

May/June 2014

europa
business press

MICROWAVE engineering europe

Test & Measurement

Antennas

www.mwee.com

The European journal for the microwave
and wireless design engineer

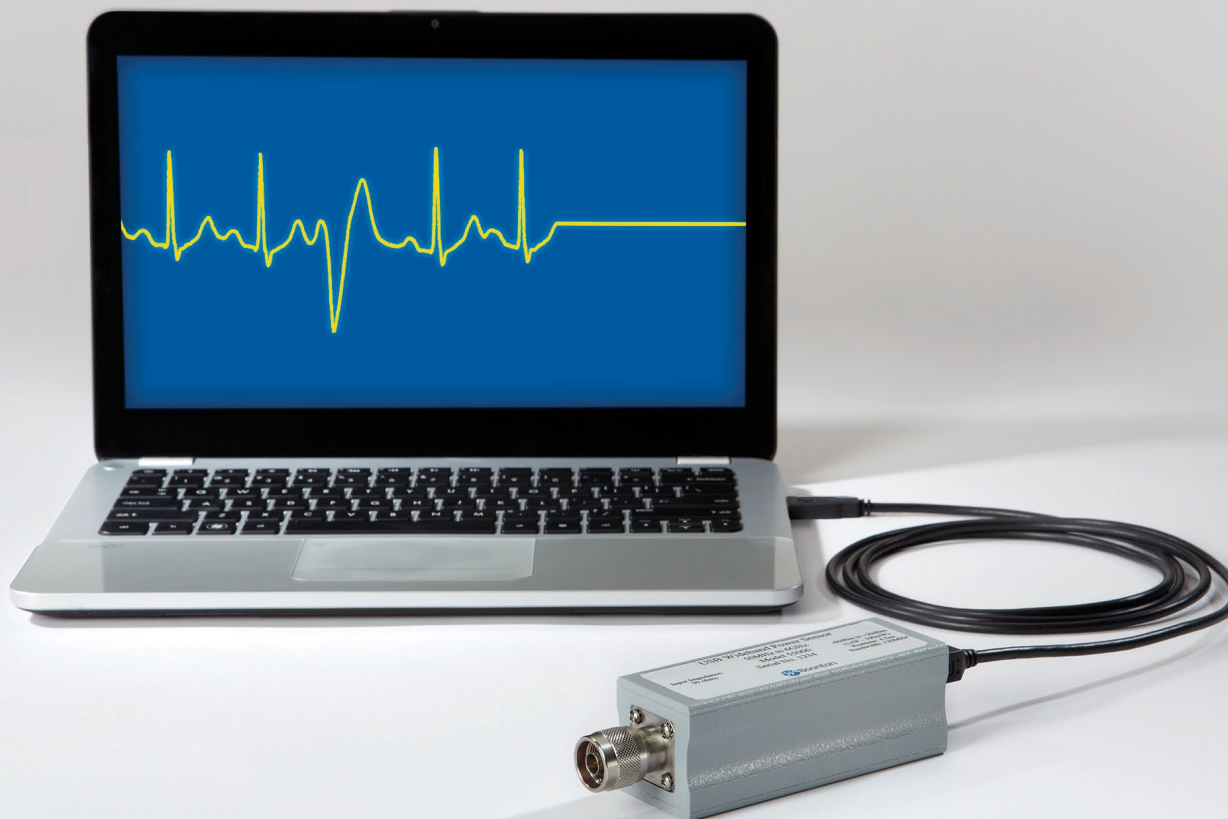


**FREE
SHIPPING**
ON ORDERS
OVER €65!



DIGIKEY.COM/EUROPE

Missing a Pulse Can Be Deadly.



The Smartest, Fastest and Only Real-Time USB Peak Power Sensor.

Don't fall victim to conventional power measurement techniques that will leave you missing valuable data - we capture every pulse with no missed glitches. The new **55 Series** delivers unsurpassed speed and accuracy for the most demanding RF power measurements thanks to Boonton's **Real-Time Power Processing™** technology. With this revolutionary technique, all processing steps take place in parallel, guaranteeing gap-free signal acquisition and reliable capture of all transients, dropouts or interference.

The new Boonton **55 Series** delivers real results no one else can see.

Taking Performance to a New Peak.

- Real-Time Power Processing™ for gap-free analysis
- 100 MSa/sec SUSTAINED sample rate is world's fastest
- 10 GSa/sec effective rate for superb waveform fidelity
- <5 ns risetime and 70+ MHz video bandwidth
- 100 ps time resolution for enhanced trigger stability
- Triggered acquisition speeds over 40,000 sweeps/sec
- Capture and analyze data more than 100x faster than conventional power sensors

For more information visit us at boonton.com or call +1 973-386-9696.



Watch measurements come alive
with **Real-Time Power Processing™**

**MOST
PREFERRED
DISTRIBUTOR**

RATED #1

Source: 2013 Most Preferred Distributor,
Distributor Customer Evaluation Study,
North America, May 2013,
UBM Electronics

THE TOP BRANDS from THE TOP DISTRIBUTOR

**FREE
SHIPPING**
ON ORDERS OVER €65*



FIND CONTACT AND ORDERING
INFORMATION FOR YOUR REGION AT
DIGIKEY.COM/EUROPE

860,000+ PRODUCTS IN STOCK | 650+ INDUSTRY-LEADING SUPPLIERS | 3 MILLION PARTS ONLINE

Digi-Key®
CORPORATION

*A shipping charge of €18.00 (£12.00) will be billed on all orders of less than €65.00 (£50.00). All orders are shipped via UPS for delivery within 1-3 days (dependent on final destination). No handling fees. All prices are in euro and British pound sterling. If excessive weight or unique circumstances require deviation from this charge, customers will be contacted prior to shipping order. Digi-Key is an authorized distributor for all supplier partners. New product added daily. © 2014 Digi-Key Corporation, 701 Brooks Ave. South, Thief River Falls, MN 56701, USA



MICROWAVE engineering europe

5 Comment

Software defined mobile networks come of age



6 News



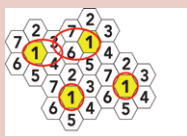
Startup uses ultrasound for low energy gesture recognition

OpenBTS 4.0 enables drive to commercial open-source cellular systems

10/14

T&M: Satellite communications power measurement using USB power sensors

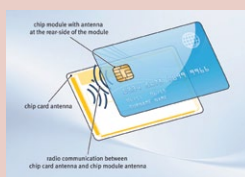
T&M: Interference in a crowded RF spectrum: why it occurs, and what to do about it



17/18

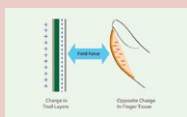
Antennas: Broadband lens may lead to antenna dishes that are flat or conform to any surface

Trends in the smart card payment



21/22

Electrostatic touch for smartphones



Products

Analogue front end for digital radios



20

Products



VNA delivers up to 24 integrated test ports



Broadband network analyzer hits 145 GHz

Editor In Chief

Jean-Pierre Joosting

Tel. +44-7800 548-133

email: jean-pierre.joosting@eetimes.be

Advertising Production

Lydia Gijsegom

Tel +32 (0) 2 740 00 50

email: lydia.gijsegom@eetimes.be

Circulation & Finance

Luc Desimpel

Tel +32 (0) 2 740 0055

email: luc.desimpel@eetimes.be

Art Manager

Jean-Paul Speliers

Tel +32 (0)2 740 0052

email: jean-paul.speliers@eetimes.be

Accounting

Ricardo Pinto Ferreira

Tel +32 (0)2 740 0051

email: financial@eetimes.be

Publisher

Andre Rousselot

Tel +32 (0)2 740 0053

email: andre.rousselot@eetimes.be

European Business Press SA

7 Avenue Reine Astrid

1310 La Hulpe - Belgium

Tel: +32 (0)2 740 00 50

Fax: +32 (0)2 740 00 59

www.microwave-eetimes.com

VAT Registration: BE 461.357.437

RPM: Nivelles

Company Number: 0461357437

© 2014 E.B.P. SA

- All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage or retrieval system without the express prior written consent of the publisher.
- The contents of Microwave Engineering Europe are subject to reproduction in information storage and retrieval systems.
- Microwave Engineering Europe is published ten times a year. Apply for a free copy of the journal online at www.microwave-eetimes.com/subscribe
- Subscriptions: Microwave Engineering Europe is available on subscription to others at 150 Euro. Refunds on cancelled subscriptions will only be provided at the Publisher's discretion, unless specifically guaranteed within the terms of the subscription offer. Paid subscription queries tel: +32 2 740 00 50
- Printed by Corelio

Software defined mobile networks come of age

While the high profile technology companies such as Google and Facebook look towards solar powered high altitude drones and hot air balloons to bring WiFi to the unconnected world, Legba and bladeRF creator Nuand have formed a partnership to expand traditional mobile networks to bring affordable mobile network access to the 3.5 billion people who currently are without any connectivity.

The problem with the hype surrounding drones and balloons is that as with all emerging technology they are not ready to be deployed and the costs have not been quantified. One reason most of the world is not connected is that mobile companies do not currently find it economically feasible. In other words, most people in this category do not have enough disposable income to warrant attention from the mainstream mobile operators or they live in remote areas. Do the same economic principles apply to Facebook and Google and ultimately their advertisers?

Maybe the answer lies more with tried and tested technology, but at a lower cost than has been previously possible. This is essentially what Legba and Nuand are attempting. The partnership brings together Legba's open source software for 2.5G networks with Nuand's software defined radio, based on Lime Microsystems' fully programmable RF transceiver technology. This combination is designated YateBTS 3.0.

YateBTS is an all-software implementation of a complete 2.5G network. It can be used for network in a box (NIB) appli-

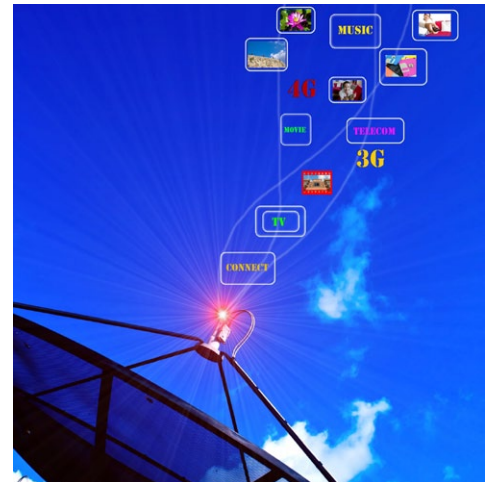
cations; large private networks, based on VoIP; public networks, based on an SS7 core; or mixed 2G/4G networks, based on an IMS core.

YateBTS is built from the OpenBTS® L1 PHY, L2 link layer and L3 radio resource manager, with upper L3 and GSM implemented in Yate. This architecture offers many advantages over the original OpenBTS® design, including dramatically improved stability and direct support for the all of the protocols already supported by Yate, including SS7/MAP, SIP/IMS, MGCP, XMPP, H.323, IAX, and ISDN.

Yate (Yet Another Telephony Engine) is a next-generation telephony engine; while currently focused on Voice over Internet Protocol (VoIP) and PSTN, it can be easily extended. Voice, video, data and instant messaging can all be unified under Yate's flexible routing engine. The software is written in C++ and it supports scripting in various programming languages (such as those supported by the currently implemented PHP, Python and Perl libraries) and even any Unix shell.

Nuand's software defined radio technology builds on proven military implementations of such technology and seeks to bring affordable mobile network access to the 3.5 billion people who currently are without any connectivity.

The bladeRF board has an entirely programmable FPGA and a large community of developers. It suits both hobbyists and professionals in exploring and experimenting with the multidisciplinary facets of RF communication. The board



uses Lime's field programmable RF transceiver to deliver a simple, high performance and low cost software defined radio board. Basically bladeRF is a high quality, low-cost software defined radio capable of capturing 40 MHz 12-bit full duplex quadrature samples in realtime. The partnership among Legba, Nuand and Lime Microsystems proves traditional mobile networks can be expanded and made more affordable.

www.leg.ba
www.nuand.com
www.limemicro.com
<http://openbts.org>
<http://yate.ro/pmwiki>

By Jean-Pierre Joosting
 Editor: Microwave Engineering Europe

Most smartphones to be vendor reference designs

The emergence of reference design programmes by chipset suppliers such as MediaTek, Qualcomm, and Spreadtrum have greatly helped small vendors, notably in China and India to compete in the lowest tier of the smartphone market.

According to ABI Research more than one-third of smartphones shipped in 2013 were attached to reference designs supplied by key chipset vendors, of which 69% were targeted at below US\$200 price points.

Tier-one OEMs have long resisted delegating the device reference design to chipset suppliers as they see it as an integral part of their brand and dif-

ferentiation. However, fierce competition from small vendors is now forcing tier-one OEMs to change their strategy and consider using third party reference designs, essentially in the cost-sensitive segments of the market (sub-\$200). Nokia, Samsung, HTC, LG, Huawei, and ZTE have already started to use this approach, mainly for products targeted at emerging markets.

"These trends will take the competition to another level, forcing OEMs to make more compromises on reference design ownership. As a result, reference designs owned by chipset suppliers will gradually entrench to higher price

points, making the smartphone market increasingly commoditized," commented Malik Saadi practice director at ABI Research.

By 2019, more than two-thirds of smartphone shipments will be based on chipset suppliers' reference designs, totaling more than 1.18 billion units, of which 23% are targeted at wholesale prices higher than \$200. This development will greatly help chipset suppliers gain more influence within the mobile value chain and lead the overall smartphone technology innovation.

www.abiresearch.com

Startup uses ultrasound for low energy gesture recognition

Startup Chirp Microsystems (Albany, California) was founded late in 2013 to commercialize research into the use of a piezoelectric ultrasound transducer array to capture depth information and gesture recognition.



The work was conducted by PhD students and company co-founders Richard Przybyla and Stefon Shelton. The company is led by co-founder and CEO Michelle Meng-Hsiung Kiang, a former executive with the Micron Technology Inc. (Boise, Idaho) imaging group, now Aptina Imaging Inc. (San Jose, California).

The company claims that the use of sound waves to locate moving objects is more energy efficient than trying to recognize them from an image sensor. The company compares a camera consuming 1 W to record video while the Chirp transducer consumes 400-microwatts to perform 3D range finding.

As part of his PhD studies at University California Berkeley, Przybyla developed the system with Stefon Shelton who studied at University California Davis and worked in the Berkeley Sensor and Actuator Center (BSAC). To show off the micro-machined ultrasound transducer and its companion ASIC, the pair developed applications for gesture recognition with

computer operating systems for such things as page turning and controlling an airplane within a flight simulator.

The system works by driving an array of silicon membranes in the MEMS device to emit an ultrasonic wave from the device and then uses

the membranes in a microphone mode – to detect the return signal. The use of time-of-flight information from the array of sensors allows calculation of the distance and direction and to build-up a 3D depth map in front of the sensor.

This is similar to the way a bat uses ultrasound to map its surroundings and also puts Chirp Microsystems in the same technology camp as Elliptic Labs Inc. (Palo Alto, California). Elliptic Labs was founded as a spin-off from the University of Oslo in 2006. Chirp's claims its technology is not only more efficient than light-based systems but can be made small enough to embed in portable equipment such as smartwatches.

Professors Dave Horsley and Bernhard Boser, who lead the development program at BSAC, are also co-founders of the company which is now part of an UC Berkeley accelerator program, SkyDeck.

www.chirpmicro.com
www.ellipticlabs.com

Fairchild enters fabless MEMS market — targets IoT and wearable devices

Fairchild Semiconductor International Inc., (San Jose, California) has confirmed it will enter the inertial MEMS market with mass production in 2014 as it formally announced the acquisition of Xsens Technologies BV (Eschede, The Netherlands).

Xsens is a private company that has specialized in 3D motion tracking systems based on MEMS inertial sensors. EE Times Europe reported the acquisition by Fairchild back in March 2014.

Mark Thompson, CEO of Fairchild, announced at a meeting held alongside the Global Semiconductor Alliance (GSA) Executive Forum in Munich that the company spent approximately \$60 million to acquire Xsens and its sensor fusion technologies. These will enable a number of context-awareness functions in mobile, industrial control and stabilization, health and fitness applications, as well as 3D character animation, the companies said.

Casper Peeters, co-founder and CEO of Xsens, said: "Xsens has the sensor and software skills. We make systems. Fairchild has the low-power MEMS capability." Xsens will operate as an independent subsidiary of Fairchild and will continue to be headquartered in Enschede, The Netherlands.

"Xsens algorithms embedded within hardware enable very low power inertial MEMS. That's going to come out later this year," said Vijay Ullal, president and COO of Fairchild. Ullal said Fairchild has already developed a six-degrees of freedom accelerometer-gyroscope and that it was getting the MEMS part made in a foundry

"There are plenty of markets beyond smartphones and tablets; especially in wearables and the Internet of Things," Ullal added stressing that Fairchild intends to focus on providing application-specific components, sub-systems and complete systems rather than standard MEMS components. "The value-add is in the applications knowledge and the algorithms deployed in hardware and software," he said.

Ullal said that by controlling both the hardware and software Fairchild is able to optimize the whole motion-tracking system for low power.

www.fairchild.com

Quantum random number generator from a phone camera

Researchers from the University of Geneva have reported on how the CMOS image sensors used within a mobile phone can be used as a quantum random number generator (QRNG). QRNGs are used to improve cryptographic protocols but have been too large, power hungry and costly to include in client devices. The research team at University of Geneva has exploited the fact that modern CMOS image sensors are sensitive to light at the level of a few photons and photon emission from light sources is an inherently quantum process. In addition CMOS image sensors

have millions of pixels and high-speed readouts allowing for millions of random bits to be generated per second.

Quantum random number generation on a mobile phone was authored by Bruno Sanguinetti, Anthony Martin, Hugo Zbinden and Nicolas Gisin and submitted to the arxiv.org online journal. The authors used a commercial astronomy monochrome CCD camera (ATIK 383L), and the green pixels on a CMOS sensor in a Nokia N9 mobile phone.

<http://arxiv.org/pdf/1405.0435v1.pdf>

Nokia invests \$100 million for Connected Car technology



Having sold its mobile phone business to Microsoft, some might have thought there is not much left of ailing infrastructure vendor Nokia. Now the company has launched a fund of \$100 million dedicated to invest into companies active in the Connected Car business.

The fund aims at extending the ecosystem around Nokia's digital maps subsidiary Here by investing in promising automotive technology and services companies. According to a Nokia release, it will identify and invest in companies which promise a significant contribution to the world of connected and intelligent vehicles. The fund will

be managed by Nokia Growth Partners (NGP), the venture capital arm of the Finland-based telecommunications technology provider.

Here provides a platform for connected driving that is partially based in the cloud. For this very reason, NGP will closely cooperate with Here. The fund "underscores that connectivity is rapidly reshaping what is possible in the car environment", said Here CEO Michel Halbherr. "We believe that connected cars equipped with precise location awareness and sensor data can become powerful devices capable of helping drivers make sense of the world around them".

The Connected Car fund extends NGPs global investment activities in the U.S., India, China and Europe. Including this latest fund, NGP holds investments amounting to \$700 million in tech companies; examples are software company Rocket Fuel, micro optics technology company Heptagon, and mobile browser vendor UCweb.

www.nokiagrowthpartners.com

Wi-Fi hotspots to grow in bid to offload traffic

Worldwide Wi-Fi deployments reached a total of 4.2 million hotspots in 2013, and will continue to grow at a CAGR of 15.0% between 2013 and 2018, to exceed 10.5 million.

Among the global Wi-Fi hotspots, 68.6% of Wi-Fi is in Asia-Pacific, followed by 12.3% in Latin America, 9.0% in Europe, 8.7% in North America, and 1.4% in Middle East and Africa. The number includes Wi-Fi hotspots deployed by mobile and fixed-line carriers as well as third party operators.

"The mobile data growth has boosted the build-out of Wi-Fi hotspots, as it is expected that the global mobile data traffic will grow to 190,000 petabytes in 2018, from 23,000 petabytes in 2013," comments Marina Lu, Research Analyst at ABI Research. "Wi-Fi helps to offload 3G/4G mobile Internet users to Wi-Fi networks, which is a more cost-effective method for both mobile carriers and mobile users."

www.abiresearch.com

Jay Alexander named CTO of Keysight

Name and date of the Agilent spin-off already have been already determined, now the parent appointed the Chief Technology Officer of the measurement instrument company. Jay Alexander, currently vice president and general manager of Agilent's high-profile oscilloscope business, will steer Keysight's technology course.

Mr. Alexander, whose appointment is effective immediately, will lead the technology development at Keysight Technologies, Agilent's electronic measurement business who will be spun off from the parent company and start its operative business coming August. He also will be responsible for the development of the product roadmap and for the resource allocation across divisions; his mission is to transform Keysight's product portfolio to meet customer needs.

Alexander has spent its entire professional career at Agilent and Hewlett Packard, the company of which Agilent has been spun off in 1999. He is a senior member of IEEE and holds 24 US patents.

Amplifier design to cut carbon emissions in mobile phone masts

The Universities of Bristol and Cardiff have designed an amplifier that works at 50 per cent efficiency compared with the 30 per cent now typically achieved, enabling mobile phone masts to deliver a 200 MW cut in the load on UK power stations, reducing CO2 emissions by around 0.5 million tonnes a year.

Currently, a 40 W transmitter in a phone mast's base station requires just over 130 W of power to amplify signals and send them wirelessly to people's mobiles. The new design, however, enables the transmitter to work effectively while using just 80 W of power.

If 10,000 base stations in the UK were fitted with the new amplifier, it is estimated that the total saving would amount to half the output of a mid-size, 400 MW power station. A 2011 estimate comes in at

50,000 phone mast base stations in the UK, so the potential energy and carbon-saving benefits could be even greater.

The team's development of a less power-hungry amplifier has focused on devising sophisticated new computing algorithms for incorporation into its inbuilt electronic management system, as well as on making a number of adjustments to the amplifier hardware.

Dr Kevin Morris, project leader and Reader in Radio Frequency Engineering, Department of Electrical & Electronic Engineering at the University of Bristol, said: "This new amplifier design represents a step change in energy efficiency that could make a really valuable contribution to meeting the UK's carbon reduction targets."

www.epsrc.ac.uk

OpenBTS 4.0 enables drive to commercial open-source cellular systems



Bringing cellular coverage to rural and remote areas has been a problem since the inception of the mobile phone, but open source technology is driving costs down so that most of the world, which remains unconnected today, may benefit from the cellular revolution.

By breaking the mould of proprietary, closed systems, open source will not only drive costs but boost innovation and even enable communities to initiate different business models than those currently deployed.

To this end, OpenBTS is an open source software implementation of a basestation that runs on a commodity server or servers and uses commodity IP routing equipment. All of the cellular network software runs on Linux and connects with commonly used TCP/IP and UDP/IP protocols. OpenBTS can even be run on virtualised servers in the cloud.

Recently, Range Networks, the leader of the OpenBTS software project, announced the release of OpenBTS 4.0. The software is now shipping in the company's laboratory development kits and commercial base stations and is also available to the OpenBTS community as a free download. OpenBTS, a software defined radio implementation of the GSM radio access network that presents normal GSM handsets as virtual SIP endpoints. In other words, through OpenBTS, any GSM handset appears as a SIP device, without the need for any special software on the phone.

The latest generation of OpenBTS offers significant improvements in processing capacity and system management features, including multi-node network scaling enhancements to Range Networks' commercial systems. These enhancements further the migration of

radio access network (RAN) infrastructure to low cost, standard hardware using open source software.

Edward Kozel, CEO of Range Networks, said: "This launch represents a significant milestone in Range Networks' product development. In addition to the new features, OpenBTS continues to provide stability, reliability and scalability. We see this as a major leap forward in terms of what OpenBTS can do for expanding the reach of non-traditional mobile networks."

Significant cost savings from the OpenBTS approach are due to several factors, including:

- For small networks, the core network hardware can be reduced to a single commodity server, or core network applications can even be run on excess resources in the base stations themselves.
- For larger networks, the core network hardware is based on commodity servers and IP routing equipment, making it possible for the provider to have one shared IP network for both data and voice.
- Because all of the cellular network software runs on Linux and connects with commonly used TCP/IP and UDP/IP protocols, the core network can even be virtualized and run in a "cloud" service, like Amazon's EC2.
- All of the proprietary software found in a conventional GSM network can be replaced with open-source applications like open-source applications like SIP Express Router (SER), Yate, Apache web server and MySQL database server, eliminating recurring licensing fees.
- Because the new core network is based on IETF internet-age protocols, newly graduated engineers and software developers do not require additional training to deal with archaic SS7 technologies.

Beyond cost savings, the conversion of the network from legacy telco protocols to internet protocols gives the operator new opportunities to implement custom speech, text and USSD applications, using web service technologies like Apache and Ruby, or through cloud-based application platforms like Tropo or Twilio. These applications can even be

installed in individual cell sites to provide locally-tailored service.

OpenBTS 4.0 features expanded capacity. Concurrent registration processing capacity has been increased by 14x, providing improved SIP authentication and service for over 1000 subscribers on a single node.

OpenBTS 4.0 offers a frequency scanning and system management API. This includes a built-in channel-scanning tool for transmission frequency selection when deploying systems. Also included is a newly implemented JSON API that allows mobile network operators to easily configure and manage the software remotely. This is done through a browser-based administrative console and provides third parties with an effective way to develop tools and interfaces for OpenBTS and other components.

Further, seamless handover and enhanced encryption is achieved through a completely new Layer 3 architecture has significantly improved network scalability, including improved handover for multi-node networks. The software now supports the A5/1 and A5/3 GSM link encryption algorithms for enhanced security.

Following several weeks of field trials, OpenBTS 4.0 is the foundation of a new, multi-node, low-cost commercial network being implemented by French carrier GlobalTel that will cover the island and city of Saint Pierre (population 7000) of the French territory St. Pierre and Miquelon, located off the coast of Newfoundland.

Range Networks supports 2.5G today and will soon support 3G UMTS, 4G LTE (E-UTRA) and 2.75G (EDGE). Although these technologies have very different air interfaces, in their Range Networks realizations, the core network is always the same. This means that a greenfield carrier can start with a simple 2G network and over time develop a mixed 2G-3G-4G system, using whatever technology is best adapted to particular sites. Core network upgrades are just capacity upgrades, replacing existing servers with more or faster processors as the traffic volume increases, or incremental upgrades to provide new features, like MMS, as they become available.

www.rangenetworks.com

Our RF & Microwave Products Give You An Unfair Advantage



Hybrid Power Solid State Modules & Benchtop Amplifiers

700 MHz to 6 GHz and 4-18 GHz Single Band Units

Now you can have Class A designs when linearity is the driving force, as in EMC and wireless applications OR Class AB designs when increased power and efficiency is paramount for EW applications. Standard 6 GHz modular designs provide up to 50 watts P out while benchtops are capable of over 200 watts. 18 GHz products deliver up to 10 watts in a modular package and 40 watts in a benchtop.



"S" Series Solid State

Numerous models from 0.7 to 18 GHz, 1 to 1200 Watts. For Immunity, Wireless Testing and TWTAs replacements. Our "S" Series amplifiers are Mismatch Tolerant providing 100% of rated power without foldback. These amplifiers will reproduce input signals and remain stable with any magnitude and phase load impedance, without damage.

1000S1G2z5 (1000 watts, from 1 to 2.5 GHz)



"A" Series-Solid State

RF Solid State Amplifiers up to 1000 MHz, and 50,000 watts. All of our RF Solid State Amplifiers have modulation capability that will faithfully reproduce AM, FM or pulse modulation for demanding EMC Radiated Immunity testing applications.

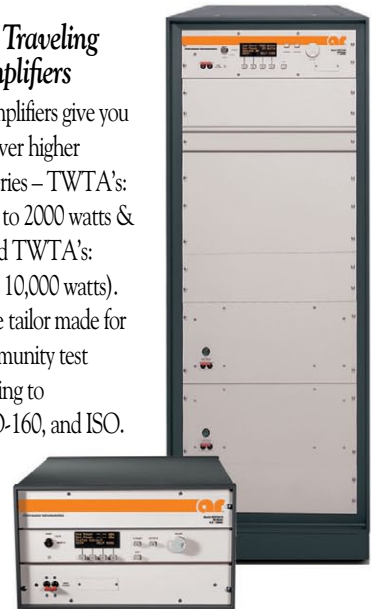


Dual Band Amplifiers

AR now offers the widest Class A solid state frequency range coverage in a single amplifier housing. Our widest bandwidth designs now cover 0.7 to 18 GHz in a dual band configuration. These amplifiers come in two different band split configurations from 0.7 to 4.2 GHz and 4 to 18 GHz, or from 0.7 to 6 GHz and 6 to 18 GHz. Output powers provide up to 80 watts for the lower band split while the higher band provides up to 40 watts.

"T" and "TP" Traveling Wave Tube Amplifiers

AR's microwave amplifiers give you more power and cover higher frequencies ("T" Series – TWTAs: 1-45 GHz; CW 15 to 2000 watts & "TP" Series – Pulsed TWTAs: 1-18 GHz; 1000 to 10,000 watts). These amplifiers are tailor made for various radiated immunity test applications according to MIL-STD-461, DO-160, and ISO.



www.ar-europe.ie/contact.php

ISO 9001:2008
Certified

ar europe

National Technology Park, Ashling Building, Limerick, Ireland • +353 61 504300 • www.ar-europe.ie

In Europe, call ar United Kingdom +44 1908 282766 • ar France +33147917530 • ar Deutschland +49 6101 80270 0 • ar Benelux +31 172 423000

www.arworld.us

Copyright © 2014 AR. The orange stripe on AR products is Reg. U.S. Pat. & TM. Off.

Satellite communications power measurement using USB power sensors

By Chin Aik Lee, Application Specialist, Agilent Technologies Inc

Introduction

Imagine if we wanted to communicate between two different places that are far away from each other; how can we achieve that communication? The two different locations could use a satellite as the relay station for their communication. Communication satellites are microwave repeater stations in space that are used for telecommunication, broadcasting and data communication. Telecommunication services include telephone calls and services provided by wireless, mobile and cellular network providers. Broadcasting services include radio and television delivered directly to consumer and mobile broadcasting services. Data communication involves the transfer of data from one point to another, such as Internet services. This article aims to provide readers with a general understanding of the power measurement requirements for satellite communication and how USB power sensors are ideal power measurement solutions for satellite application.

How do Satellites Work?

A satellite communication system can be divided into two main components: the ground segment, which consists of the ground station (also known as the earth station), and a space segment, which consists of the space station or satellite. Communication between the ground station and space station requires a communication-circuit design and communication schemes to transmit/receive the signal between ground station and space stations.

The ground station transmits a signal to the satellite, where the uplink frequency is the frequency at which the ground station communicates with the satellite. The satellite receives the signal and broadcasts it to other places on the earth. The satellite is an independent system floating in space. It provides its own power supply, maintains its altitude, and is able to withstand the harsh environment of space. The main components of a satellite consist of antennas, transponders (transmit and receive signal) and a power system which includes

solar panels to generate electricity. Satellite transponders convert the signal and send it down to another ground station, and this frequency is called as downlink. Some ground stations have the capability to transmit and receive the signals. Generally, satellite communications use a very high frequency range of 1 to 50 GHz (gigahertz) to transmit and receive the signals.

Figure 2 shows a diagram of a typical satellite communication system. A

transmit station is a combination of an up-converter mixer, local oscillator, power control and driver, and a high-power amplifier with output detector. The high-power amplifier is usually a travelling wave tube amplifier (TWT), which amplifies the signal to be fed into a transmitting antenna for broadcast as the uplink carrier signal. On the other hand, receive stations are composed of a low noise amplifier (LNA), local oscillator and mixer, which can be integrated

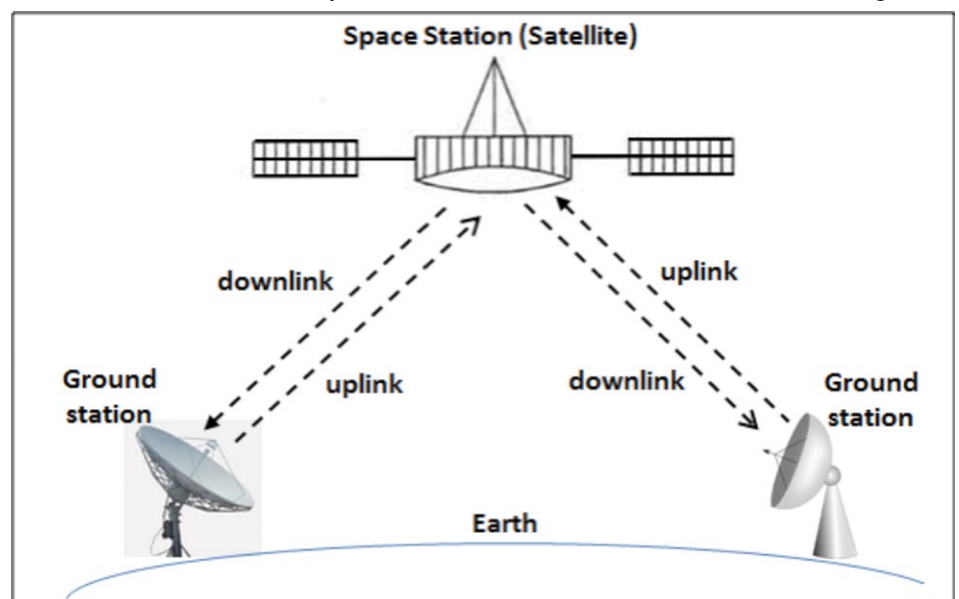


Figure 1: Typical satellite communication system between ground stations and a satellite.

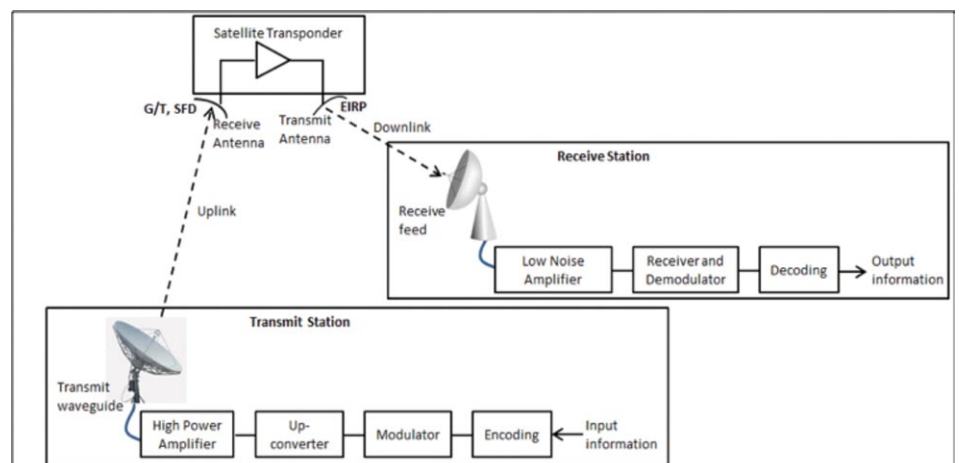


Figure 2: Diagram of a typical satellite communication system.

Redefining Automated Test

with open software and modular hardware



How we interact with devices is changing. As the world becomes more software oriented, what we can accomplish increases exponentially. This shift should apply to our test equipment, too. Unlike traditional instruments with predefined functionality, the NI automated test platform provides the latest technologies to build complex systems while reducing development time and cost.

Through an intuitive graphical programming approach, NI LabVIEW reduces test development time and provides a single environment that simplifies hardware integration and reduces execution time.



>> Accelerate your productivity at ni.com/automated-test-platform

Follow us on   Search **National Instruments** or **LabVIEW**

Austria 43 662 457990 0 • Belgium 32 (0) 2 757 0020 • Czech Republic, Slovakia 420 224 235 774 • Denmark 45 45 76 26 00
Finland 358 (0) 9 725 72511 • France 33 (0) 8 20 20 0414 • Germany 49 89 7413130 • Hungary 36 23 448 900 • Ireland 353 (0) 1867 4374
Israel 972 3 6393737 • Italy 39 02 41309277 Netherlands 31 (0) 348 433 466 • Norway 47 (0) 66 90 76 60 • Poland 48 22 328 90 10
Portugal 351 210 311 210 • Russia 7 495 783 6851 • Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Macedonia 386 3 425 42 00
Spain 34 (91) 640 0085 • Sweden 46 (0) 8 587 895 00 • Switzerland 41 56 2005151 • UK 44 (0) 1635 517300

©2014 National Instruments. All rights reserved. LabVIEW, National Instruments, NI and ni.com are trademarks of National Instruments.
Other product and company names listed are trademarks or trade names of their respective companies. 14594



into a single module known as an LNB (low noise block down-converter), and is typically mounted directly at the antenna feed to minimize noise.

The uplink provides the satellite with signals to retransmit into the downlink. Like the downlink, the uplink typically has a coverage “footprint”. The receive footprint is specified with two parameters - the gain to noise temperature ratio (G/T), which is also called the receive figure of merit, and the Saturation Flux Density (SFD). G/T and SFD are the information used to determine the size of the uplink antenna and ground (uplink) transmits power. A satellite's EIRP determines the size of the receiving dish, while the satellite's receive G/T and SFD determine the transmitting earth station's uplink power.

In this article, we will focus on effective isotropic radiated power (EIRP) measurement in following section.

Satellite power measurement – effective isotropic radiated power

The most important technical characteristic of a satellite application is the transmit power for downlink into the coverage area. EIRP represents the strength of a signal leaving the satellite antenna or the transmitting earth station antenna, and is used to determine the overall quality of the link between the satellite and the earth station, as well as the size (and hence cost) of receiving dishes. The higher the EIRP in the direction of the receiving dish, the better the quality of the link, meaning smaller receiving dishes can be used. EIRP is measured in decibels relative to one watt (dBW), and is expressed by the product of the transponder output power and the gain of the satellite transmit antenna.

To measure the EIRP, a conventional power meter or USB power sensor is required. Figure 3 shows the typical setup using a USB power sensor together with a transmitter and antenna to measure the EIRP. USB power sensors measure small amounts of power transmitted from the transmitter when the coupler is fitted in between. The coupler in this case will attenuate 30 dB, a small part of power before passing through the antenna. The USB power sensor will then read 30 dB lower and so by adding the 30 dB onto the USB power sensor reading, the forward power into the antenna is measured as 45 dBm. The antenna has a gain of 20 dBi and so the EIRP of this system is simply $45 + 20 = 65$ dBm.

$$\text{EIRP} = \text{Transmitter Output Power (dB)} + \text{Antenna Gain (dB)}$$

EIRP is a comparative measurement, which is used to compare every antenna to one single reference, the isotropic antenna. The measurement is calculated by adding the antenna gain and forward power, minus any loss.

$$\text{EIRP} = \text{Forward Power (dB)} + \text{Antenna Gain (dB)} - \text{Losses (dB)}$$

USB power sensor solution

Satellite application engineers need to assess EIRP performance on the antenna transmit and receive signal quality. Communication satellite operations are monitored from a control room and if a problem occurs, technicians can

attempt repairs. Measuring and monitoring the signal in satellite communication systems is complex and it requires extremely accuracy and reliability test equipment. To address such challenges, using USB power sensors is an ideal power measurement solution for measuring EIRP on the antenna transmit and receive power at the ground station.

The following sections describe the major satellite applications where obtaining power measurement is required.

Long distance power measurement

For long distance applications where power measurements must be made from an outdoor ground station antenna, where access is difficult or inconvenient, USB power sensors are an ideal solution

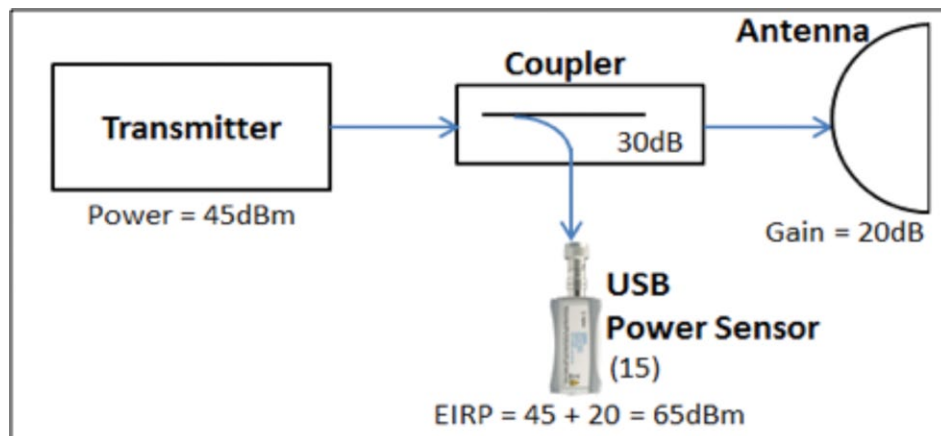


Figure 3: Diagram showing the EIRP measurement using a USB power sensor, transmitter, coupler and an antenna.

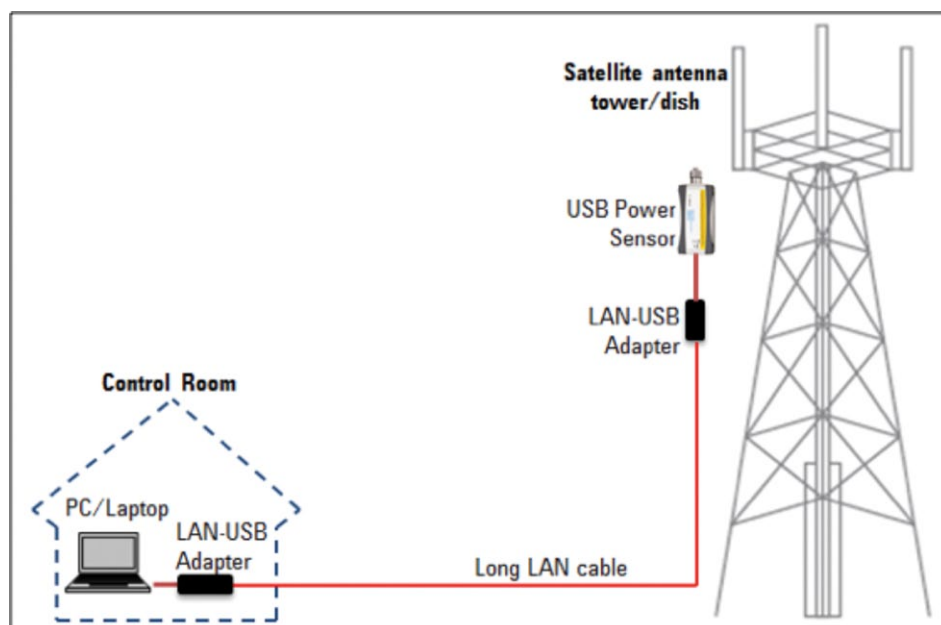


Figure 4: Single-channel EIRP power measurement with a USB power sensor and LAN-USB extender, used to extend the measurement distance for ground station antenna application.

because they operate without the need for a separate power meter. However, The IEEE specified limitation of USB cable lengths, which are restricted to five meters (16 feet), would be an obstacle for long-distance power measurement.

To overcome this, a LAN-USB extender allows the USB protocol to be transmitted via a LAN cable for single-channel power measurement (Figure 4). The extender consists of a transmitter and a receiver that are interconnected by the LAN cable, which allows data to be transferred at distances of up to 100 meters. These extenders are plug-and-play and work efficiently with all major operating systems. This solution is cost-effective and easy to implement.

Multi-channel power measurement

A given ground station may operate several channels where each channel uses a specific set of frequencies: one for the uplink and one for the downlink. Depending on the communication technique, each channel can simultaneously process communications from one or several active handsets. In this situation, multi-channel power measurements must be made simultaneously to verify the transmit/receive power of each channel. Multiple USB power sensors can be connected to a networked USB hub, which is then installed at the ground station and networked to the control room (Figure 5). A networked 5-port USB hub allows multi-channel power measurements to be taken simultaneously when multiple USB power sensors are connected to the networked hub. The networked 5-port USB hub uses USB over an IP connection (LAN). Users can remotely control the setup from a PC or laptop via LAN from the control room.

Continuous monitoring of power transmitted/received at ground station

As ground stations operate 24/7 under extreme conditions, continuous monitor of the transmitted/received power is critical. Remote control of USB power sensors requires a Window software application, such as the Agilent N1918A power analysis software, to record the power measurement over time, and to retrieve the data for power measurement analysis.

Conclusion

Satellite communication plays an important role our daily lives and is responsible for telecommunication transmissions and receptions of signal. EIRP measurement is one of the important

technical characteristic of satellite communication, and it determines the overall quality of the link between the satellite and the earth as well as the size and cost of receiving dishes. When setting up a satellite communication systems, engineers must balance having sufficient power in the satellite signal with keeping the system cost, size and weight to levels that make set up practical. USB power sensors are ideal solutions used to facilitate direct measurement of transmitted/received power levels in a satellite communication system, and need to be highly accurate and reliable to access EIRP performance. Agilent, with its 50-year history of producing high

quality power measurement tools, offers a wide variety of power measurement equipment that is ideal for accurate and reliable satellite applications.

For more details about Agilent recommended power measurement solutions for satellite testing, read the related application note, "Long-Term, Remote Monitoring of Satellite Performance," at the Power Measurement Hints and Tips page — www.agilent.com/find/rfpowertips.

The author, Chin Aik Lee is an Application Specialist at Agilent Technologies Inc.
chin-aik_lee@agilent.com

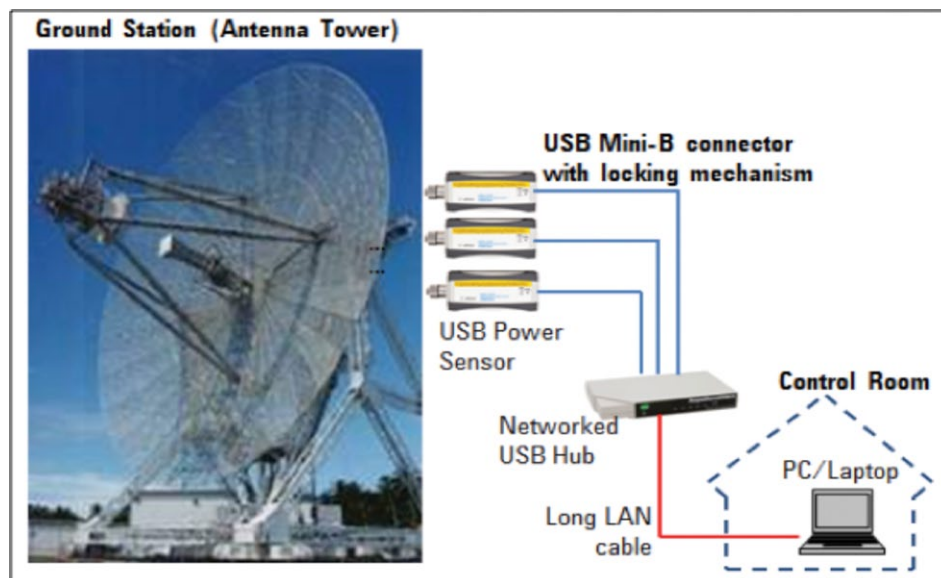


Figure 5: Multi-channel power measurements via a networked USB hub for simultaneous antenna EIRP power measurement.

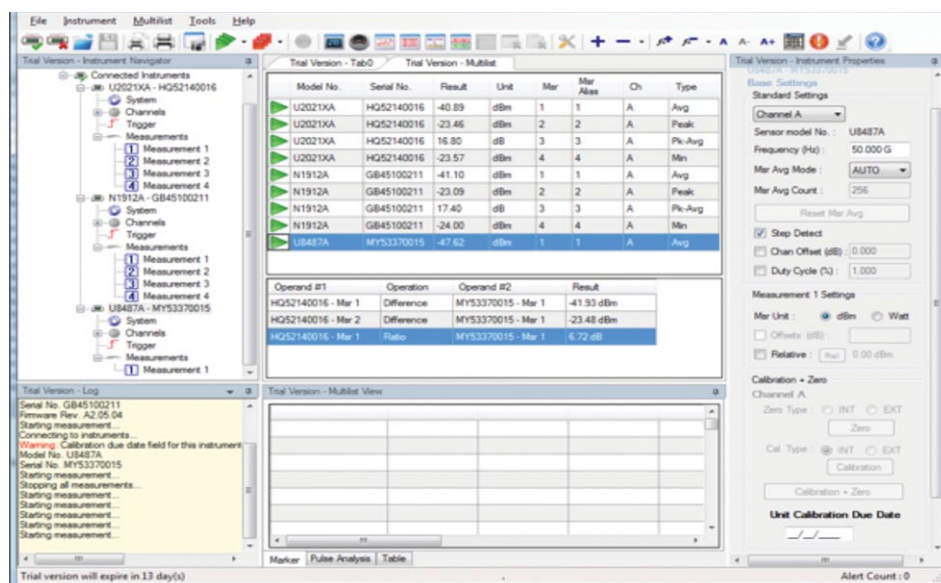


Figure 6: Multi-list display format of Agilent N1918A power analysis manager, which is capable of supporting more than 20 USB power sensors simultaneously for data recording

Interference in a crowded RF spectrum: why it occurs, and what to do about it

By Eder Eiras and Mathias Hofer, Anritsu

As the number of wireless services has grown in recent years, so interference, once uncommon, has become a regular headache for wireless and broadcast service providers. 'Interference' is in fact a catch-all term for a variety of phenomena that disrupt or even disable transmission and reception of wide-area wireless communications. It's therefore not in itself a useful term: it does not help network engineers and wireless equipment developers to troubleshoot and repair a specific problem that is compromising a system, or to design equipment that is immune to the effects of this problem. This article sets out to pick apart the concept of interference as it applies to cellular networks and broadcast television transmissions, and to show how the correct representation and diagnosis of the common causes of interference make it easier to fix.

Self-disturbance in cellular networks

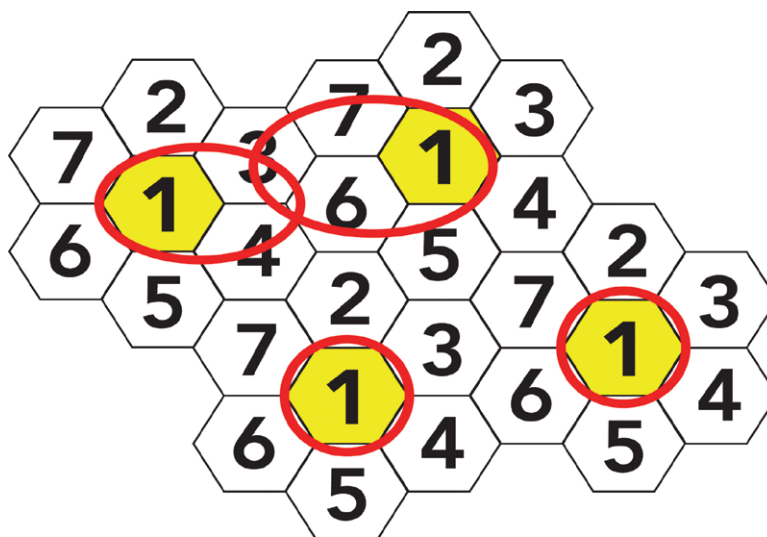
Interference problems in European cellular networks have in part been the unwitting result of government restrictions. Environmental legislation has had the effect of limiting the availability of new base station sites. To increase network capacity, service providers have therefore had to increase the density of antennas on existing cell towers. Of course, this in itself increases the potential for one network to interfere with another.

Often, however, the interference is the result of a cellular network disturbing itself. One example is co-channel interference (CCI), which can occur in GSM and FDD-LTE networks. Normally, network operators allocate different frequency bands (250kHz for GSM, up to 20 MHz for LTE) to neighbouring cells. The goal of the network planning process is to ensure that signals from two cells using the same frequency band do not share the same air space. In their planning, service providers take account of the geography of the cell location. For instance, transmissions from a base station at the top of a hill can radiate further than those from a base station in a valley.

CCI arises when a base station radiates further than was expected by the network planner. This can sometimes happen in particular weather conditions: for example, humidity helps electromagnetic waves to travel further. This means that fog extends a base station's coverage, and can thus cause transmissions

to reach the coverage area of another, distant site with the same frequency allocation (see figure 1).

CCI as a cause of network problems can be discovered by correlating the pattern of network disturbance events with weather patterns, and by the use of a direction-finding measurement



Cellular Coverage Pattern of frequency No.1

Fig. 1: Co-channel interference occurs when transmissions radiate further than expected.

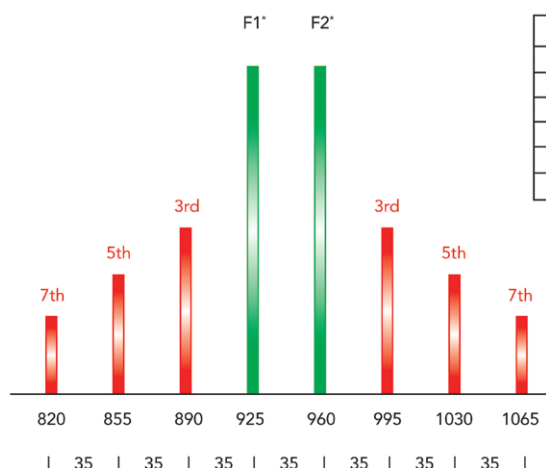


Figure 2: The incidence of intermodulation products of two carrier signals.

EU bands	Rx	Tx
800 (20)	832 to 862	791 to 821
900 (R/T)	870 to 880	915 to 925
900 (8)	880 to 915	925 to 960
1800 (3)	1710 to 1785	1805 to 1880
2100 (1)	1920 to 1980	2110 to 2170
2600 (7)	2500 to 2570	2620 to 2690

instrument. For instance, the MA2700A Interference Hunter from Anritsu includes a GPS location device and electronic compass. Connected to an Anritsu spectrum analyser and a directional antenna, it enables a network engineer to find the location of any interferer by triangulation.

Rust as a source of interference

A different cause of self-disturbance is Passive Intermodulation (PIM). It is caused when two or more strong RF signals combine in a non-linear device, such as a transistor or diode. In fact, the crystals found in corrosion or rust on an antenna or cable connector can cause PIM. Even corrosion outside the intended radio signal chain can cause interference: a rusty fence, rusty bolts, corroded rooftop air conditioners or even a rusty barn roof in proximity to the base station are a hazard. Of course, it's also possible that loose connectors in an antenna feed line or poorly configured transmitters can cause PIM.

PIM frequencies are predictable. If you have two signals at frequencies F1 and F2, the third-, fifth- and seventh-order intermodulation products will be found equally spaced above and below the two signals (see figure 2).

So for instance, if a base station transmits two signals at 925 MHz and 960 MHz (the extremities of the EGSM band), intermodulation products will be found at 890 MHz, 855 MHz and 820 MHz. The problem here is that the 890MHz intermodulation signal is in the middle of the EGSM receiving band (880-915 MHz), so the intermodulation product will therefore interfere with valid incoming signals that the base station is trying to receive.

For LTE, most European operators have allocated a single, wideband channel (of up to 20 MHz). Even here, though, PIM – which requires two strong signals – can occur. This is because the channel includes sub-carriers in the OFDM modulation scheme that LTE uses. So if the infrastructure is liable to cause PIM, all the sub-carriers will intermodulate with each other and so disturb the receiver (see figure 3).

Interference is not only caused internally: external interference also affects cellular networks. The biggest such source is jammers installed for the specific purpose of blocking mobile phone transmissions. These devices, which can be readily bought online for less than €300, are used by places of worship and cinemas to prevent mobile phones from causing disturbance, and by universities to stop students using mobile phones to find information during examinations.

In fact, usage of jammers is strictly forbidden in Europe: this is mainly to ensure that emergency services (available by dialing 112 in the European Union) can be reached at any time from any place. But a secondary problem is that users of jammers cannot control their coverage, and this means they frequently block mobile phone reception close to, as well as inside, the buildings that host them.

Interference in broadcast networks

Cellular network operation is also responsible for instances of interference with reception of television broadcasts. The problem arises from the way that analogue TV spectrum has been released for mobile phone usage.

Initially, the plan was to allocate the freed spectrum for digital video broadcast. In fact, DVB-T broadcasting needs less spectrum than analogue TV, so a portion of the spectrum in the 800 MHz band remained free. In Europe, the European Commission is set to release it for LTE transmissions. Unfortunately, this new wideband cellular standard adjacent to digital broadcast spectrum increases the chances of interference, as DVB-T

pico[®]
Technology

PicoScope: THE NEW FACE OF SAMPLING OSCILLOSCOPES



20 GHz bandwidth

- 17.5 ps rise time
- 40 ps differential TDR / TDT
- 11.3 Gb/s clock recovery
- Industry's fastest 1 MS/s capture rate
- Optical input 9 GHz typical

Integral signal generator: Pulse, PRBS NRZ/RZ,
500 MHz clock, Eye diagram, eye line,
histograms and mask testing

YES REALLY

From only \$14,995

www.picotech.com/RF951

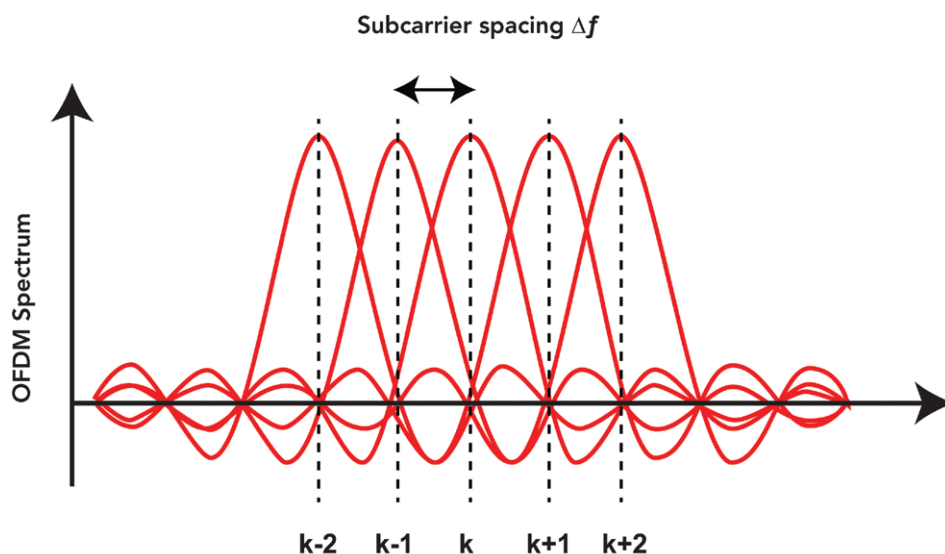


Figure 3: Sub-carriers in LTE transmissions can generate intermodulation products.

receivers and antennas are designed to receive signals in the 800 MHz band, including the part now reserved for use by LTE transmissions.

This means that a strong LTE signal broadcast can interact or even overlap with a DVB-T signal, with effects that can range from barely noticeable video and/or audio errors, to freezing of the video signal, up to complete loss of service.

The interference can come from both LTE network base stations and user equipment. The more common source is user equipment, even though its transmissions are much weaker than a base station's. This is because the base station is usually far from a DVB-T receiver (a set-top box), while a user's mobile phone can be very close – in the worst case, the user might even put it on top of a set-top box.

This source of interference can be particularly hard to find, since a mobile handset or dongle only broadcasts intermittently, when linked with a base station during a voice call or data session.

800 MHz LTE transmissions can also interfere with digital cable TV (DVB-C)

reception if the receiver, or the cables connecting to the receiver, are improperly shielded. This can impair not only TV reception, but also telephone and internet service carried on the same cable.

A number of techniques are used today to try to prevent interference with TV broadcasts, with varying levels of success. One of the most common is to install a low-pass/band-pass filter between the antenna and the receiver; if this helps DVB-T interference, however, it will not fix DVB-C problems.

Unfortunately, commercially available and affordable filters that block 800MHz LTE transmissions also attenuate the DVB-T channels that are close to the LTE bands. While this is not a problem in locations with a good DVB-T signal, it can actually disrupt the service for a location with a weak DVB-T signal.

Effective methods for dealing with interference

The first requirement in dealing with interference problems is to locate and identify the source of the interference, whether it be CCI, PIM, a jammer, or (in

the case of digital video broadcast) LTE transmissions. Many types of RF test instrument can potentially be used for this. Dedicated interference detection equipment, however, will save the user a great deal of time, because of the precision with which it locates and analyses the source of interference.

For PIM problems, the Anritsu MW8219A PIM Master is ideal: it can generate two tones of up to 40 W into the transmission system, and measure precisely the occurrences of passive intermodulation. Its 'Distance to PIM' feature lets the user exactly locate the source of the interference. The MA2700A Interference Hunter is equally helpful for other kinds of interference.

Once located, the interference can normally be eliminated easily. In the case of DVB-C broadcasts, filtering is ineffective because the technology uses overlapping frequency bands. The correct approach here is to specify the receiver, cables, modem and other components with high resistance to interferers.

As for DVB-T, it can be helpful to replace an omni-directional antenna with a uni-directional antenna (the smaller the beam width, the better). This is not a guaranteed fix: it will make no difference if the LTE base station is located in the same direction as the DVB-T transmitter.

And in general, the best cure for interference is prevention: using excellent components and installing them properly eliminates almost all risk of interference. But since no real-world operation is ever perfect, it is useful to know that precise and accurate instruments are available that will quickly find the source of an interference problem when it occurs.

Eder Eiras is Business Development Manager at Anritsu, while Mathias Hofer is Regional Account Manager.
www.anritsu.com

BMW updates navigation data via mobile radio

Carmaker BMW has announced online updates for road maps stored in the automotive navigation system. The move could be a step towards software updates over the air.

Market watchers like Machina Research already rank BMW as the top vendor in terms of connectivity. Now the Bavarian carmaker goes one step

further and enables the navigation system embedded (Professional version) in BMW's Connected Drive concept to automatically keep street maps current. While most navigation system vendors offer an update once or twice a year, BMW downloads the data as often as required, and entirely without the driver being involved. To enable this functionality, a backend

server establishes a data connection through the 3G or 4G modem installed in the vehicle.

The map download is not the only automatic data update for information stored in the navigation system; a head unit app available later this year will poll the fuel price from the filling stations in the surrounding area.

Broadband lens may lead to antenna dishes that are flat or conform to any surface

By depositing an array of tiny, metallic, U-shaped structures onto a dielectric material, a team of researchers in China has created a new artificial surface that can bend and focus electromagnetic waves the same way an antenna does.

This breakthrough, which the team is calling the first broadband transformation optics metasurface lens, may lead to the creation of new types of antennas that are flat, ultra low-profile or conformal to the shape of curved surfaces.

The lens, described in AIP Publishing's journal Applied Physics Letters, was fabricated by Tie Jun Cui and colleagues at Southeast University in Nanjing, China and is an example of a metasurface or metamaterial an artificial material engineered in the lab that has properties not found in nature. In this case, by coating

the surface with the tiny U-shaped elements, it acquires properties that mimic something known as a Luneburg lens.

First discovered in the 1940s Luneburg lenses are traditionally spherical optics that interact with light in an unusual way. Most lenses are made of a single material like plastic or glass that bends light passing through in a consistent, characteristic way a key characteristic of the material, which is called its "index of refraction." Some materials, like glass, have a higher index of refraction and bend light more than other materials such as quartz.

A Luneburg lens has the unusual property of bending light more or less depending on where the light strikes the lens. This is because in a Luneburg lens, the index of refraction varies across

the spherical lens body, making it very different than a normal lens. Luneburg lenses can focus light or incoming electromagnetic waves to an off-axis point at the edge of the lens (not directly in front or behind it as a normal lens would do). Or they can uniformly channel electromagnetic waves emanating from a nearby point source and radiate them in a single direction something no spherical lens can do.

Because of their properties, Luneburg lenses find a variety of applications as radar reflectors and microwave antennae. However, the spherical shape of a typical Luneburg lens is inconvenient in some applications, Cui said, which is why he and his colleagues used inhomogeneous artificial structures to create a flat surface that acts like a Luneburg lens.

RF Solutions from JFW Industries



**Test Systems
Terminations
Variable Attenuators
Power Dividers**

**Programmable Attenuators
Fixed Attenuators
RF Switches
RF Test Accessories**

JFW Industries

Call 317-887-1340 Toll Free 877-887-4JFW (4539)
E-mail sales@jfwindustries.com Visit www.jfwindustries.com

Trends in the smart card payment industry — chip innovations drive new applications and services

By Björn Scharfen, Infineon Technologies

To an ever increasing extent, modern society is benefiting from the use of connected mobile devices and chip-based smart cards for cashless payment applications, an increasing proportion of which are contactless. However, even these devices are becoming more and more vulnerable to security attacks, and require hardware-based security chips working hand in hand with software and system security features to provide state-of-the-art barriers against unauthorized access and misuse. Regional markets differ in their requirements with respect to applications and technologies, so high-performance, innovative chip solutions are key drivers for the continuously growing and very dynamic payment market. And, independent of the form used for payment, be it a smart card or a mobile phone, the protection of the customer's credentials against manipulation and fraud is key to any successful implementation.

The payment chip-card market shows a clear trend towards contactless and converging applications. Contactless payment can be performed with smart cards as well as with mobile devices. In particular, the demand for Dual Interface (DIF) payment cards is growing. These cards are equipped with a contact-based interface to support traditional payment transactions, but at the same time they offer a contactless interface to perform access, transport or micropayment roles.

This convergence of services will result in an increasing demand for multi-application cards. These could, for instance, be credit/debit cards that support additional applications, thus giving the issuer of the card – the bank or credit-card institute – an edge in a highly competitive market.

While DIF cards will clearly dominate the market in the near future, the parallel demand for hardware-based security solutions for mobile payment is steadily growing. Though offering similar combinations of applications to smart cards, mobile payment is experienced differently by users. Implementations include remote payment, like ordering goods or services in the Internet, as on a desktop com-

puter; proximity payment with an NFC-enabled device, equivalent to a contactless card transaction; or using a mobile device as card reader. Even though these payment services are offered by market players such as mobile network operators, smart-phone manufacturers or service providers, they also require hardware-based security chips in various forms to protect customer credentials. Typical forms of secure elements might be SIM, μ -SD cards or embedded Secure Elements integrated into smart phones or tablets.

High market potential for smart cards

Consequently, the industry is facing a high market demand for chip-card-based payment applications. Worldwide, payment cards are being migrated to more secure chip-based solutions, with a strong growth in DIF products. The major driver is the liability shift for banks according to the regulations of EMV (Europay MasterCard VISA). Today, only some 40% of the payment cards in circulation are chip-based. The secure-microcontroller payment market is expected to grow at a CAGR of +19.5% from 2013 to 2017 in terms of volume (IHS 2013). In 2017 DIF solutions will dominate the market.

Two major trends figure prominently in national banking schemes. In their quest to combat fraud and to improve system security, more banks worldwide are turning towards DDA (Dynamic Data Authentication) technology based on asymmetric encryption.

As a second trend, many banks are gearing up to issue contactless and dual-interface payment cards to provide greater convenience and added-value features for their customers, where multiple applications and mobile payment are the key drivers.

Security and convenience

The payment market is diversified, with a wide range of local systems and infrastructures, but there are some common criteria to ensure adequate security and

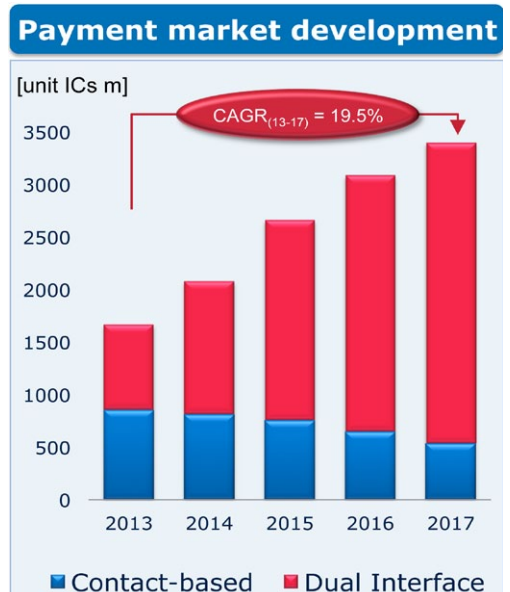


Figure 1: Worldwide, payment cards are migrating to chip-based solutions with strong Dual Interface growth (Source: IHS, "Payment and Banking Cards-World-2013", August 2013).

convenience for the end customer:

- Security certifications, such as EMVCo approval;
- Superior performance for fast transactions and support of multiple applications;
- Low power consumption for contactless application;
- Support of global infrastructure implementations.

Infineon helps the value chain to develop better, more secure products without compromising the cost factor. Infineon supports payment providers on a worldwide basis, and is active in all relevant standardization bodies and security authorities.

Infineon's payment portfolio ranges from chip card ICs for low-end EMV SDA to high-end-security devices targeting EMV DDA, CDA or open-platform applications. The payment portfolio will continuously be enhanced and diversified across all regions, independent of the form used.

But not only chip performance and security are essential for chip card products; time-to-market is also becoming more important.

Faster time-to-market with SOLID FLASH products

Infineon equips all new security controllers with its SOLID FLASH technology. There are numerous advantages from using this flexible, secure, robust memory, so ROM (Read-only Memory)-based products for payment will be successively phased out, as SIM card controllers or automotive products were years ago.

Whereas ROM products require several efforts with to apply a new code, this can be done immediately with SOLID FLASH products. This reduces the development and delivery times by months, and speeds up the time-to-market compared to traditional, inflexible ROM devices without compromising on security or reliability. All SOLID FLASH products are certified according to EMVCo and other type approvals, as well as the Common Criteria up to EAL6+(high).

In addition, Flash products allow product customization to be carried out at a later stage in the value chain, so that card manufacturers can decide just before shipment of the card which operating system and application code are to be programmed into the Flash devices, depending on the project and market requirements. This offers significantly higher flexibility compared to ROM mask products, where each project typically requires a specific mask and the total production process down to the semiconductor factory has to be carefully planned.

Contactless performance and fast transaction times

To support the trend towards contactless transactions, the latest SOLID FLASH security controllers from Infineon have outstanding contactless functionality designed into them. Equipped with true 16-bit architecture, they show a performance increase of up to 40 percent in typical contactless applications, compared to 8-bit controllers. Produced in 90nm technology, the SLE 77 and SLE 78 families comprise more efficient instructions and larger register sizes, and provide fast transaction times, e.g. for multi-application cards including transport functionality. This significantly increases the convenience for the end user and the acceptance of the contactless use of payment cards.

Product families

Within one family, the SLE 77 covers SDA and DDA payment applications for both contact-based and contactless/dual-interface projects, as well as transport-market and selected ID applications. It is equipped with the features and cryptographic coprocessors needed for symmetrical and asymmetrical encryption, has up to 240KB of NVM, and is certified according to EMVCo and EAL5+ (high).

The SLE 78 family brings a lot of advantages to the market for projects, where longevity is most in demand. Selected payment projects and the majority of Government ID customers rely on this family, which incorporates unique functions and mechanisms based on the award-winning Integrity Guard technology. Thanks to Integrity

Guard, the security controllers are able to monitor the entire data path continuously by means of comprehensive error detection. This is suitable for high-end applications in which the stored data require an especially high level of protection such as e-signature applications, in which electronic certificates are to be securely stored on chip. The SLE 78 security controllers have two CPUs, making error detection possible even during data processing. The SLE 78 family is certified according to EMVCo and CC EAL6+ (high).

Intelligent packaging to ease DIF card production

'Coil on Module' (CoM) is an innovative chip package technology for DIF debit or credit cards. It is based on an inductive coupling technology, as opposed to the

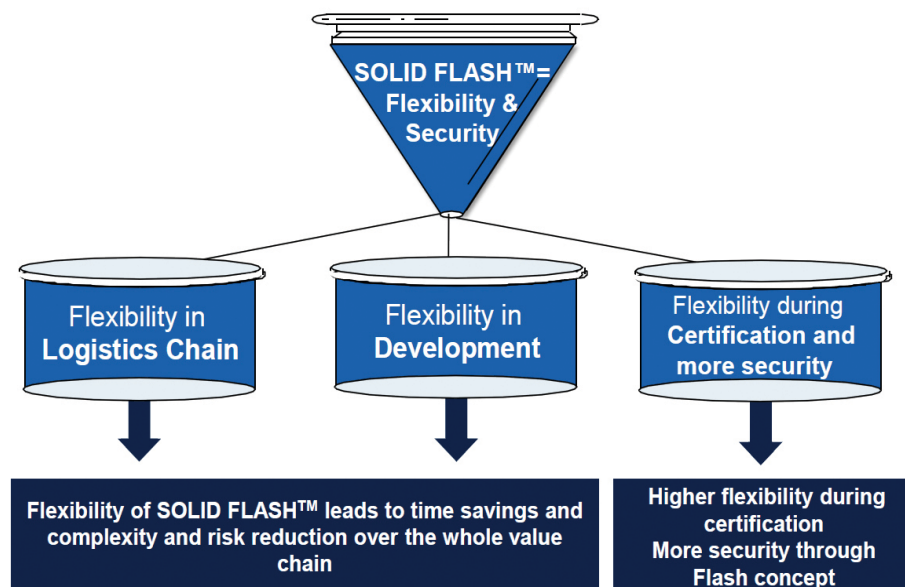


Figure 2: Mobile payment solutions require security chips (e.g., Secure Elements) in different forms.

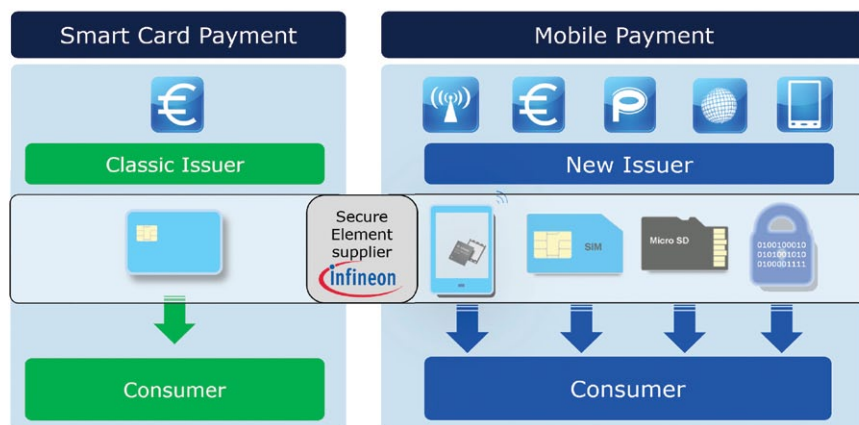


Figure 3: SOLID FLASH concept enables faster time-to-market with flexible, secure, fast mask technology.

Smart Card Payments

usual mechanical-electrical connection between the card antenna and the chip. The major advantage of CoM is that the DIF chip cards can be produced on existing contact-based equipment, which helps especially smaller customers around the world to start ramping up to DIF cards without major investments.

Moreover, CoM improves the robustness of the payment card in the field, and simplifies the design options for the card and the inlays, while card manufacturing becomes more efficient and faster than with conventional technologies. It also reduces the thickness of the card for cosmetic reasons. Consequently, it saves costs throughout the entire process. This package innovation will make it easier to supply DIF cards, thus further accelerating the introduction of payment solutions supporting contactless functionality while saving costs along the value chain.

Open standards

Open standards are a prerequisite for mass deployment and the introduction of multi-application cards. CIPURSE is a truly open security standard intended to overcome existing monopolistic solutions for transport authorities, banks and governmental solutions. It is optimized for secure contactless applications, and will drive the growth of multi-application technology.

It is expected that ticketing programs for public transport – that is, combined with payment functions – will act as a major growth driver for contactless multi-application cards, because the infrastructure (readers, gates) is already installed, and users benefit from the increased convenience compared to contact-based transactions. But there is both a technological challenge with respect to performance, speed and security of existing systems and a financial challenge for transport authorities, once investment in a new infrastructure becomes necessary. There is a clear advantage in standardized and open transport schemes, because only they allow sustainable investment for transport agencies.

CIPURSE has been developed by an industry consortium, and offers state-of-the-art security features (AES128 encryption) and fully flexible implementation from low-end to high-end solutions. It is not surprising that it has been adopted by many companies and, in a very short time frame, has evolved from a pure transport scheme towards a multi-application (transport,

ID, micropayment, access, loyalty) implementation. The chance to develop interoperable, certified products that work across different systems and even cross borders makes open standards very attractive for the industry. Another advantage is that there are multiple vendors, which means a choice for the end customer and allows non-discriminatory public tenders.

SOLID FLASH products suit CIPURSE perfectly, as they offer the flexibility needed for the multiple implementations.

Conclusion

The smart card payment industry shows a clear trend towards Dual Interface/contactless solutions and multi-application implementation in Smart Cards and beyond, such as in a mobile payment environment. The rapid increase of chip-based payment cards in more and more diversified applications and offerings does require security solutions that allow products to be custom-made

without compromising time to market or security. Digitalization and increased connectivity will strongly influence the development of the cashless payment market; new market players, various mobile devices and established smart-card solutions will drive convenient contactless applications. Innovations in hardware therefore help the value chain while implementing new services. High-performance security chips with fast transaction times, flexible packaging technologies, support for different forms and open standards are the prerequisites for response to market demand and mass deployment of new solutions.

The author, Björn Scharfen is Marketing Director, Head of Product Marketing & Management, Business Line Secure Mobile & Transaction, at Infineon Technologies.
www.infineon.com

Portfolio highlights	Contact-based SDA	Contact-based DDA/CDA	Contactless and dual-interface
High-performance 16-bit 90nm security controllers	●	●	●
RSA functionality	–	●	●
Optimized for payment applications such as VSDC, M/Chip, PBOC	●	●	●
Optimized for low energy consumption	–	–	●
Ready for multi-application and public transport cards	–	●	●
Fast personalization capabilities	●	●	●
Supporting Type A, B and C (Felica™)	–	–	●
Short lead times thanks to SOLID FLASH™	●	●	●
Optimal fit for our easy-to-use inductive coupling technology (CoM)	–	–	●

Figure 4: High-performance 16-bit controllers like the SLE7x family provide fast transaction times and multi-application support with increased user convenience.

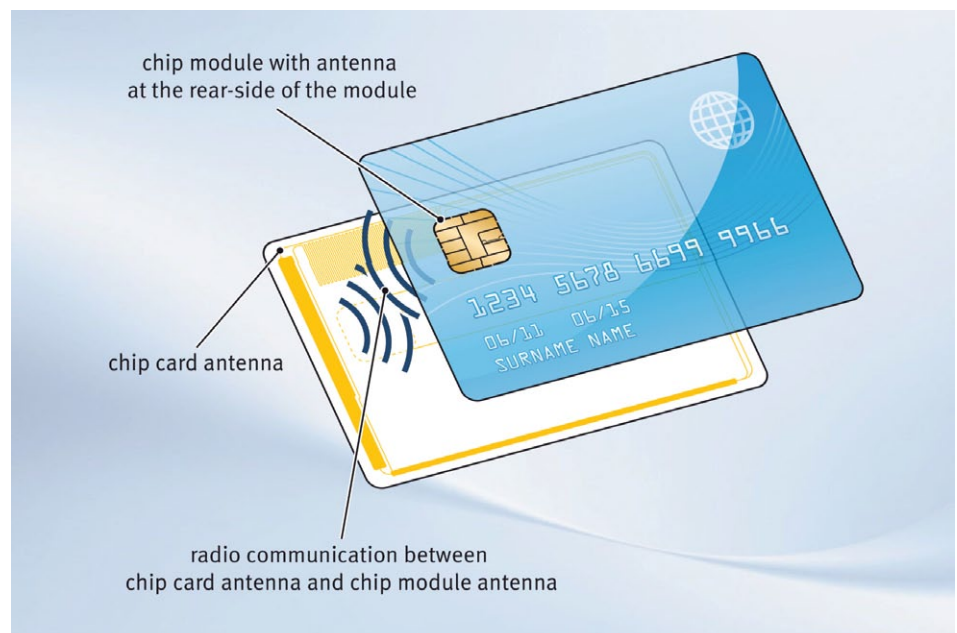


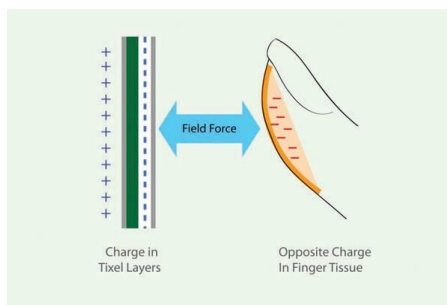
Figure 5: Coil-on-Module design employing inductive coupling allows cost-effective manufacturing of robust DIF cards.

Electrostatic touch for smartphones

Senseg Oy (Espoo, Finland), a developer of electrostatically-generated touch feedback for smartphones, has raised \$6 million in a Series B round of funding led by NXP Semiconductors NV. The investment included the participation of existing investors Ambient Sound Investments, and Finnvera Venture Capital. This brings the total raised by Senseg to about \$12 million.

The company said it intends to use the funds to recruit software and Android application developers, particularly those with mobile game development experience, to help bring its initial product to market. No timetable was given although Senseg is already running late with the introduction of its products. Back in 2012 Senseg was predicting its technology would be in volume production late in 2013.

Senseg's technology creates a sensation of touch and texture using an



electrostatic field to stimulate the fingers when they are close to or in contact with a display surface. By modulating this attractive force on the fingers a variety of sensations can be generated, including textured surfaces, edges, vibrations and 'key' movements without any mechanical movement.

Senseg, founded in 2006 by CTO Ville Makinen, is based on Makinen's PH.D research at Helsinki University of Technology, and is led by CEO Paul Costigan.

Costigan is formerly COO with Movidius Ltd. and was previously COO at analog IP developer Chipidea Microelectronica SA and founder and CEO of Massana, a fabless chip company focused on gigabit Ethernet. Senseg's technology has potential in smartphones, tablet computers and many other consumer and industrial applications.

"We have focused our R&D on the smartphone market, which requires smaller chip architectures, and more time to properly develop. We are building out our team with software developers who want to help create a new way to interact with the smartphone through a feel-screen experience," said Costigan, in a statement.

"We are now ready to move forward with this plan to deliver the first production-ready next-generation haptic silicon for the smartphone market," he added.

www.senseg.com

Prototyping 3D Circuitry

Extension of the interconnect pattern into the third dimension adds new potential. The LPKF ProtoLaser 3D for laser direct structuring (LDS) gives engineers an outstanding flexible and economical access to 3D prototypes. Discover for yourself a new dimension: lpkf.com/protolaser3d

LPKF Laser & Electronics AG Phone +49 (0) 5131-7095-0

LPKF
Laser & Electronics

Quadrature hybrid coupler

delivers 30 W, 3 dB for mobile communications



AVX PC series couplers feature a 1 mm profile, low parasitics, and heat dissipation. The series comprises two wideband, 3 dB, 90° hybrid couplers — a 2100 MHz device for 1.5 to 2.1 GHz and a 2700 MHz device for 2.1 to 2.7 GHz.

Based on the company's MLO technology, which enables the integration of high Q passives in low cost, high density interconnect components, PC series power couplers exhibit excellent isolation and high reliability to comply with JEDEC and MIL standards.

Expansion-matched to PCBs and supplied in surface mountable 2025 size land grid array (LGA) packaging, the multifunctional, low profile PC Series couplers also exhibit low parasitics, exceptional heat dissipation, and excellent solderability.

PC Series 3 dB, 90° hybrid couplers are rated for 30 W maximum power handling and operating temperatures spanning -55°C to +85°C. The devices measure 6.35 x 5.08 x 1.0 mm.

www.avx.com

Wideband ADCs

drive applications to direct-RF sampling

Analog Devices has introduced two high speed analogue-to-digital converters at 14-bits and 1 or 2-Gsamples/s, that are ideal for handling wide bandwidth signals, with wide dynamic range, while providing the linearity required for undersampling.

AD9680 is a dual-channel, 1.25-V, 14-bit, 1-Gsample/s A/D converter featuring the best noise and dynamic range performance in its class enabling the trend for direct RF sampling in communications, instrumentation and military/aerospace applications. Its noise density of -154 dBFS/Hz is the lowest in the industry.

Wideband RF data acquisition allows for better signal extraction in congested RF environments, over a wider bandwidth; the device also features four digital down-converters to assist with isolating a specified fraction or subset of the overall bandwidth. The AD9680 is interoperable with FPGAs from major manufacturers and supported with known good configurations, and offers ease of interfacing.

The AD9680, ADI says, allows more degrees of freedom for system designers trading off signal bandwidth, noise and linearity because it can digitise a DC to 2-GHz input signal with an accompanying dynamic range performance that was previously unavailable on the open market. You can increase signal sensitivity and bandwidth data rate, while enabling the use of an advanced reconfigurable data acquisition or radio platform. The A/D converter is available with an evaluation board design environment and reference designs for rapid system prototyping and board-level design and layout.

When converting a 1-GHz input, the converter achieves spurious-free dynamic range (SFDR) performance of 80-dBc and 61.5-dBFS signal-to-noise ratio (SNR) while consuming 1.65 W of total power per channel. Integrated functionality includes digital signal processing blocks and a configurable JESD204B interface, allowing designers to create advanced reconfigurable radio platforms that meet bandwidth and cost requirements across multiple systems. Higher speed grades are scheduled. On-chip features support signal monitoring and threshold detection prior to the signal being passed to an FPGA, speeding reaction and reducing the digital processing load.

Also announced by ADI is the AD9625, which is a 12-bit, 2-Gsample/s A/D converter. The converter's noise spectral density of 149.5 dBFS/Hz, coupled with high-input bandwidth, allow designers to use undersampling system architectures into the 2nd Nyquist zone, saving on a frequency down-conversion stage.

An ADI spokesman confirmed that the 9625 – a single channel part – is not a variant of the 9680, interleaving the two channels of the 9680, but is a completely separate design. It shares features with the 9680, in that it also has additional on-chip functionality for ease-of-use, such as digital-down-conversion to select a subset of the input bandwidth; and the JEDEC JESD204B interfacing capability.

The AD9625's wider input bandwidth enables advanced RF sampling architectures and allows designers to reduce the number of analogue frequency down-con-

version stages and their associated noise and cost contributions. The simplified system architecture eliminates the need to interleave multiple A/D converters to obtain needed performance and allows for development of reconfigurable platforms. It is available with an evaluation board design environment and reference designs to simplify system prototyping and board-level design and layout.

The AD9625 achieves 80-dBc spurious-free dynamic range (SFDR) with a 1-GHz input. ADI claims the AD9625 is the only open-market-available 12-bit, 2-Gsample/s, A/D converter that simplifies the digital interfacing challenge by integrating two digital-down converters (DDC), two numerically controlled oscillators (NCO) and a configurable JESD204B serial link for the output data.

Key applications include ultra-wideband RADAR, wideband front-ends for digital storage oscilloscopes and data acquisition platforms.

www.analog.com

Integrated wireless controller

features low power for IoT applications



A fully integrated wireless controller suitable for remote, battery powered sensor systems, which can offer current consumption as low as 32 μ A is available from LPRS

The low cost, high security easyRadio Integrated Controller (eRIC) offers designers seven power saving modes of operation to ensure maximum battery life of remote sensors. The eRIC transceiver power saving modes provide control of the duty cycle of the receiver so that the 'ON' time can be set to 12.5%, 6.25%, 3.1%, 1.56%, 0.78%, 0.39% & 0.2% with corresponding levels of power saving from its "always on" current of 16 mA. The transmitter may then be independently set to the same duty cycle as the receiver or

longer as required for transfer of data. Up to 250 Byte data-packets are supported throughout all operating modes and up to 500 Kbs over air data rates are available.

The LPRS eRIC module is now available with operating frequencies for world markets and provides secure over-air transmission with the availability of an AES 128 bit data encryption option. Many other advanced features are available as standard including; received signal strength indicator (RSSI), carrier detect and group ID.

The advanced design of this transceiver uses system-on-chip (SOC) technology removing the need for an external processor. The on-board processor memory is partitioned giving half to the easyRadio configurable settings and communication software and leaving the rest available for design engineers to add their own application code. Code can be written using industry standard tools and a quick to learn API (application programming interface). This partitioned memory design will often eliminate the need for any additional microcontroller, saving cost, space and power.

www.lprs.co.uk

Broadband conical monopole antenna



The BCM40 antenna from Heuermann HF-Technik (HHF) is a very low loss conical monopole antenna, manufactured precisely enough to operate at frequencies up to 40 GHz,

offering good matching and an antenna gain of 0 dBi.

This antenna covers all major frequency bands with a broadband frequency band of 1.2 to 40 GHz. The robust casing allows for indoor and outdoor use even in moist conditions.

Modern radio communication utilizes different frequency bands. Common antennas provide acceptable performance only in narrow frequency bands, requiring the user to change antennas when changing the frequency band. For broadband

monitoring purposes, an array of different antennas is thus required.

The BCM40 antenna eliminates the need for different antennas in a frequency band from 1.2 to 40 GHz. The omnidirectional characteristic of the BCM40 allows the controlling of rooms and outdoor areas in a broadband spectrum.

www.hhft.de

Wide frequency universal clocks

Exar Corporation has announced the XR811xx series of universal clocks, which offer a wide range of output frequencies from 10 MHz to 1.5 GHz, with ultra-low phase noise jitter of less than 200 fs. Designed for communications, audio/video and industrial applications, the QFN-10 and TSSOP-8 packaged devices are footprint compatible with industry standard synthesizers, providing a superior performance second source option.

The design the XR811xx synthesizers utilizes a highly flexible delta-sigma modulator and a very wide-ranging VCO in a PLL block that has been optimized to be extremely power efficient. With a core current consumption of just 20 mA, these parts dissipate 60% less power than equivalent competitive devices.

The PLL can operate from either an input system clock or a crystal and incorporates both an integer divider and a high-resolution (<1 Hz) fractional divider for increased flexibility to generate any clock frequency. Additionally, up to four different frequency multiplier settings can be stored allowing for different application configurations providing BOM savings compared to multiple synthesizers.

www.exar.com

Analogue front end for digital radios

The CMX983 from CML Microcircuits is an analogue front end (AFE) IC that bridges the gap between a digital radio's RF section and the DSP/FPGA. Specifically designed to meet the needs of a software designed radio (SDR), the CMX983 performs critical DSP-intensive functions, provides dual-channel



analogue-to-digital and digital-to-analogue conversion, includes two RF fractional-N synthesizers and embeds a host of auxiliary ADCs and DACs for use within the radio system.

The CMX983 is suitable for radio systems employing modulation bandwidths up to 25.8 kHz, and it is particularly suited to satellite communication, high-performance wireless data and professional two-way radio systems. The AFE is highly configurable, supporting numerous sample rates and filtering characteristics.

www.cmlmicro.com

Power dividers cover 1 to 40 GHz

AtlanTecRF has announced a range of 40 GHz coaxial power dividers, designated AKD, that available in a choice of 2, 4 or 8 ways and feature bandwidths starting at 18- to 40 GHz but extending to the full six



In Pursuit of Excellence Through Engineering

INTEGRATED MICROWAVE ASSEMBLIES AND COMPONENTS

INTEGRATED ASSEMBLIES

- Solid State Switch Based Assemblies
- Switch Matrices on a substrate
- Direction Finding and Beam Forming Networks
- Custom Integration and turn Key systems



MIL 883 CAPABLE
ISO9001:2008
REGISTERED

AMERICAN MICROWAVE CORPORATION

PH. 301.662.4700 | FAX 301.662.4938
AMERICANMIC.COM | SALES@AMERICANMIC.COM

plus Octaves of 1.0 to 40.0 GHz. VSWR is better than 2.0:1 in all cases and amplitude balance is less than ± 0.5 dB. Power handling capability is up to 20 W while the operating temperature range is -55 to +85°C making the units rugged enough for harsh environments”.

Geoff Burling, AtlanTecRF CEO said, “This is an amazing range of versatile, yet affordable power splitters in compact packages that can be used in a wide variety of industries”.

Connectors are 2.92 mm female in stainless steel and the housings are aluminium alloys with a paint finish.

www.atlantecrf.com

5 GHz WLAN switch and LNA front end module

TriQuint's TQL1600 is a highly integrated WLAN front-end module designed for 802.11a/n/ac applications. It contains a low noise amplifier (LNA) with bypass mode and a transmit/receive switch. The architecture and interface are optimized for next generation WLAN integration into high throughput 802.11ac devices providing outstanding stable performance across temperature and voltage range.

With a frequency range of 5.15 to 5.875 GHz, the TQL1600 features a fully integrated, T/R SPDT switch and bypass LNA. It features 2.5 dB noise figure, integrated on-chip matching with 50 ohm I/O, integrated temperature compensated active bias, and CMOS compatible logic controls with integrated shutdown control pin. Gain is 13 dB in normal mode and -7 dB in bypass mode. The device operates off a +3 V to +5 V supply.

The TQL1600 is manufactured using TriQuint's high reliability E/D pHEMT technology and is assembled in an ultra thin profile 16 pin 2.5 x 2.5 x 0.45 mm Pb-free, RoHS-compliant QFN package.

www.triquint.com

Radar scenario generator

handles complex simulations

Eastern OptX, a company specializing in sophisticated radar test and simulation equipment, has introduced the Series 1000 radar scenario generator. The instrument enables scenarios that take into account speed of the target through

a variety of Doppler frequency maths and enables programmable radar target creation.



The Series 10000 utilises advanced technologies, including programmable delay lines to 40 GHz, range formula target amplitudes, Doppler radar generation, dynamic multipath, and sophisticated software.

Key features include:

- Dynamic Doppler radar addition is imposed directly onto the radar system's transmit signal;
- Scenario creation is done from the front panel touch screen or via Ethernet remote programming;
- Programmable radar target creation is possible from close in (five feet) to over 200 miles, in steps as small as five feet; and
- Optional software allows entry of scenarios by segment via either latitude/longitude or Google Maps enabling complex flight simulations.

When used as a radar altimeter test set, these programmable features allow for flight path simulations, such as takeoff and landing patterns.

www.eastern-optx.com

Limiter diodes

deliver fast turn-on time and low loss



SemiGen (ISO and ITAR registered) is offering limiter diodes that feature fast turn-on time, low loss, low capacitance

and resistance, and easy bonding.

The company's RF Supply Center provides high-quality limiter diodes that can be supplied in chip form or in a choice of packages. These diodes are proprietary designs that are fabricated in the United States using qualified process partners.

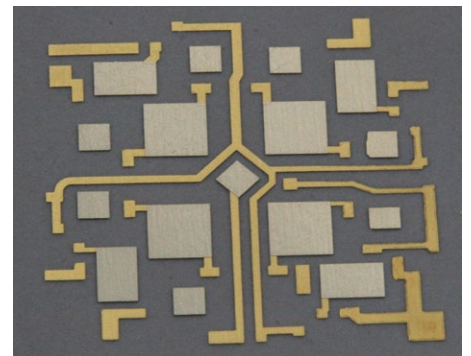
The SemiGen SLP7100 series of limiter diodes is processed with a high-resistivity epi that has thin, intrinsic layers. These devices are typically in the 2 to 20 micron range of epi thickness and can be gold-doped to achieve specific performance goals. They are used in passive or active limiter designs in the 100 MHz to 30 GHz frequency ranges.

Ideal applications for these diodes are waveguide, stripline, coax, or microstrip, in single- or multi-chip devices, depending on power handling and performance goals.

www.semigen.net

Cost-effective gold tin plating technique

for high frequency circuit board interconnect



Remtec has adapted its gold-tin plating technology on metallized ceramics to include a newly developed technique of selectively applying AuSn deposits for interconnecting RF and microwave electronic components, lead frames and other miniature parts on high frequency PC boards.

The proprietary new process replaces the commonly used, labor intensive method of placing and fastening gold tin solder performs on organic boards. Remtec widely applied the same process to ceramic substrates, metals and metal alloys such as Kovar or Copper Tungsten.

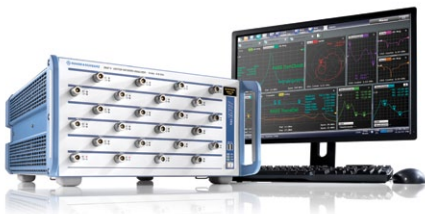
Recent material advances with ceramic loaded organic boards (RO3000™ laminates and others) that can withstand processing temperatures in excess of 300°C made gold tin application a pos-

sibility much like ceramic circuits, metal and metal alloy sheets. The use of the company's time-proven gold tin plating capabilities to selectively apply solder on board materials makes electronic assembly significantly less costly and often serves as an enabling solution for assembly of tiny parts and components on "hard to get" places on circuit boards.

The company's latest process provides final products in multiple-image panels selectively gold tin plated on one or both sides ready for circuit etching and automatic assembly. Otherwise, parts can be etched and supplied in individual circuits. This method permits higher circuit density and lower cost assembly operations and aims to meet the continuing growing demands for miniaturization and higher performance required in today's high density electronic applications.

www.remtec.com

VNA delivers up to 24 integrated test ports



Rohde & Schwarz has released the first network analyser with up to 24 integrated test ports: the ZNBT. The instrument allows users to characterise devices under test with multiple test ports and enables production lines to maintain high throughput by measuring multiple DUTs in parallel.

The ZNBT offers the high RF performance of a two-port network analyser at each of its test ports; it covers the frequency range from 9 kHz to 8.5 GHz, and the base model is equipped with four test ports. Depending on application requirements, the analyser can be enhanced to include 24 ports. The ZNBT is primarily used in the development and production of active and passive multiport components such as front-end modules for multiband mobile phones.

When fitted with its maximum number of test ports, the ZNBT is capable of determining all 576 S-parameters of a 24-port DUT. It requires no switching, and therefore carries out multiport measurements faster than switch matrix-based

multiport systems. For example, the ZNBT can cover all 576 S-parameters at 201 frequency points in less than 260 ms. That is 10 times faster than the ZNB and ZN-Z84 switch matrix solution from Rohde & Schwarz, which is already high-speed. The latter requires more than 2.7 s for this measurement. Alternatively, the ZNBT can also measure multiple DUTs in parallel. Previously, users had to operate several network analysers in parallel to achieve such high throughput.

The ZNBT also does away with the loss introduced by matrix switches, making it possible to deliver measurements with the instrument's full dynamic range of 130 dB, a high output power level of 13 dBm and low trace noise.

www.rohde-schwarz.com

Fixed frequency synthesizer

delivers ultra low phase noise

An RoHS, L-band compliant fixed frequency synthesizer, model SFS1575D-LF is a single frequency synthesizer that operates at 1575.42 MHz with a 10 MHz reference and features a typical phase noise of -102 dBc/Hz at the 10 kHz and offsets.

The SFS1575D-LF is designed to deliver a typical output power of 5 dBm with a VCO voltage supply of 5 Vdc while drawing 20 mA (typical) and a phase locked loop voltage of 3 Vdc while drawing 14 mA (typical). This fixed frequency synthesizer features a typical 2nd harmonic suppression of -18 dBc and spurious suppression of -70 dBc.

The fixed frequency synthesizer is housed in Z-Comm's standard PLL-V12N package measuring 0.6 x 0.6 x 0.13 inches. The SFS1575D-LF is also ideal for automated surface mount assembly and is available in tape and reel packaging.

www.zcomm.com

X-band high power amplifiers

target commercial radar and communications

M/A-COM Technology Solutions has announced two high power MMIC amplifiers ideal for X-Band communication and radar applications.

The MAAP-015030 two stage 8.5 to 11.75 GHz GaAs MMIC power amplifier

has a saturated pulsed output power of 41 dBm, a large signal gain of 21 dB and 40% power added efficiency. The power amplifier can be biased using a direct gate voltage or using an on chip gate bias circuit providing an excellent bare die solution for high power X-Band applications.

The MAAP-015035 is a three stage 8.5 to 11.5 GHz GaAs pHEMT MMIC power amplifier capable of achieving a saturated pulsed output power of 41 dBm and a small signal gain of 36 dB. The gate terminals of the power amplifier can be biased directly using a direct gate voltage or using an on chip gate bias circuit. The chip provides 40 % power added efficiency and offers very high gain which eliminates the need for a driver amplifier in customers' circuits.

www.macom.com

Small 70-80 GHz radio

for small cell and macrocell backhaul

The Aviat WTM 3300 radio claims to be the smallest and lightest 70-80 GHz radio on the market.

It redefines the urban backhaul market because it is purpose-built for deployment in newly "densified" city environments where traditional microwave and typical 70-80 GHz radios cannot be installed due to large, highly visible parabolic antennas.

The visual aesthetic impact on residents of neighborhoods where the radio is installed will be minimized due to the WTM 3300's small form-factor.

"The Aviat WTM 3300 70-80 GHz radio offers up to 1 Gbps capacity, which makes it ideal for meeting the requirements of even the most stringent urban application," says Ola Gustafsson, Aviat Networks' senior vice president, product and services portfolio management. "WTM 3300 supports this high throughput at one-fifth the weight and one-half the power requirements of traditional all-outdoor Ethernet microwave radios."

www.aviatnetworks.com

L and S band high gain amplifiers

Pasternack Enterprises has released a portfolio of L and S band high gain amplifiers covering 1.2 to 1.4 GHz and 3.1 to 3.5 GHz specifically for use in commercial

and military radar applications as well as observation satellites and communications systems.



The high gain amplifier modules are optimized for 1.2 to 1.4 GHz and 3.1 to 3.5 GHz radar applications, packaged in hermetically-sealed metal enclosures and exhibit outstanding performance in high gain, gain flatness, high output power and low noise.

These RF amplifiers utilize a hybrid microwave integrated circuit design and advanced GaAs pHEMT technology to produce an unconditionally stable module. They are also designed with built-in voltage regulation, bias sequencing, and reverse bias protection for added reliability and over-voltage protection is installed externally for easy repair.

A total of six L and S band high gain amplifiers are offered. Two of these products are low noise amplifiers (LNA) which demonstrate noise figure performance of 1.1 dB to 1.5 dB at high gain levels of 40 dB typical gain while also exhibiting excellent gain flatness. Also offered are 10 W and 20 W high power amplifiers that have gain performance of 40 to 47 dB with 1.0 dB to 1.5 dB gain flatness. The company is also releasing an L-band driver amplifier that displays solid gain performance of 47 dB while delivering competitive gain flatness of 1.5 dB.

www.pasternack.com

OCXO delivers ± 5 ppb stability

comes in a 14 x 9 mm package

In an industry standard package measuring just 14 x 9.0 mm and with a height of only 6.5 mm, the IQOV-162 series OCXO provides a frequency stability down to ± 5 ppb (parts per billion) over the full industrial temperature range from -40 to 85°C . In addition to this exceptional size/

performance ratio the OCXO is available in a very wide frequency range from 10 to 100 MHz. Operating from a 3.3 V supply voltage, the IQOV-162 consumes 600 mA of current during warm up and takes less than 5 minutes to be within <100 ppb of the final specification and 300 mA maximum at steady state at 25°C .

The output can be specified as either HCMOS, 15 pF load or Sinewave, into a 50 Ohms load. As well as offering phase noise performance better than -150 dBc/Hz at 1 kHz offset, ageing performance is also extremely good at less than ± 500 ppb per year.



Variants can be specified to include voltage control to enable the frequency to be adjusted for correction over time and remotely with a pullability range of ± 3 ppm to ± 8 ppm.

Typical applications include CDMA base stations, femtocells, optical networking, 3G and 4G LTE, Ethernet, SoNET/SDH, ATM backplanes, SATA and satellite communications, or whenever a very low profile OCXO is required.

www.iqdfrequencyproducts.com

Next-generation wireless prototyping platform

National Instruments has announced an integrated software defined radio solution for rapidly prototyping high-performance, multichannel wireless communication systems.

The NI USRP RIO platform is built on the LabVIEW RIO architecture and combines a high-performance 2 x 2 multiple input, multiple output (MIMO) RF transceiver capable of transmitting and receiving signals from 50 MHz to 6 GHz with an open LabVIEW programmable FPGA architecture.

Wireless engineers can use this technology to rapidly prototype real-time wireless communications systems and test them under real-world conditions. They can also prototype more capable wireless algo-

rithms and systems faster and reduce time to results using the only complete platform to take full advantage of a graphical system design approach. The USRP RIO family delivers high-performance, real-time processing capability with the Xilinx Kintex-7 Series FPGA, low latency with the PCI Express connection to a host computer and small size (1U half wide, 19 inch rack mountable).

www.ni.com

Broadband network analyzer

covers 70 kHz to 145 GHz in a single sweep



With its latest VectorStar ME7838D broadband network analyzer, Anritsu offers industry-best frequency coverage of 70 kHz to 145 GHz in a single sweep using a coaxial test port. Applications are on-wafer device characterization for 77 GHz automotive radar devices, E-band wireless communication, and emerging applications above 110 GHz.

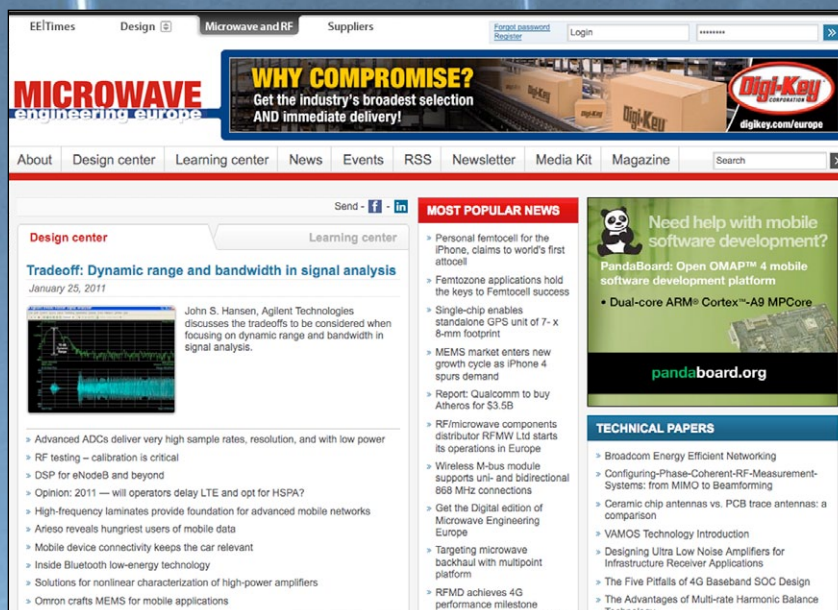
The VectorStar ME7838D conducts a single sweep on a device over multiple RF, microwave, and millimeter-wave waveguide bands, allowing engineers to more accurately characterize integrated circuits and other RF building blocks. Due to the instrument's ability to perform sweeps from rather low frequencies in the kHz range to 145 GHz, engineers can create more accurate models and subsequently have fewer design turns when devices are subsequently used in applications.

The key enabler for broadband operation to 145 GHz is the MA25300A Non-Linear Transmission Line (NLTL) module. The module extends the frequency range of previous NLTL modules and is compatible with the basic VectorStar ME7838 system. Thus, all versions of the ME7838 series can be upgraded to ME7838D 145 GHz performance.

www.anritsu.com

For the latest news: www.microwave-eetimes.com

news...
features...
products...
design...
white papers...
newsletter...
digital edition...



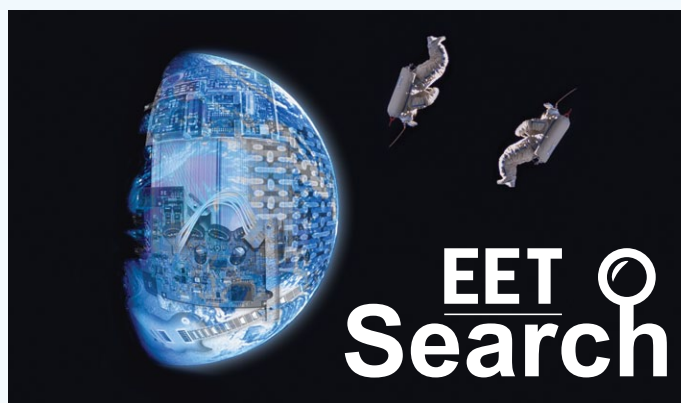
www.microwave-eetimes.com

The only European Site dedicated to
Microwave and RF offering News, Design,
How-to articles as well as an ever growing
library of Technical Papers.

Your Global Link to the Electronics World



www.automotive-eetimes.com



www.eetsearch.com



www.electronics-eetimes.com



www.analog-eetimes.com



www.ledlighting-eetimes.com



www.edn-europe.com



www.tm-eetimes.com



www.power-eetimes.com

SIX DAYS

THREE CONFERENCES

ONE EXHIBITION

EUROPEAN MICROWAVE WEEK 2014
NUOVA FIERA DI ROMA, ROME, ITALY
OCTOBER 5 - 10, 2014



European Microwave Week 2014

REGISTRATION INFORMATION



EuMA

European Microwave Association

Official Publication:



The 9th European Microwave
Integrated Circuits Conference

Co-sponsored by:



Organised by:



Supported by:



Co-sponsored by:



Co-sponsored by:



The 44th European Microwave Conference

Co-sponsored by:



The 11th European Radar Conference

Co-sponsored by:



Register online at www.eumweek.com



EUROPEAN MICROWAVE WEEK

ROME, ITALY

5-10 OCTOBER 2014
www.eumweek.com

EUROPEAN MICROWAVE WEEK 2014

THE ONLY EUROPEAN EVENT DEDICATED TO THE MICROWAVE AND RF INDUSTRY

EuMW 2014 will be held in the extraordinary and beautiful 'Eternal City' of Rome. Bringing industry, academia and commerce together, European Microwave Week 2014 is a SIX day event, including THREE cutting edge conferences and ONE exciting trade and technology exhibition featuring leading players from across the globe. EuMW 2014 will see an estimated 1,700 - 2,000 conference delegates, over 5,000 visitors and in excess of 250 exhibitors.

THE EXHIBITION

Concentrating on the needs of engineers, the event showcases the latest trends and developments that are widening the field of the application of microwaves. Pivotal to the week is the European Microwave Exhibition, which offers YOU the opportunity to see, first hand, the latest technological developments from global leaders in microwave technology, complemented by demonstrations and industrial workshops.

Registration to the Exhibition is FREE!

- **International Companies** - meet the industry's biggest names and network on a global scale
- **Cutting-edge Technology** - exhibitors showcase the latest product innovations, offer hands-on demonstrations and provide the opportunity to talk technical with the experts
- **Technical Workshops** - get first hand technical advice and guidance from some of the industry's leading innovators

BE THERE

Exhibition Dates	Opening Times
Tuesday 7th October	09:30 - 17:30
Wednesday 8th October	09:30 - 17:30
Thursday 9th October	09.30 - 16:30

Fast Track Badge Retrieval

Entrance to the Exhibition is FREE and attending couldn't be easier.

VISITORS

Registering for the Exhibition

- Register as an Exhibition Visitor online at www.eumweek.com
- Receive a confirmation email with barcode
- Bring your barcode with you to the Exhibition
- Go to the Fast Track Check In Desk and print out your visitor badge
- Alternatively, you can register onsite at the self service terminals during the Exhibition.

Please note NO visitor badges will be mailed out prior to the Exhibition.

www.eumweek.com



**EUROPEAN
MICROWAVE
WEEK**

ROME, ITALY

5-10 OCTOBER 2014
www.eumweek.com

EUROPEAN MICROWAVE WEEK 2014 THE CONFERENCES

Don't miss Europe's premier microwave conference event. The 2014 week consists of three conferences and associated workshops:

- European Microwave Integrated Circuits Conference (EuMIC) 6th – 7th October 2014
- European Microwave Conference (EuMC) 6th – 9th October 2014
- European Radar Conference (EuRAD) 8th – 10th October 2014
- Plus Workshops and Short Courses from 5th October 2014
- In addition EuMW 2014 will include the 'Defence, Security and Space Forum'.

The three conferences specifically target ground breaking innovation in microwave research through a call for papers explicitly inviting the submission of presentations on the latest trends in the field, driven by industry roadmaps. The result is three superb conferences created from the very best papers, carefully selected from over 1,100 submissions from all over the world. Special rates are available for EuMW delegates. For a detailed description of the conferences, workshops and short courses please visit www.eumweek.com. The full conference programme can be downloaded from there.

Fast Track Badge Retrieval

Register online and print out your badge in seconds onsite at the Fast Track Check In Desk

Conference Prices

There are TWO different rates available for the EuMW conferences:

- **ADVANCE DISCOUNTED RATE** – for all registrations up to and including 5th September
- **STANDARD RATE** – for all registrations made after 5th September

Please see the Conference Registration Rates table on the back page for complete pricing information.
All payments must be in Euros – cards will be debited in Euros.

Online registration is open now, up to and during the event until 10th October 2014

DELEGATES

Registering for the Conference

- Register online at www.eumweek.com
- Receive a confirmation email receipt with barcode
- Bring your email, barcode and photo ID with you to the event
- Go to the Fast Track Check In Desk and print out your delegate badge
- Alternatively, you can register onsite at the self service terminals during the registration opening times below:
 - Saturday 4th October (16.00 – 19.00)
 - Sunday 5th October (08.00 – 17.00)
 - Monday 6th October (08.00 – 17.00)
 - Tuesday 7th October (08.00 – 17.00)
 - Wednesday 8th October (08.00 – 17.00)
 - Thursday 9th November (08.00 – 17.00)
 - Friday 10th November (08.00 - 10.00)

Once you have collected your badge, you can collect the conference proceedings on USB stick and delegate bag for the conferences from the specified delegate bag area by scanning your badge.

CONFERENCE REGISTRATION INFORMATION

EUROPEAN MICROWAVE WEEK 2014, 5th - 10th October, Rome, Italy

Register Online at www.eumweek.com

ONLINE registration is open from 1st June 2014 up to and during the event until 10th October 2014.

ONSITE registration is open from 16:00h on 4th October 2014.

ADVANCE DISCOUNTED RATE (up to and including 5th September) STANDARD RATE (from 6th September & Onsite)

Reduced rates are offered if you have society membership to any of the following*: EuMA, GAAS, IET or IEEE.

EuMA membership fees: Professional € 25/year, Student € 15/year.

If you register for membership through the EuMW registration system, you will automatically be entitled to discounted member rates.

Reduced Rates for the conferences are also offered if you are a Student/Senior (Full-time students 30 years or younger and Seniors 65 or older as of 10th October 2014).

ADVANCE REGISTRATION CONFERENCE FEES (UP TO AND INCLUDING 5TH SEPT.)

CONFERENCE FEES	ADVANCE DISCOUNTED RATE			
	Society Member (*any of above)		Non Member	
<i>1 Conference</i>	Standard	Student/Sr.	Standard	Student/Sr.
EuMC	€ 440	€ 120	€ 580	€ 160
EuMIC	€ 340	€ 110	€ 450	€ 150
EuRAD	€ 300	€ 100	€ 390	€ 130
<i>2 Conferences</i>				
EuMC + EuMIC	€ 630	€ 230	€ 830	€ 310
EuMC + EuRAD	€ 600	€ 220	€ 780	€ 290
EuMIC + EuRAD	€ 520	€ 210	€ 680	€ 280
<i>3 Conferences</i>				
EuMC + EuMIC + EuRAD	€ 760	€ 330	€ 1000	€ 440

STANDARD REGISTRATION CONFERENCE FEES (FROM 6TH SEPT. AND ONSITE)

CONFERENCE FEES	STANDARD RATE			
	Society Member (*any of above)		Non Member	
<i>1 Conference</i>	Standard	Student/Sr.	Standard	Student/Sr.
EuMC	€ 580	€ 160	€ 760	€ 210
EuMIC	€ 450	€ 150	€ 590	€ 200
EuRAD	€ 390	€ 130	€ 510	€ 170
<i>2 Conferences</i>				
EuMC + EuMIC	€ 830	€ 310	€ 1080	€ 410
EuMC + EuRAD	€ 780	€ 290	€ 1020	€ 380
EuMIC + EuRAD	€ 680	€ 280	€ 880	€ 370
<i>3 Conferences</i>				
EuMC + EuMIC + EuRAD	€ 1000	€ 440	€ 1310	€ 580

WORKSHOP AND SHORT COURSE FEES (ONE STANDARD RATE THROUGHOUT)

FEES	STANDARD RATE			
	Society Member (*any of above)		Non Member	
	Standard	Student/Sr.	Standard	Student/Sr.
1/2 day WITH Conference registration	€ 90	€ 70	€ 120	€ 90
1/2 day WITHOUT Conference registration	€ 120	€ 90	€ 160	€ 120
Full day WITH Conference registration	€ 130	€ 100	€ 170	€ 120
Full day WITHOUT Conference registration	€ 170	€ 130	€ 220	€ 160

Proceedings on USB Stick

All papers published for presentation at each conference will be on a USB stick, given out FREE with the delegate bags to those attending conferences. For additional USB sticks the cost is € 50.

International Journal of Microwave and Wireless Technologies

Int'l Journal printed issues (6/year) € 42

DVD Archive EuMC

DVD Archive EuMC 1969-2003	FREE
DVD Archive EuMC 2004-2008	€ 10

Concert and Gala Dinner

Wednesday 8th October 2014

The Gala Dinner and Concert will take place in the historical palace Palazzo Brancaccio and costs € 35 per person. Please note places are limited and assigned on a first-come-first-served basis.

SPECIAL FORUMS & SESSIONS

Date	Time	Title	Location	No. of Days	Cost	
Wednesday 8th October	09:00h - 18:20h	Defence, Security & Space Forum	Flavia	1	€ 10 for delegates (those registered for EuMC, EuMIC or EuRAD)	€ 50 for all others (those not registered for a conference)