

Design Notes & Market Reports

500K TD-LTE Base Stations by 2016

At least half a million base stations will be installed or upgraded for TD-LTE by the end of 2016.

“It was only two years ago that nearly every WiMAX operator, including operators with unpaired TDD frequency spectrum, were planning to deploy WiMAX 2,” says Aditya Kaul, practice director, mobile networks. “Today, almost all of them have switched plans and are deploying TD-LTE instead.”

TD-LTE is the Time-Division Duplex (TDD) variant of the fourth-generation (4G) Long Term Evolution (LTE) wireless standard.

WiMAX operators today are generally offering fixed WiMAX service based on the IEEE 802.16d specification, or mobile WiMAX service based on IEEE 802.16e. The IEEE 802.16m standard (also known as WiMAX 2) was developed to provide higher data rates and increased capacity and the members of the WiMAX Forum committed to follow this evolution path for 4G.

“A funny thing happened on the way to the forum,” says Jim Eller, principal analyst, wireless infrastructure. “Despite starting two years later than WiMAX 2, TD-LTE emerged as a viable alternative.” China Mobile was the early promoter of TD-LTE technology, as a 4G evolution path for its 3G network based on TD-SCDMA technology. Other operators, however, saw better advantages in aligning with the global LTE standards.

TD-LTE commercial service has been launched in Brazil, Japan, Poland, Saudi Arabia, and other countries. TD-LTE deployments are underway in Australia and Scandinavia and large-scale TD-LTE networks are planned in the United States and India.

China: 600-pound gorilla

The 600-pound gorilla in TD-LTE is still China. China Mobile started its second phase of the TD-LTE Large Scale Trial Initiative (LSTI) in December and it will run until June 2012. According to Jake Saunders, vice president of forecasting, “China Mobile announced plans last month to install an additional 10,000 to 20,000 TD-LTE base stations in 2012 and perhaps another 60,000 in 2013.”

ABI Research’s new study, “Wireless Infrastructure Market Data,” tracks base station deployments by technology, by region, and by country. The market data also forecasts new deployments, upgrades, and replacements annually through 2016, as well as operator base station spend estimates.

For more information visit www.abiresearch.com, or call +1.516.624.2500.

FI Projects \$4.25 Billion U.S. Military Airborne Communications Market

Forecast International projects that defense departments throughout the world will spend about \$4.25 billion on 13 military airborne communications development and acquisition programs within the U.S. market over the next ten years. More specifically, this amount will be allocated for the development or procurement of airborne military communications systems or technology within the United States market.

In its annual “The Market for U.S. Military Airborne Communications Systems” analysis Forecast International further projects that defense departments will procure 18,382 individual units from among eight airborne military communications systems that are covered in the report.

According to the analysis, the Joint Tactical Radio System program, the ARC-210 program, and the Fighter Tactical Data Link program will all have a major impact on the U.S. military airborne communications market in the coming decade.

The JTRS program to produce a single standard software-operated radio for the U.S. armed services is currently in research and development. FI is projecting that the Pentagon will spend some \$847.34 million from FY11 to FY15 on research and development of the Airborne/ Maritime/Fixed Station (AMF) Joint Tactical Radio System.

The ARC-210 is an airborne military radio manufactured by Rockwell Collins that provides two-way voice and data communications. It is also software-operated. Among recent activity, in the summer of 2011, Rockwell Collins announced that it had received \$25 million in orders from the U.S. Navy for ARC-210 Gen5 radios. Forecast International estimates that defense departments will purchase more than 11,300 ARC-210 radios in the coming decade.

The U.S. Air Force’s Fighter Tactical Data Link R&D program seeks to provide critical capability and enhancements to tactical datalinks used on Air Force fighter aircraft. FI projects that the Air Force will spend about \$113 million on its Fighter Tactical Data Link program over the next decade.

In terms of contractors, Forecast International projects that Northrop Grumman, Boeing, Rockwell Collins, ViaSat, and Data Link Solutions will receive 62.06 percent of the amount to be spent by defense departments on the 13 products and programs covered in the analysis. Northrop will lead with \$1.03 billion. Boeing, Rockwell, ViaSat, and Data Link Solutions will follow with \$951.90 million, \$660.21 million, \$154.08 million, and \$136.97 million, respectively.

Information: Forecast International, Inc., www.forecastinternational.com.

BTS Transceiver Market Down 24 Percent in 2011

The global base transmitting station (BTS) transceiver (TRx) market declined by 24% in units in 2011, according to the latest report from EJL Wireless Research titled “Global BTS Transceiver Market Analysis and Forecast, 8th Edition, 2011-2016.”

“While the year started off strong, the economic uncertainty of Greece, coupled with weakness in India and North America left the market in a state of turmoil by the fourth quarter of 2011 with a negative outlook into the first half of 2012. The decline in 2011 was the first ever in BTS TRx shipments since 2001,” says founder and President, Earl Lum. The report provides a unique perspective on the global shipments and demand for base station equipment covering all air interface standards and frequencies and major OEMs including Alcatel-Lucent, Ericsson, Huawei Technologies, Nokia Siemens Networks (including Motorola), Samsung Electronics and ZTE.

“LTE shipments were up in 2011 but delays in spectrum auctions in Spain, Italy and France pushed some forecasted shipments into 2012. While AT&T Wireless did finally launch its LTE network, its proposed merger with T-Mobile USA softened demand during the second half of 2012 for North America. Furthermore, uncertainty and the eventual cancellation of 122 GSM1800 licenses by the Supreme Court in India negatively impacted the GSM market. Finally, our prediction that it was unlikely LightSquared would ever deploy its LTE 1600MHz network in the US, once the GPS interference issue became apparent, turned true,” says Lum.

Some key predictions from EJL Wireless Research LLC for 2012:

- Global BTS TRx shipments will be flat
- Global BTS GSM TRx shipments are expected to remain the largest category
- Global BTS LTE TRx shipments are expected to more than double

The top suppliers for overall base station transceiver shipments as well as by air interface standards for 2011 were:

- Overall #1 TRx Supplier: Ericsson
- Overall #1 GSM TRx Supplier: Nokia Siemens Networks
- Overall #1 W-CDMA TRx Supplier: Huawei Technologies
- Overall #1 CDMA TRx Supplier: ZTE
- Overall #1 LTE TRx Supplier: Ericsson
- The report is currently available for purchase and information can be downloaded at www.ejlwireless.com.

Microelectronics Companies Targeting High-Frequency Applications

Microelectronics companies continue to focus development on high performance, high frequency applications in defense, test and measurement, very small aperture terminal (VSAT) and microwave radios. The Strategy Analytics GaAs and Compound Semiconductor Technologies Service (GaAs) viewpoint, “Compound Semiconductor Industry Review July-September 2011: Microelectronics,” captures product, technology, contract and financial announcements for companies, such as RFMD, Skyworks Solutions, ANADIGICS, Agilent, Hittite Microwave, TriQuint Semiconductor, Avago, NXP Semiconductors, Microsemi, Renesas Electronics and Murata Manufacturing.

“Handset products dominate compound semiconductor revenue, yet there is still a substantial amount of product development aimed at high frequency market applications,” noted Eric Higham, Director of the Strategy Analytics GaAs and Compound Semiconductor Technologies Service. “While these products do not offer the volume of some of the commercial market opportunities, high frequency market applications provide an opportunity for device manufacturers to differentiate their products based on superior performance”.

This viewpoint summarizes financial, product, contract and employment developments from major compound semiconductor device suppliers, addressing a variety of commercial and military applications that use gallium arsenide (GaAs), gallium nitride (GaN), Silicon carbide (SiC), silicon germanium (SiGe) and complementary metal-oxide-semiconductor (CMOS) technologies.

GaAs Device Growth Returning to Historical Averages

After a banner year in 2010 and a fast start to 2011, GaAs device revenue growth slowed, maintaining an historical average of six percent.

The Strategy Analytics GaAs and Compound Semiconductor Technologies Service (GaAs) Insight, “2011 GaAs Device Revenue Falts after Strong Start,” explores GaAs device revenue growth trends in handsets and smartphones, as well as revenue performance of leading substrate and device manufacturers, like IQE, VPEC, Kopin, RFMD, Skyworks, TriQuint Semiconductor, Avago Technologies and WIN Semiconductor.

While growth drivers are still present, the rates are likely to continue to flatten in 2012.

This insight summarizes revenue performance of a representative set of GaAs device manufacturers for 2010 and 2011. It also discusses trends and drivers for the overall GaAs device industry and forecasts trouble spots and directions to be monitored through 2012.

--strategyanalytics.com

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Wireless Infrastructure Drives RF Power Semiconductor Markets to Well over \$1 Billion

Spending on RF power semiconductors for the wireless infrastructure market experienced significant growth in 2011. Other markets – notably the military – are seeing some moderation in growth as the global economic picture and political factors come into play. Also, gallium nitride (GaN) – long seen as the promising new “material of choice” for RF power semiconductors – is continuing its march to capture share.

“GaN has the promise of increased market share in 2012 and is forecast to be a significant force by 2017,” notes Lance Wilson, research director, mobile networks. “It bridges the gap between two older technologies, exhibiting the high-frequency performance of gallium arsenide combined with the power-handling capabilities of Silicon LDMOS. It is now a mainstream technology that has achieved measurable market share and in the future will capture a significant part of the market.”

Commercial Avionics

The vertical market showing the strongest uptick in the RF power semiconductor adoption business, outside of wireless infrastructure, is commercial avionics and air traffic control, which Wilson describes as now being “a significant market.” While the producers of these chips’ devices are located in the major industrialized countries, this sub-segment market is now so global that end equipment buyers can be from anywhere.

ABI Research’s new study, “RF Power Semiconductors,” examines RF power semiconductor devices that have power outputs of greater than four watts and operate at frequencies of up to 3.8 GHz, which represent the bulk of applications in use today. With the current release, analysis of the six main vertical segments (wireless infrastructure; military; industrial, scientific, and medical (ISM); broadcast; commercial avionics and air traffic control; and non-cellular communications) which were previously subdivided into 24 sub-segments, are expanded to 29 sub-segments.

This study is part of the firm’s RF Power Devices Research Service.

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Book Review

Handbook of RF and Microwave Power Amplifiers

Edited by John L. B. Walker, Cambridge University Press 2012 ISBN 978-0-521-76010-2 Hardback.

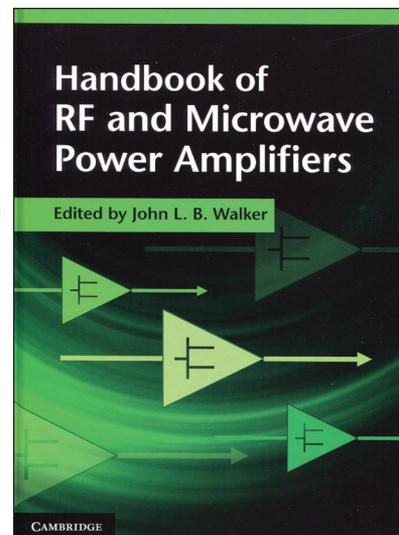
Reviewed by Tom Perkins, HFE Senior Technical Editor.

This publication, organized like a handbook, provides a balanced and broad discussion of modern power amplifier design. The latest device technologies, including LDMOS and VMOS, GaAs FETs, SIC and GaN, are well described. Various classes of operation are discussed including not only classic A, AB, B and C, but also F, J, E and S.

The book provides a very refreshing discussion of contemporary computer aided design (CAD) techniques including linear, harmonic-balance, and time-domain analysis. A significant highlight is the attention given to details including passive circuitry, biasing techniques, circuit design and packaging, and an entire chapter (9) devoted to thermal design. Heat removal is a key area requiring very careful attention in PA design. There is significant attention paid to applications, systems integration and measurement techniques

The book could be used as a college or university engineering course textbook, a reference for practicing RF and microwave engineers, or even relatively light reading for those actively engaged in current power amplifiers R&D or applications.

This 687-page book is well organized with a good quantity of useful references. It is the kind of book that might be found more often on the desk than on the shelf.



News from 2012 GSMA Mobile World Congress

TriQuint Semiconductor, Inc. unveiled the industry's smallest **dual-band PA duplexer (PAD)** for global 3G and 4G smartphones. The new TRITIUM Duo™ family combines two band-specific power amplifiers (PAs) and duplexers in a single compact module, effectively replacing up to twelve discrete components.

"We've powered the world's top smartphones with over a half billion of our single-band TRITIUM™ modules, and now the TRITIUM Duo™ is being evaluated by customers for use in next generation smartphones," said **Ralph Quinsey**, president and chief executive officer of TriQuint. "Our broad technology portfolio has enabled us to integrate two commonly used bands in one small footprint. Not only have we simplified the RF front-end for phone designers, we have also increased performance and flexibility."

The TRITIUM Duo family shares a common 6 x 4.5mm footprint, giving designers the flexibility to support multi-band, multi-mode operations across multiple platforms. Mobile device manufacturers can capitalize on the dramatic size reductions to include more features or larger batteries in thinner, lighter form factors with all the performance needed for **CDMA, 3G, and 4G networks**.

The R&S CMW500 wideband radio communication tester from **Rohde & Schwarz** was a featured product at the Barcelona event. This **multistandard platform performs RF, protocol, performance and application tests on wireless devices** for LTE (FDD and TDD), WCDMA, HSPA+, GSM and CDMA2000. The R&S CMW500 can also test the handover between these technologies. A major topic for the industry will be the rollout of **voice services in LTE networks**. To support these services, wireless devices will use the new voice over LTE (VoLTE) technology. This will present a major challenge for network operators and manufacturers of wireless devices.

To help them meet this challenge, Rohde & Schwarz offers a new test solution based on the R&S CMW500 and the R&S UPV audio analyzer which allows signaling and audio quality tests for VoLTE. A new test solution for WLAN-RF and end-to-end data testing on wireless devices is also available. Rohde & Schwarz presents the first universal platform that allows manufacturers of wireless devices to precisely test video and audio interfaces. This unique all-in-one solution for development and production measures all protocol layers and media content. The primary focus is on mobile high definition link (MHL).

This new interface standard is ideal for high-resolution video content that is transferred via LTE. It also offers a direct interface to connect a tablet PC, smartphone or other wireless device to a high definition multimedia interface (HDMI) device. The consumer electronics industry needs reliable test solutions for MHL. The latest generation of test and measurement equipment from Rohde & Schwarz fulfills this market requirement.

Anritsu demonstrated the first laboratory simulation of SRVCC (**Single Radio Voice Call Continuity**) using its RTD (Rapid Test Designer) protocol development solution. SRVCC enables a VoIP/IMS call in the LTE packet switched domain to be transferred to the legacy 2G/3G circuit switched domain. Testing of this function is very important for user experience of **LTE handsets**, as it prevents the 'dropped call' when a user moves outside of LTE coverage to 2G/3G network during a voice call. Anritsu's RTD is the fastest and most flexible way to test LTE devices during development.

Anritsu has teamed with RADVISION to integrate its PROLAB IMS testing product with RTD to provide an integrated VoLTE (Voice over LTE) test solution. Anritsu's SRVCC demonstration shows that a VoLTE call connected with an Anritsu MD8430A LTE signaling tester and RADVISION PROLAB IMS server can be transferred to a circuit switched voice connection with an Anritsu MD8480C WCDMA signaling tester. This capability provides developers of leading edge LTE smartphones with a comprehensive solution for testing voice calls and handovers between LTE and other radio technologies.

RF Micro Devices, Inc. announced it has secured a reference design win for its second-generation ultra-high efficiency family of **power amplifiers**. The new reference design win is on a highly integrated multimode multi-band 3G/LTE solution.

Eric Creviston, president of RFMD's Cellular Products Group (CPG), said, "We are excited to expand our relationship with this leading chipset supplier to include our ultra-high efficiency 3G/4G power amplifiers. RFMD is already supporting our mutual customers with high-performance 3G/4G switches and switch-based products, and we are enthusiastic about the incremental growth opportunities presented by our increasing participation on 3G and LTE reference designs."

RFMD's second-generation ultra-high efficiency 3G and 4G LTE PAs deliver an enhanced user experience by extending battery life and reducing the thermal impact of data usage in smartphones.