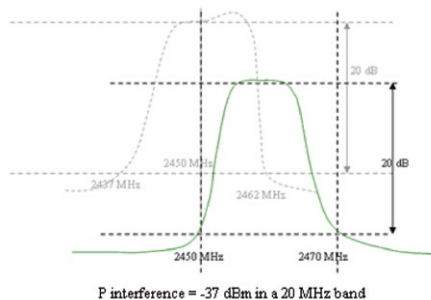
- Occupied band frequency at -20 dB;
- Corresponding channel power.



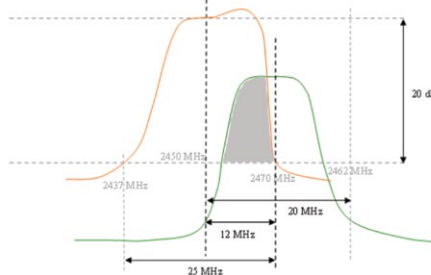
Shut off the radio signal and measure the interfering signal (I).

Using the “Channel BW” and “Channel Power” functions, determine:

- Occupied band frequency at -20 dB;
- Corresponding channel power.



C/I calculation



Only the power shown in the shaded area is interfering; in this case only 12/20ths of the power of the interfering signal should be taken into account, i.e.:

$$\begin{aligned} \text{Effective interfering power} &= -47\text{dBm} - 10 \log (12/20) \\ &= -47\text{dBm} - 2\text{dB} \\ &= -49\text{dBm} \end{aligned}$$

Similarly, this power only disturbs the signal in 12/25ths of the received signal bandwidth.

$$\begin{aligned} \text{Effective interfering power referred to received signal bandwidth:} &= -49\text{ dBm} - 10 \log (12/25) \\ &= -52\text{dBm} \end{aligned}$$

By definition, the C/I is the signal to interference ratio, i.e. in this case:

$$C/I = \frac{-37\text{dBm}}{-52\text{dBm}} = 15\text{dB}$$

By Cyril Noger, Anritsu Corporation
www.anritsu.com

Anite validates first GCF TD-LTE/TD-SCDMA Inter-RAT test cases

Anite has validated the first GCF (Global Certification Forum) TD-LTE/TD-SCDMA Inter-RAT (Inter-Radio Access Technology) test cases. By reaching this milestone, the company now supports all of the GCF LTE protocol test requirements for TD-LTE mobile operators ahead of their network launches. TD-LTE is a variant of LTE that mobile operators such as China Mobile are currently deploying.

The TD-LTE/TD-SCDMA Inter-RAT conformance test cases enable chipset manufacturers and handset vendors to develop and certify dual-mode TD-LTE/TD-SCDMA devices. TD-SCDMA is the 3G standard widely deployed in China. The availability of these test cases is key to accelerating the launch of dual technology handsets in China, which will allow users seamless access to high speed data services offered by both TD-LTE and TD-SCDMA. This is a key enabler to ensure the rapid deployment of TD-LTE in China.

www.anite.com

Protocol tester adds scenarios for LTE-A carrier aggregation

The CMW500 wideband radio communication tester from Rohde & Schwarz adds software options for LTE-Advanced downlink carrier aggregation. The protocol tester makes it possible for the developers of chipsets used in tomorrow's wireless devices to carry out the tests defined in LTE-Advanced Release 10. These include verification tests on the physical layer and the protocol stack as well as throughput tests. Any potential scenario a network operator might need to test can be configured in the lab. All combinations of defined bands and bandwidths for LTE-Advanced can be tested with two downlink carriers, including MIMO 2x2 and 4x2.

The CMW500 emulates the two cells used in an LTE-Advanced network. By combining two CMW500s, it is also possible to test the handover within LTE-Advanced networks. The instrument also supports earlier digital wireless communications standards.

www.rohde-schwarz.com

Self-powered electronics architecture cuts consumption of sensors by 100 times

An electronics architecture developed by researchers at Columbia University has the potential to cut power consumption of sensors by 100 times using daisy-chained intermittent operation and ambient light as a power source, enabling future sensors to cut the power cord for monitoring vital signs, weather patterns and energy consumption, among other applications.

Self-powered electronics eliminates the need for batteries and the maintenance headaches of keeping sensors and other remote monitoring facilities online 24/7 year-in and year-out, according to the Columbia researchers that worked on the projection.

"Power consumption becomes very low as you pack more functionality into

smaller spaces," said Peter Kinget, a professor at Columbia. "But nanoscale transistors are not as reliable and cannot sustain as large signal levels, requiring new design concepts."

Using daisy-chained intermittent operation — instead of always-on transmission — can enable many types of sensors to dramatically reduce power consumption while still providing the data needed to make them useful. Such applications include smart clothing that monitors vital signs and transmits a wearer's location during emergencies, sensors that monitor energy consumption from inside walls of new buildings, or sensors dropped from planes to collect and transmit data about weather patterns in remote regions.

The Columbia architecture chosen by Kinget uses tiny amounts of ambient light to generate nano-amps of current on-chip to power sensors that intermittently sample their environment whenever they have stored up enough energy to take a reading. Then instead of powering up a long-range wireless receiver, the device queries its environment to find its closest neighboring sensor, to which it sends its reading daisy-chain style for communication from node to node. Finally, since reliability cannot be guaranteed from such tiny devices, an algorithm is used to average multiple readings to achieve any desired level of accuracy.

By R Colin Johnson, EE Times

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Active RFID systems that combine robust RF performance and low power consumption

By Shawn Rezaei

Radio frequency identification (RFID), as an automatic wireless data collection technology, is commonly used in applications such as asset tracking, access control and inventory management. The common way to implement the technology is in the form of passive RFID systems, in which an RFID reader transmits a modulated RF signal to RFID tags each consisting of an antenna and an IC. The chip receives power from the antenna and responds by varying its input impedance, and thus modulating the backscattered signal. The ability to backscatter is strongly dependent on the surface on which the tag is mounted. A conductive material close to the tag can adversely affect performance by detuning the tag and limiting the read range.

As a result, passive RFID systems have limitations due to any one or more of the following factors:

- Tag power is limited (the power at the tag determines its read range);
- Tag reflection affects the signal that is scattered back;
- Surface on which the tag is mounted affects performance;
- Environmental factors can include multi-path fading and interfering readers;
- Above a certain speed, moving tagged objects cannot be interrogated by a reader;
- There is mutual coupling between tags;
- Performance degradation can be due to low reader Transmit antenna gain and low reader Receive sensitivity;
- Some systems have the inability to transmit through metal, rock, masonry or liquid;
- Sometimes, wrongly oriented tags will limit readability.

Under these conditions, an 'active RFID' system, in which each active tag carries its own battery power source, offers far more robust communications performance. The battery power source enables the tag to support high-power transmission, providing for greater range, and the ability to connect even through solid barriers of metal or masonry.

But this very property of an active tag is also its main limitation: high-power UHF transmitters are power-hungry devices. So how can an active RFID system be designed to provide excellent communications performance while operating for several years on a cheap, small battery?

This article describes the operation of an active tag RFID system, and then introduces a reference design which demonstrates a way to square the circle of high RF output power and low system consumption.

The operation of active RFID systems

Active RFID usually operates at 455 MHz, 850 MHz, 900 MHz, 2.4 GHz or 5.8 GHz. It is suited to applications such as asset and people tracking, access control, passive keyless entry in cars, parking management systems and temperature monitoring. As stated above, active RFID tags have greater transmission power than passive tags. Another difference in active RFID systems is that an active tag using its own battery power source can continually transmit its identity and other data at a pre-determined rate back to the reader or a base station – tags are typically configured with an interval of around one or two seconds between transmissions. This gives the system designer considerable extra flexibility compared to a passive RFID system, in which the passive tag must first receive a transmission from a reader before it can initiate a data transmission. In an active RFID system, by contrast, a tag can broadcast its identity to a reader over a relatively long range (up to 100 m) even if the tag's receive path is compromised, for instance because of interference or low antenna sensitivity.

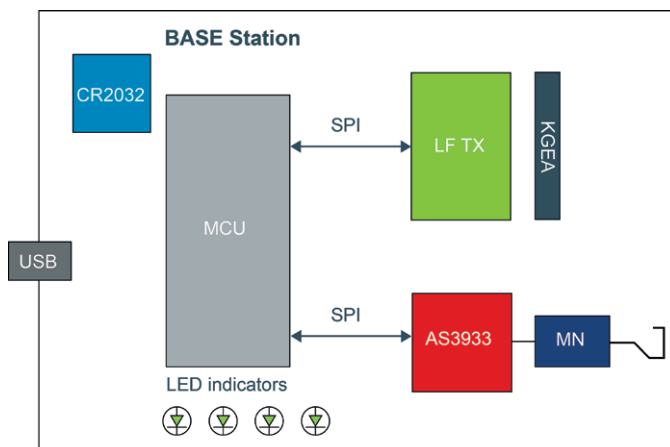


Figure 1: ams active RFID reference design – base station block diagram.

This mode of operation, however, entails relatively high power consumption, since the high-power UHF transmitter is required to operate every one or two seconds. An alternative approach allows the active tag to remain in a deep power-down state almost permanently. To achieve this, the system requires a low-frequency (LF) wake-up receiver, which waits to receive an incoming signal from a nearby reader before initiating a UHF transmission. Low-frequency transmissions are little impaired by reflections from materials such as rock and liquids, and also support operation at a lower current than UHF transmissions. A well-designed LF receiver can operate continuously on a tiny current similar to a battery's leakage current, and thus has a negligible effect on the tag battery's life.

Now, however, the range of the system is the smaller of the receive range of the tag's LF receiver and the transmit range of the tag's UHF transmitter. Clearly this means the sensitivity of the LF receiver is of high importance. This low-power architecture can be evaluated in a reference design kit developed by ams. So how can this implementation of the low-power architecture described above ensure years of operation on a small battery?

Architecture of the ams reference design: base station

The base station consists of an LF wake-up transmitter, a 2.4 GHz RF trans-

ceiver (the AS3940) and a microcontroller - see figure 1. The base station is powered via its USB interface. As stated above, the effective range of the system is limited by the receive range of the tag's LF receiver. In order to maximize the base station's LF transmit range, a power management IC (PMIC) is used, supporting a high voltage input to the LF antenna. A low-power microcontroller (MCU) controls the operation of the LF and UHF protocols. The LF transmitter is based on discrete transistor circuitry, a matching network (MN) and the PCB antenna. LEDs indicate the status of the base station.

The base station's primary task is to continually transmit its LF wake-up pattern and its own identification data. It also collects return signal strength indicator (RSSI) information and identification data from tags that are within receive range, and communicates this to a host device or controller.

Architecture of the ams reference design: active tag

The tag consists of an LF (15-150 kHz) wake-up receiver, the AS3933, the AS3940 2.4 GHz UHF frequency shift keying (FSK) transceiver, and an ultra-low power MCU - see figure 2. As stated above, the sensitivity of the wake-up receiver is a crucial factor in determining the effective range of the complete system. This is addressed in a clever design which takes advantage of the AS3933's three-channel input. In the challenging applications to which active RFID technology is suited, the orientation between the base station and the active tag is normally not fixed. The ams reference design thus uses a three-dimensional antenna system, with an antenna in each of the x, y and z axes each feeding one of the device's inputs. These three LF coils are combined in a single package. The AS3933 offers typical receive sensitivity of 80 μ Vrms.

The UHF transmit path is implemented via the 2.4 GHz transceiver with its matching network (MN) and the PCB antenna. The LEDs operate as status indicators. In a system based on this reference design, an active tag can be expected to operate for a typical period of three years on a small CR2032 coin cell.

System operation

The base station works in the following manner. The MCU initializes the LF wake-up receiver and the UHF transceiver with updated register settings. It then transmits the LF wake-up signal.

After the LF transmission, the MCU switches the 2.4 GHz transceiver to receive mode, waiting for active tags to respond. When a tag responds, it needs first to be temporarily paired to the base station. Once the devices are paired, one streaming data packet is expected. The tag's ID and RSSI information are contained in this packet. (If pairing is not accomplished, the base station will issue a second temporary pairing command after a period of time.) As soon as the packet has been streamed, the base station switches back to receive mode, waiting for another tag to respond.

The tag's operation mirrors that of the base station. On power-up, the MCU initializes the LF wake-up receiver and the UHF transceiver. The RC oscillator of the LF wake-up receiver is calibrated and the 3D antenna is automatically tuned by the AS3933. After this, the tag goes into deep sleep mode, waiting for an LF wake-up signal. Once a wake-up signal is received, the device checks that its pattern corresponds to its reference pattern. It then generates an external interrupt to bring the MCU out of sleep mode. The MCU reads the RSSI and the base station ID contained in the LF signal. The tag will have a defined UHF transmission time slot assigned to its ID. To conserve power, the tag goes into sleep mode again until this time slot arrives. During the reserved time slot, the tag establishes a 2.4 GHz connection with the base station, pairs with it and streams a data packet. Afterwards, the tag goes into sleep (LF receive) mode again.

A low-power active RFID implementation

The advantage of the architecture described above is its ultra-low power con-

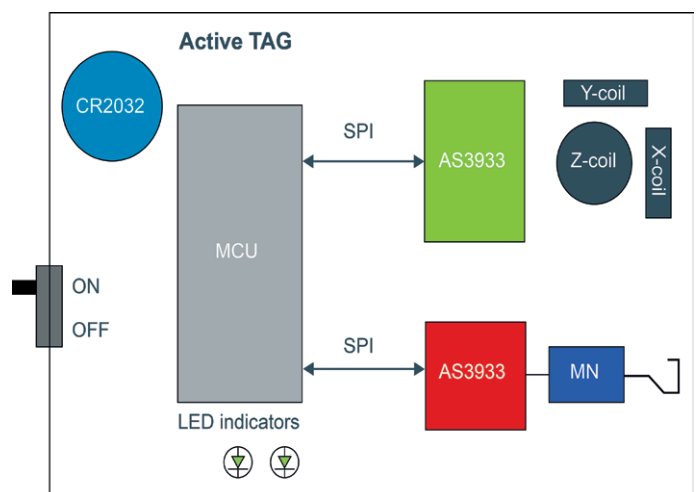


Figure 2: ams active RFID reference design – active tag block diagram.

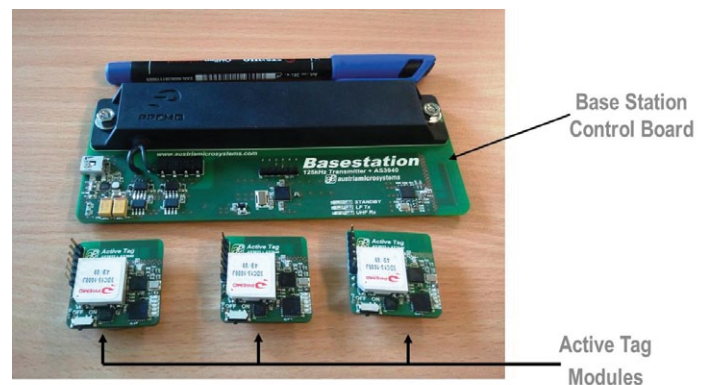


Figure 3: the ams active RFID demonstration system.

sumption, the result of keeping the UHF transmitter in almost permanent power-down mode. This is enabled through the use of an LF wake-up receiver, the AS3933, which features a Manchester decoding capability. This allows the implementation of pattern recognition, so that the system avoids false wake-up calls generated by noise or interference. Thus the AS3940 UHF transceiver only operates when in the vicinity of a base station. The rest of the time, the tag draws just a few microamps.

As well as achieving outstandingly low power consumption, the highly integrated design is also small and has a low bill of materials - see figure 3. It has been successfully implemented in a number of end products, including access control and real-time location systems, and in passive keyless entry systems.

By Shawn Rezaei, Field Application Engineer (US), ams - www.ams.com

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Wireless Sensors

M2M set to become a key component of Healthcare and Big Data in 2013

Machine-to-machine (M2M) communication is revolutionising many areas of the global economy. At present, over 100 million vending machines, vehicles, smoke alarms, and other devices are sharing information automatically. In 2012, major initiatives from operators such as Deutsche Telekom, included the launch of the M2M Marketplace, for buyers and sellers of M2M products, and the launch of the M2M Developer Community to support solution developers and users in the growing market.

Jürgen Hase, Vice President of M2M Competence Center at Deutsche Telekom and Chairman of the M2M Alliance expects the following developments in 2013:

- **Middleware layers will speed up development and deployment:** New horizontal middleware layers for M2M will emerge. Placed on top of existing layers such as connectivity and device management, they will provide support for common tasks in all industries – for instance, in setting up heterogeneous sensor networks for industrial monitoring. This will accelerate the development and deployment of M2M solutions, while drastically reducing development costs. Huge benefits are expected for both solution developers and adopters.
- **Big Data:** M2M is about to enter the next evolutionary stage: at the moment we collect data, but the real benefits of M2M will become apparent by analyzing this data. Today, it is already possible to detect attrition in production facilities by analyzing data in real time. Combined with machine learning algorithms, such applications will recognize more and more patterns and allow completely new insights in businesses.
- **Alliances:** M2M is not a local based business. In 2013, we will witness a number of strategic alliances, which will shape the future of the M2M market. They will work to overcome a major challenge in the long run: to provide seamless services in all countries. Furthermore, alliances are necessary to improve quality of service and establish M2M communication standards.
- **Automotive drives M2M in Europe:** In Europe the main driver of M2M adoption will be the automotive industry. The European Union has decided that starting in 2015 all newly registered motor vehicles must be equipped with an eCall emergency call system. Automotive manufacturers will focus on integrating embedded SIMs to comply with this regulation. Furthermore, telematics and connected entertainment services are additional M2M solutions, which will be subject to mass-production.
- **Health drives M2M in the USA:** Healthcare will be a main driver of M2M in the USA. Using M2M devices, a patient's state of health can be monitored continuously. A computer checks readings such as blood pressure, pulse or blood sugar level and notifies a doctor or care workers in the event of an emergency. As American health insurances recognize the potential long term savings, they will subsidize a great number of M2M solutions in 2013.

By Jürgen Hase, Vice President of M2M Competence Center at Deutsche Telekom and Chairman of the M2M Alliance

Mozilla enters smartphone market with Firefox OS developer preview phones

Mozilla have announced two Firefox OS developer preview phones to allow developers to build smartphones apps. These developer phones are being developed by Geeksphone in partnership with Telefonica and will be available in February.

Firefox OS is a mobile operating system that uses HTML5 apps to operate and bring functionality to the smartphone — for example, these HTML5 apps can make the phone vibrate, make a phone call or send a text message.

The Keon model features a Qualcomm Snapdragon S1 1GHz CPU, 3.5-inch HVGA multitouch screen, 3 megapixel Camera, 4 GB ROM, 512 MB RAM and 1580 mAh battery. It also has MicroSD, Wifi N, light and proximity sensor,



G-sensor, GPS, and MicroUSB. The Keon is designed to operate on UMTS 2100/1900/900 (3G HSPA) and GSM 850/900/1800/1900 (2G EDGE) networks.

The high-end Peak model is based on a dual-core 1.2 GHz Qualcomm Snapdragon S4 CPU and features a 4.3 inch qHD IPS multitouch screen, 8

megapixel back camera, 2 megapixel front camera, 4 GB ROM and 512 RAM. Further features include MicroSD, Wifi N, light and proximity sensor, G-sensor, GPS, MicroUSB, and camera flash. The Peak smartphone is design for UMTS 2100/1900/900 (3G HSPA) and GSM 850/900/1800/1900 (2G EDGE) networks.

The developer phones are solely for developing HTML 5 apps for Firefox OS, with the aim of bringing open standards and an open community to the mobile platform. On the consumer side, first smartphones based on the Firefox OS will be launched in Brazil — purportedly under the \$100 price point.

<https://hacks.mozilla.org>
www.geeksphone.com

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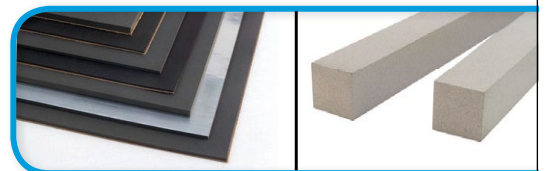
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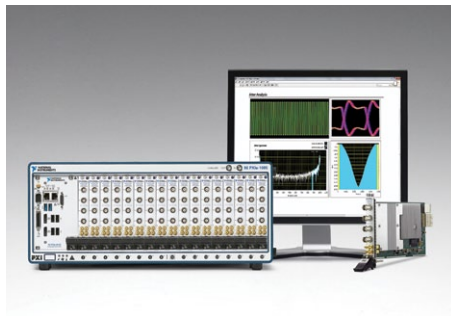
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PXI digitiser with jitter analysis toolkit

features a 5 GS/s sample rate

National Instruments has announced the PXIe-5162 digitiser and updates to the LabVIEW Jitter Analysis Toolkit. The digitiser, with 10 bits of vertical resolution and a 5 GS/s sample rate, provides



high-speed measurements at four times the vertical resolution of a traditional 8-bit oscilloscope.

With 1.5 GHz of bandwidth and four channels in a single slot, the PXIe-5162 is suited for high-channel-count digitiser systems in manufacturing test, research and device characterisation. Engineers can use the digitiser with LabVIEW and the LabVIEW Jitter Analysis Toolkit, which provides a library of functions optimised for performing the high-throughput jitter, eye diagram and phase noise measurements demanded by automated validation and production test environments.

www.ni.com/digitizers

Coaxial resonator oscillator

maximizes performance and efficiency

Crystek has introduced the CVCO55CXT-4812-4812 coaxial resonator oscillator (CRO) which is a coaxial-based VCO with an internal proprietary frequency doubler.

The CVCO55CXT family's frequency doubling, 2X fundamental technology reaches new performance levels of lower phase noise and much lower harmonics over the competition, while achieving lower current consumption in the process.

The VCO operates at 4812 MHz with a tuning voltage range of 0.3 Vdc to 4.7 Vdc. This coaxial VCO features a typical phase noise of -102 dBc/Hz at 10 kHz offset and has good linearity. It exhibits

an output power of 3.0 dBm typical into a 50 ohm load with a supply of +5.0 Vdc and a current consumption of 25 mA (maximum). The VCO is packaged in the industry-standard 0.5-inch x 0.5-inch package. Pushing and pulling are both minimized to 1.5 MHz/V and 0.5 MHz, respectively. Second harmonic suppression is -30 dBc typical.

www.crystek.com

Flexible loop GPS/GLONASS antenna

outperforms most active patch antennas with 80% efficiency

Taoglas USA has launched the FXP.611 Cloud, a GPS/Glonass flexible loop antenna that outperforms most active patch antennas with an efficiency of 80% and a peak gain of 3 dBi across the GPS and Glonass bands (1575 to 1610 MHz).



This antenna has a unique ability to resist external detuning effects due to dual resonance and has a small form factor of 38 x 37 x 0.1 mm. At less than half the cost of heavy active patch antennas, this peel and stick, flexible loop antenna is suitable for any GPS/Glonass M2M device.

The patent-pending FXP.611 Cloud antenna eliminates the need for a filter or low noise amplifier (LNA) so, can connect directly to a module or to a connector on a board.

Further the antenna offers a simple "peel and stick" mounting with 3M tape that can be attached to plastic device housings freeing up board space, costs half the price of active patch antennas, incorporates a unique detuning design with dual resonance, and radiates power uniformly with an omnidirectional design, making it suitable for use in devices that have fixed positions.

www.taoglas.com

Compact block converters

target space sensitive satellite communications systems



Designers of satellite communications systems can free up a significant amount of 19-inch rack space by using the latest range of compact block converters from Link Microtek.

Manufactured by MITEQ, the patented 1/3-rack products are each housed in a 1/3-width, 1U-high package, allowing three times as much functionality to be integrated into the rack space of a conventional 19-inch unit. These full-function upconverters and downconverters are designed to provide frequency translation between L-band and the transponder frequency. They are available in a wide range of frequency options covering commercial and military satcom applications in the C, X, Ku and Ka bands.

The block converters can be easily configured to create redundancy systems in a 1U space, thereby ensuring continuous operation of satellite communications terminals and preventing any disruption to services.

Featuring a gain of 30 dB for upconverters and 35 dB for downconverters, the units incorporate a gain control facility and automatic selection of 5/10 MHz internal/external reference oscillator.

www.linkmicrotek.com

802.11b/g/n WLAN front-end modules

in a tiny 2.5- x 2.5-mm package

The TQF9046 from TriQuint is a complete WLAN front-end module in an ultra small 2.5 mm x 2.5 mm footprint package for 802.11b/g/n + BT applications. It comprises a 2.4 GHz PA, directional detector, front-end SP3T switch, and LNA with bypass mode.

The device also features internally matched input/output and temperature compensated bias network. The architecture and interface are optimized for next generation WLAN integration into handset devices.

The front-end module features CMOS compatible control voltages to facilitate ease of use. With its low power dissipation, the front-end module contributes to the extended battery life of next generation WLAN solutions. It is manufactured in TriQuint's high-reliability E/D pHEMT technology and is assembled in ultra thin profile 2.5 mm x 2.5 mm x 0.40 mm QFN, 16 Pb-free package.

www.triquint.com

Dual mode Wi-Fi network controller

compact, 2.4 GHz 802.11b/g/n applications

Murata has announced the SN8200 series of compact low power certified Wi-Fi controller modules capable of providing 2.4 GHz 802.11b/g/n internet connectivity to a broad host of home appliances, industrial automation machines and healthcare equipment.



The self-contained module utilizes Broadcom Corporation's Wireless Internet Connectivity for Embedded Devices (WICED) architecture to provide comprehensive firmware and software features including a built-in Wi-Fi security supplicant supporting WPA PSK and WPA2 PSK, TCP/IP network stack and a simple network interface card (SNIC) protocol that supports socket connections.

Measuring just 30.5 x 19.4 x 2.9 mm, the SN8200 module is certified to FCC, IC and ETSI wireless standards and is equipped with a STM32 ARM Cortex-M3, an on-board antenna and offers both UART or SPI connectivity to the host application. The ability to support sensor applications is also possible by using the module's ADC, DAC, I2C and GPIO interfaces.

www.microwave-eetimes.com

The SN8200 can operate in either access point (AP) or station (STA) mode. An integrated web server available in AP mode makes target device setup and control extremely easy. Output power is typically +18 dBm when operating in 802.11b mode at 11 Mbps.

www.murata.eu

Ultra-miniature LDO delivers advanced drop-out and noise performance

Toshiba Electronics Europe (TEE) has released a family of ultra-miniature CMOS low drop-out voltage regulators (LDOs) with a 200 mA driving capability.



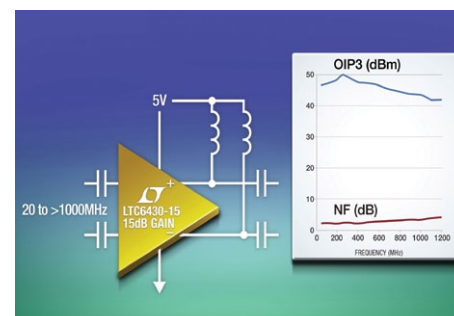
The TCR2EN series of highly integrated devices is ideal for mobile phones and other battery-powered, portable devices that demand low power consumption, high performance and minimum PCB space.

Based on Toshiba's latest CMOS process, devices in the new series are smaller than other 150/200 mA class molded package alternatives. Despite this miniaturization typical drop-out voltage ratings are only 160 mV (at an output voltage and current of 2.5 V and 150 mA). In addition, at just 35 μ Vrms (2.5 V, 10 mA output) the LDOs also offer the industry's lowest typical output noise for this class of package. Load transient response is only 55 mV (typical) for output current changes between 1 and 150 mA.

www.toshiba-components.com

Fully Differential IF 15dB RF/IF Amplifier achieves 50 dBm OIP3

The LTC6430-15, from Linear Technology, is a 15 dB amplifier, which achieves high dynamic range in a 100 Ohm differential environment from 20 MHz to 1 GHz and beyond. Two performance grades are available: at 240 MHz, the A-grade OIP3



is typically 50 dBm and is fully tested and guaranteed to be a minimum of 47 dBm; while the B-grade OIP3 is typically 47 dBm. Noise Figure is 3 dB, which corresponds to an input-referred amplifier noise of 1 nV/ $\sqrt{\text{Hz}}$. DC power consumption is 800 mW. This combination of low noise and low distortion provides wide dynamic range needed for high performance intermediate frequency communications and CATV applications.

The LTC6430-15 is easy to use, it is unconditionally stable, and the input and output are internally matched to 100 Ohm differential. With greater than 2.75 Vp-p linear output swing, it is well suited for driving high speed, high performance ADCs. Two 1:2 baluns, DC blocking capacitors, and RF bias chokes are all that is needed externally to achieve a wideband 50 Ohm balanced amplifier in communications applications.

www.linear.com

Short-range wireless module

ideal for multi-kilometer-range wired-to-wireless migration

Telit Wireless Solutions has announced the LE70-868 point-to-point, star-topology, short-range wireless module for the European multi-kilometer range wired-to-wireless network migration market in application areas such as solar/wind farms and agricultural automation.

The module operates on the 868 MHz European ISM license-free frequency allowing manufacturers to quickly integrate wireless communication, control, and sensor nodes replacing wire-networked models and fully meeting regulatory compliance on the short-range radio link.

The LE70-868 excels in all dimensions that are critical for original equipment manufacturers. The 139 dB radio link budget makes integration to the host hardware simple, eliminating the need for complex and costly NRE into radio and

antenna engineering and design, also lowering BOM costs. High 500 mW configurable radio output power combined with -112 dBm sensitivity, significantly improve the customer device's operating range and reliability — up to 10 km. And an ultra-low 1 μ A standby current allows successful integration of the module into battery powered electronic designs for applications such as soil moisture monitors, hall-effect closure detectors, and PIR surveillance devices, which require battery replacement cycles in multiples of years.

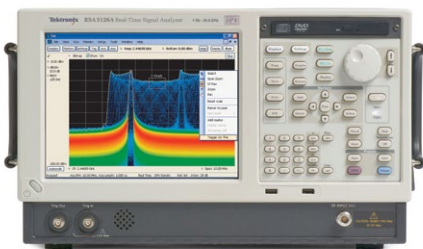
The compact module is housed in a 26 x 15 mm package and is capable of sustaining data rates up to 57.7 Kbps providing customers a wide array of application possibilities. AES encryption allows the LE70-868 to be applied in products transmitting sensitive data as well.

www.telit.com
www.m2mAIR.com

Mid-range real-time spectrum analyzer

offers advanced signal discovery and triggering

Tektronix has announced its lowest cost real-time spectrum analyzer for mid-range performance, featuring advanced signal discovery and triggering capabilities. Included in the expansion of the RSA5000 real-time spectrum analyzer series are 26.5 GHz and 15 GHz models along with the recently-announced 110 MHz bandwidth option that is now available on all the company's real-time spectrum analyzers.



The DPX spectrum display used in the RSA5000 offers an intuitive live color view of signal transients as they change over time in the frequency domain. This live display of transients is impossible with other signal analyzers. A number of advanced DPX features including swept DPX, gap-free DPX spectrograms, and DPX zero span with real-time amplitude,

frequency, or phase make it easy to find troublesome signals under a variety of conditions.

The RSA5000 provides a comprehensive set of triggers essential for troubleshooting modern digitally implemented RF systems. These include time-qualified power, runt, density, frequency, and frequency mask triggers. Also included are a number of DPX triggers including the DPX density trigger that works on the measured frequency of occurrence and "trigger on this" that allows the user to point at the signal of interest on the DPX display.

The RSA5000 series accelerates troubleshooting and analysis by pinpointing the root cause of problems in multiple domains. Engineers can analyze captured data across domains at any time using correlated markers. Time-correlated measurements can be made across frequency, phase, amplitude, and modulation domains. This is ideal for signal analysis that includes frequency hopping, pulse characteristics, modulation switching, settling time, bandwidth changes, and intermittent signals.

www.tektronix.com

Lightning protection products

target RF communication networks

Times Microwave Systems introduces the Times-Protect® LP-18-400-N series of DC pass RF lightning and surge protection products with a frequency operating band from DC to 6000 MHz.

This bidirectional design with either a type N male or type N female connector on one end can be directly attached to LMR-400 cable via the same standard EZ non-solder interface used on other EZ-400 non-solder style connectors and utilizes the same CST-400 prep tool and either the CT-400/300 crimp tool or combination of the HX-4 crimp handle and Y1719 (0.429-inch hex) crimp dies for installation.

The protector which handles up to 150 W of RF power and allows for up to 72 V of DC voltage to be supplied on the center pin of the coaxial cable eliminates the two connectors normally needed thereby reducing insertion loss, return loss and lowering cost. The LP-18-400-N series is the perfect RF equipment protection solution for any application requiring RF only or RF plus DC voltage

and current to power tower top mounted electronics. The body is IP67 rated making it suitable for outdoor as well as indoor installations.

www.timesmicrowave.com

Programmable digital downconverter targets wideband radar and SDR applications



Pentek has enhanced its fastest-ever data acquisition XMC module for the popular Cobalt® family. The Model 71641, capable of digitizing one 12-bit channel at 3.6 GHz, or two channels at 1.8 GHz, comes preconfigured with a program-

mable one- or two-channel digital downconverter (DDC) loaded into the onboard Xilinx Virtex-6 FPGA. The module is ideal for wideband radar and software defined radio (SDR).

Within the Virtex-6 FPGA is a powerful Pentek designed DDC IP core. The core supports single and dual channel modes, accepting data samples from the analog to digital (A/D) converter at the full 3.6 GHz rate in single-channel mode or 1.8 GHz in two-channel operation.

Each DDC has an independent 32-bit tuning frequency programmable from DC to f_s , where f_s is the A/D sampling frequency. In single channel mode, DDC decimation can be programmed to 8x, 16x or 32x. In dual channel mode, both channels share the same decimation rate, programmable to 4x, 8x or 16x.

The decimating filter for each DDC accepts a unique set of user-supplied 16-bit coefficients. The 80% default filters deliver an output bandwidth of $0.8 \cdot f_s/N$, where N is the decimation setting. In single channel mode the maximum output bandwidth is 360 MHz. Rejection of adjacent-band components within the 80% output bandwidth is better than 100 dB. Each DDC delivers a complex output stream consisting of 24-bit I + 24-bit Q or 16-bit I + 16-bit Q samples at a rate of f_s/N

www.pentek.com

IP for Vector Signal Transceiver

extends out-of-the-box capabilities

National Instruments has announced 10 pieces of new application IP that enable engineers and scientists to use LabVIEW system design software to build their own custom RF instruments. This IP integrates with PXI FPGA targets such as the PXIe-5644R vector signal transceiver (VST) and extends their default capabilities by adding new features or enhancing performance in specific applications.

Each piece of IP is available in a stand-alone package so that users can add it to one of the default VST personalities and mix and match the relevant components for their applications. The IP is also prebuilt into examples to provide immediate access to its functionality. This eliminates the need for the user to compile the code and subsequently reduces development time. In addition to VST IP from National Instruments, NI Alliance Partners and third-party developers are creating IP and developing software add-ons for the VST.

Examples of IP include: hardware power servoing for RF amplifier test; RF channel impairments including fading, noise, multipath and Doppler effects; digital device under test control; and contiguous I/Q waveform streaming to and from disk.

www.ni.com/vstgettingstarted

Handheld spectrum and interference analyzer

for 2G/3G/4G wireless, WLAN, satellite and microwave networks



Trilithic has introduced the Model 8853S handheld spectrum and interference analyzer; a 3 GHz 50 Ohm handheld spectrum analyzer that can be used anywhere in 2G/3G/4G wireless, wireless LAN, satellite and microwave networks

www.microwave-eetimes.com

to analyze RF signals with a comprehensive scope of measurements.

This analyzer includes a larger display, internal calibration and preselection to meet the precision testing needs of the customer, with a familiar and intuitive user interface. This analyzer also provides signal strength indication, spectrogram, and waterfall diagrams to identify interference signals.

The complete kit includes the 8853S, soft carrying case with shoulder strap, Li-Ion Bbattery, AC to DC power adapter and battery charger, vehicle power adapter, RJ-45 crossover cable, Type-A to Mini-B USB cable, male N to female SMA adapter, Q-Lab software and operation manual on CD.

<http://rfmicrowave.trilithic.com>

Phase noise frequency synthesizer

features integrated VCO that outputs 50 to 3760-MHz



Texas Instruments has introduced a wideband frequency synthesizer with integrated voltage-controlled oscillator (VCO) that claims to deliver the industry's lowest phase noise.

The device's combination of ultra-low noise phase-locked loop (PLL) and industry's highest phase detector frequency outperforms the competition in both phase noise and spurs. The LMX2581 combines the capability to drive highest system performance along with the flexibility of a wideband frequency synthesizer that outputs 50 to 3760 MHz. It allows designers to use one frequency synthesizer to support a variety of demanding applications in wireless infrastructure, radar, medical imaging, defense and aerospace, and test and measurement.

The LMX2581 has a phase detector frequency of 200 MHz and low PLL normalized phase noise of -229 dBc/Hz, which provides a precision local oscillator to an RF front end for better receiver sensitivity.

Integrated VCOs allow the device to output frequencies from 50 MHz to 3760 MHz, eliminating the multiple VCO/PLL combinations typically required to support a broad range of applications. The LMX2581 also gives designers the option to bypass its internal multi-core VCO in favor of an external VCO. The delta-sigma PLLatinum PLL engine with 200-MHz phase detector frequency boosts spurious performance.

The ultra-low noise, wideband frequency synthesizer integrates a delta-sigma fractional-N PLL; a multi-core VCO with tank circuit; optional frequency divider; two differential RF output buffers that can deliver 10 dBm single-ended on each side; and several low-noise, high precision low dropout regulators (LDOs).

www.semtech.com

70 W Ku-band linear power amplifier

covers 14.4 to 15.35 GHz operating range.

L-3 Electron Devices has introduced its latest Ku-Band Microwave Power Module (MPM), which produces a full 70 W of linear power in the 14.4 to 15.35 GHz operating range.



The complete module weighs in at just six pounds, is ruggedized for environmental conditions (-54 to +85°C), is MIL-STD-461-compliant and is packaged in an industry leading 7- x 7.5- x 2.6-inch high-density form factor.

www.L-3com.com

Dual-channel rotary joint

for the 26.5 to 40 GHz frequency band up to 100 W CW

The Engineering Division of Link Microtek has introduced the AM28RJUD, a dual-channel rotary joint that is specifically

aimed at applications in Ka-band satellite communications systems on board aircraft or unmanned aerial vehicles.



The AM28RJUD features a WR28 waveguide channel for transmissions in the 26.5 to 40 GHz frequency band at up to 100 W CW, combined with a DC-2 GHz coaxial channel for receive signals. The rotary joint complies with the relevant requirements of the RTCA DO-160 [AD/1] specification, which details environmental conditions and test procedures for airborne equipment - covering parameters such as temperature, pressure, humidity, shock and vibration.

To operate at the high frequencies of the Ka band, the device is small: measuring only 42 mm between waveguide flanges, with an overall length of 120 mm between coaxial connectors.

The non-contacting design of the waveguide channel makes for an inherently high power handling capability of 100 W CW, together with a VSWR of 1.2:1 and a typical insertion loss of 0.6 dB. The coaxial channel has a VSWR of 1.5:1 and an insertion loss of less than 0.4 dB, while isolation between the two channels is better than 65 dB

www.linkmicrotekeng.com

Low phase noise VCO designed to operate at 1200 MHz

Z-Communications announces an RoHS compliant VCO, designated model CRO1200A-LF for high speed analog to digital converters. The VCO is designed to operate at 1200 MHz within a tuning voltage range of 0.5 to 4.5 Vdc. This VCO features phase noise of -119 dBc/Hz at 10 kHz offset and a typical tuning sensitivity of 2 MHz/V.

The robust CRO1200A-LF provides the end user typical output power of -3.0 dBm into a 50 Ω load while operating off a 5 Vdc supply and drawing 20 mA,

typically, over the temperature range of -40 to 85° C. This VCO features typical second harmonic suppression of -25 dBc and comes in the company's standard MINI-16-SM package measuring 1.27- x 1.27- x 0.56 -cm.

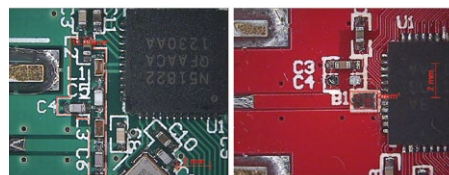
This low noise VCO is further heightened by pushing less than 0.5 MHz/V, with 5% change of the supply voltage, and pulling less than 0.5 MHz with a 12 dB return.

www.zcomm.com

Balun antenna matching design

occupies up to 90 percent less board space

STMicroelectronics has developed an integrated 2.4 GHz balun design for Nordic Semiconductor's nRF51 and nRF24 Series transceivers and SoCs that eliminates the need for RF antenna matching circuitry.



The design slashes board space requirements by up to 90 percent while improving performance, simplifying design, and reducing cost and BoM. The balun design does away with RF antenna matching circuitry that would typically comprise up to eight passive components (capacitors and inductors) and the interconnections between them.

The STMicroelectronics design incorporates a BAL-NRF01D3 Integrated Passive Device (IPD) balun matching network in a single 1.0 x 1.5 mm flip-chip package. The IPD balun takes direct differential input from a Nordic nRF device and feeds directly out into a single-ended 50-Ohm antenna. The Nordic nRF24 devices require no further matching and harmonic suppression components — they only require a single 0.8 pF capacitor externally to the BAL-NRF01D3.

The high Q (antenna performance boosting) thin-film technology employed in the BAL-NRF01D3 also significantly improves RF performance and characteristics over the use of standard passive component matching. This includes: a +0.9 dB average output power improvement at 4 dBm; +1 dB better sensitivity at 1 Mbps on-air transmit speeds; 10 dB

better LO (local oscillator) suppression; and -39.1 dBm 2nd harmonic suppression. The improved harmonic and LO suppression levels also promote simpler mandatory FCC/ETSI compliance testing and approvals.

www.st.com

Front end RF module addresses smart metering and ISM band applications

RF Micro Devices has announced a front end RF, the single-chip RFFM6403, designed to reduce customer design time and speeds customer time-to-market in smart energy metering applications operating in the 405 to 475 MHz frequency range, as well as for portable battery powered equipment and general 433/470 MHz ISM band systems.

The RFFM6403 integrates a transmit high power path with a +30.5 dBm PA and Tx harmonic output filtering, a transmit bypass through path with Tx harmonic output filtering, and a receive path with a low noise amplifier (LNA) with bypass mode. The FEM also features a low insertion loss/high isolation SP3T switch and separate Rx/Tx 50 Ω ports, simplifying matching and providing input and output signals for both the Tx and Rx paths.

The RFFM6403 is designed for systems operating with high efficiency requirements and a minimum output power of 30 dBm. In the receive path, the Rx chain provides 16 dB of typical gain with only 5 mA of current and an excellent noise figure of 1.7 dB. The 6 x 6 x 1 mm chip minimizes product footprint at the customer device while reducing external component count and associated assembly costs.

www.rfmd.com

50-Ohm sub-miniature RF connector

operates at up to through 40 GHz

Bomar Interconnect Products has expanded its RF connector offering with the introduction of the SMP Interface System, commonly employed in a wide range of sub-miniature, high frequency coaxial cable-to-board and board-to-board applications.

Engineered to securely mate and maintain performance through 40 GHz, the 50-Ohm sub-miniature devices addi-

tionally feature a VSWR of 1.18 maximum at 40 GHz. SMP male PCB connectors are available in vertical surface mount, vertical surface mount through-hole (for extra board retention), and in edge mount configurations.



They are supplied in three levels of detent, each with different engage and disengage coupling forces. The three levels are: full detent, limited detent and smooth bore. The full detent provides the highest insertion and withdrawal forces and the smooth bore, the lowest. Bomar's cable ended SMP female connectors are offered to accommodate cable sizes 0.047, 0.085 and 0.086 diameter semi-rigid or conformable coaxial cable. Additional cable sizes are available upon request.

www.bomarinterconnect.com

Tri-band reference design

features both 802.11ac and 802.11ad technology

Qualcomm Incorporated has announced that its subsidiary, Qualcomm Atheros and Wilocity have launched the first tri-band reference design that combines 802.11ac and 802.11ad wireless capabilities on a single module.

Based on Qualcomm VIVE™ 802.11ac Wi-Fi and Wilocity 802.11ad WiGig™ wireless technologies, the reference design delivers tri-band Wi-Fi, which allows consumers to connect to 60 GHz-enabled devices, docks, displays and storage at multi-gigabit speeds, while maintaining enterprise-wide or whole home coverage with 2.4-GHz/5-GHz Wi-Fi.

Building on the success of the QCA9005 tri-band wireless solution, this tri-band wireless networking card takes advantage of the Qualcomm VIVE 802.11ac combined with the recently ratified 802.11ad standard that enables multi-gigabit networking, data syncing, and video and audio streaming, while

maintaining its wireless bus extension docking capabilities.

By integrating a solution that combines whole home, gigabit-class Wi-Fi with in-room, multi-gigabit connectivity into their devices, equipment manufacturers will benefit from the ultra-high speed this newest solution offers.

www.qualcomm.com

Transceiver compliant with ETSI Category 1 with 6-dB margin to support healthcare monitoring

Semtech Corporation has expanded its RFIC transceiver platform with the SX1235, a fully integrated, high-performance, low current sub-GHz RF transceiver that provides ETSI category 1 compliance with 6 dB regulatory margin.

ETSI category 1 compliance is the highest transceiver rating for European regulations and is required for safety-critical wireless applications such as social alarms and healthcare monitoring.

Previous category 1 solutions have only been realizable with large and expensive discrete solutions which are difficult to design and offer little flexibility, thus limiting the overall deployment of products designed to provide safety to the elderly and workers in hazardous conditions. An integrated solution with the SX1235 reduces the development time and cost with flexibility to tailor to multiple products leading to the expansion of products to serve this important market segment.

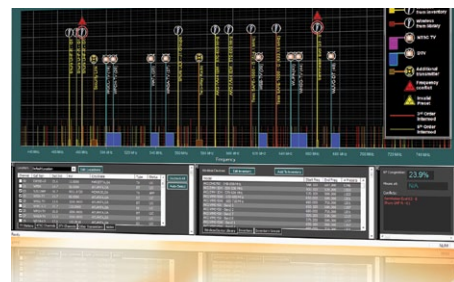
With an industry-leading 9.3 mA receive mode current consumption, the SX1235 is ideal for category 1 applications seeking the lowest consumption possible for maximum battery lifetime while giving the highest margin to the regulatory limits.

www.semtech.com

Software-based RF spectrum tool

identifies intermodulation distortion frequencies

Launched by Kaltman Creations LLC, RF-intermodPRO is software product that aids in calculating, predicting and identifying intermodulation interference of wireless devices.



The PC-based software refines and simplifies the process of identifying intermodulation distortion (IMD) frequencies in a given RF spectrum. It is available as a standalone PC-based software product or as a plug-in option for the Invisible Waves™ RF Command Center.

The RF-intermodPRO graphically displays onscreen the predicted locations of these intermod components and assists in the frequency coordination process. Based on the user's selection of transmitter models from a device library or custom inventory list, the software will advise the user on the best selection of transmitters/frequencies.

www.kaltmancreationsllc.com

Frequency planning wizard

for determining spurious free bandwidths in system design

AWR has announced RFP™, an innovative frequency planning wizard within Visual System Simulator™ (VSS) that enables engineers to efficiently determine spurious free bandwidths when designing complex radio communications systems.

RFP excels as a frequency planning simulation tool in two ways. First, in addition to spur analysis, RFP gives engineers the first cut of cascaded measurements such as noise figure (NF), gain compression (P1dB), signal-to-noise-ratio (SNR) and third-order intermodulation (IM3), as well as spurious free dynamic range.

Second, RFP is seamlessly integrated with AWR's VSS communications system design software so that with a single mouse click the RF link constructed in RFP is automatically translated to a VSS system diagram. VSS can then be used to account for mismatch between components, account for noise at image frequency, and run yield analysis and optimization. Engineers then have a choice of modulated signals and can perform, for example, EVM, ACPR, and BER measurements.

www.awrcorp.com

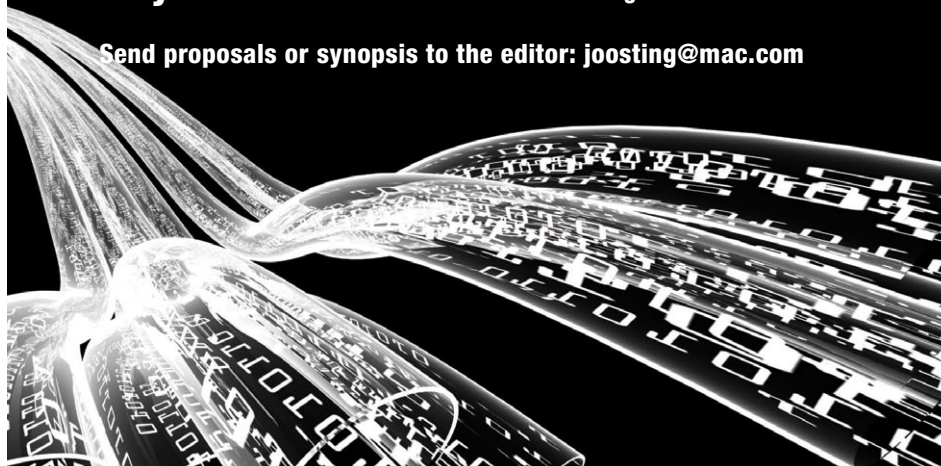
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Microwave & RF

10th - 11th April 2013
Paris Expo
Porte de Versailles
France
www.microwave-RF.com

CTIA 2013

21st - 23rd May 2013
Sands Expo and Convention Center
Las Vegas, NV, USA
www.ctia2013.com

MTT-S International Microwave Symposium

2nd - 7th June 2013
Washington State Convention Center
Seattle, WA
<http://ims2013.org>

LTE World Summit 2013

24th - 26th June 2013
Amsterdam RAI
The Netherlands
<http://ws.lteconference.com>

European Microwave Week

6th - 11th Oct 2013
Nürnberg Convention Center
Nuremberg, Germany
www.eumweek.com

IBC Conference/Exhibition

12th - 17th September 2013
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www.ibc.org

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Invention Capital: Why the World Needs More of it

Monday, 3 June 2013

"It is an exciting time to be a technologist. Every day, breakthroughs in research laboratories offer the promise of products and solutions to meet a range of global challenges and opportunities. However, it is very difficult to successfully commercialize technology; and unfortunately most efforts fail. We need to improve the success rate, otherwise billions of dollars of R&D funding will be wasted, and innovation-driven economies will stall. Invention Capital is a missing link in the value-creation chain."

Dr. Patrick Ennis will talk about how researchers from a variety of scientific and technical fields can optimize the value-creation chain. He will be sharing new models such as Open Innovation and Invention Capital that are necessary to successfully commercialize technology, in today's challenging environment where the speed of

technology development and adoption has so accelerated that even leading technology companies find it hard to just keep up. This is an opportunity for leading researchers to understand the latest trends in managing valuable IP and bringing it closer to commercialization.

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