Keysight Technologies
Move Forward to What's Possible in TD-LTE

Design and Test Solutions

KEYSIGHT
TECHNOLOGIES

Overview

Third-generation (3G) wireless systems are deployed all over the world. The next step is Long-Term Evolution (LTE) of the 3rd Generation Partnership Project (3GPP) covering emerging needs of "mobile broadband" into the next decade, with cell data rates of over 300 Mbps expected when the system is fully functional.

Following the integration of the Chinese TD SCDMA standard, based on time division duplex (TDD), into the 3GPP specifications, chipset and device designers are now working to include TDD capability for LTE. Now known as TD-LTE, the standard allows carriers to make use of the unpaired spectrum that many of them already own. With the complexity of LTE and the need for backward compatibility with legacy systems come development and test challenges that are new to engineers involved in all aspects of product development—from components to complete systems. In addition to higher data rates, major design criteria for LTE-based networks include low latency (turnaround) from user request to server reply—down from around 100 ms for today's HSPA networks to a goal of 5 ms.

You take TD-LTE forward. Keysight clears the way

As a world leader in test and measurement solutions, Keysight Technologies, Inc. products provide the data rates and channel bandwidths required early in the TD-LTE product design cycle. We have developed several first-to-market TD-LTE test products to help ensure the success of TD-LTE deployment—from early RF and digital design through conformance testing to network deployment and service assurance.

Keysight is a member of 3GPP and an active contributor to the development of next-generation specifications, including both the FDD and TDD variants of LTE and the concurrent System Architecture Evolution (SAE), which is required to realize full performance potential. We create our product plans based on the knowledge and insight gained from this participation.

Our engineers, experts in test and measurement, have dedicated their careers to understanding the intricacies of evolving technologies such as TD-LTE to provide you with the solutions you need, when you need them. So, as you take TD-LTE forward, Keysight clears the way.

TD-LTE Design Simulation and Integration into Real-World Measurements

Baseband Design & Verification

Keysight's SystemVue is an electronic system-level design and verification environment for baseband PHY architectures and algorithms. SystemVue provides two levels of capability for 3GPP LTE that bring instrument-like compliance to your earliest design efforts. SystemVue's baseband verification library is a fast, pre-built set of parameterized LTE PHY simulation reference models that provide a "gold standard" to compare against user supplied IP and to generate test vectors at any point within a signal processing chain. SystemVue's baseband exploration library goes further and opens up the algorithmic source code for each of the key LTE PHY models to help you create and verify LTE PHY algorithms even faster. Both SystemVue libraries support the FDD and TDD modes for LTE and provide both UE and eNodeB models in the DL and UL paths. MIMO precoding and MIMO channel models are also provided for complete link level modelling and receiver design.

RF Design & Verification

Keysight's 3GPP LTE Wireless Library for advanced design system (ADS) saves valuable design and verification time for RF designers and system integrators, and helps improve raw, uncorrected PHY performance. The 3GPP LTE Wireless Library provides signal processing models and preconfigured simulation setups for use within Keysight's ADS software. It creates and demodulates spectrally correct test signals that comply with the latest LTE specifications, including MIMO and TDD. This enables early verification of RF hardware performance before committing RFIC and board designs to fabrication, saving costly design turns. Designers can combine live, high-performance RF simulations, baseband simulations and standard-compliant measurements from the real world to measure EVM, PAPR, CCDF, and ACLR performance of RF components.

Combining Design Tools for Real-World Measurements

Keysight's 3GPP LTE TDD Wireless Library for Keysight SystemVue and ADS works directly with Keysight's broad portfolio of measurement platforms to provide the first fully coded BER solution for the TDD version of the LTE standard using 2x2 and 4x4 MIMO technology. The solution allows fully coded BER measurements of a device under test, including simulation and real-time emulation of channel impairments for multipath fading in MIMO systems. Connectivity between Keysight's SystemVue and test equipment, such as signal sources and signal analyzers, helps minimize development risk and costs by identifying problems early in the design and fabrication cycle.

TD-LTE Signal Generation and Signal Analysis

The Keysight N7625B Signal Studio for LTE TDD is a powerful, PC-based software application for creating standards-based TD-LTE signals using Keysight's N5182A/62A MXG and E4438C ESG vector signal generators, and the N5106A PXB baseband generator and channel emulator. The Signal Studio solution supports the 3GPP LTE Mar-09 standard, offers multichannel capability for PDSCH, PHICH, PCFICH, PBCH, PDCCH, PUSCH, PUCCH, and has the ability to transmit DL and UL signals. The software provides basic capabilities well suited for testing components used in base stations and mobile handsets, such as power amplifiers and filters. It also provides advanced receiver test capabilities that support transport layer coding, 4x4 MIMO pre-coding and fading.

Keysight 89600 VSA software provides RF and baseband engineers with a comprehensive set of TD-LTE signal analysis, physical layer testing and troubleshooting tools for LTE transceivers and components. TD-LTE downlink (OFDMA), uplink (SC-FDMA) and MIMO analysis are available in a single option. This VSA software can be used with more than 30 Keysight products, including spectrum and signal analyzers, oscilloscopes and logic analyzers, to make LTE measurements anywhere in the block diagram—from baseband to antenna, on digitized or analog signals. It supports up to 2x2 MIMO analysis in conjunction with Keysight's X-Series (EXA/MXA/PXA) signal analyzers or VXI-based VSA analyzer and up to 4x4 MIMO analysis with several oscilloscopes.

The 89600 VSA software offers industry-leading performance with EVM of up to –53 dB (hardware dependent) and bandwidths of 1.4 MHz to 20 MHz. It's capability features up to 4x4 MIMO analysis and advanced uplink and downlink evaluation tools supporting all LTE bandwidths, TDD DL/UL allocation (0-6), special subframe length (0-8) and modulation formats and sequences that include BPSK, QPSK, 16 QAM, 64 QAM, CAZAC, OS and PRS. It also has connectivity with Keysight's ADS TD-LTE wireless library for mixed simulation and real-world measurement early in the design process.

The N9082A LTE TDD measurement application for the Keysight X-Series signal analyzers provides simple one-button power measurements and analysis of BTS and MS devices for conformance test requirements to 3GPP test standards. With the same algorithm and feature set of the 89601A-BHE embedded into the signal analyzer, the N9082A has the testing capability for both LTE downlink (OFDMA) and uplink (SC-FDMA) in a single option. Specifi cally for TD-LTE, the N9082A supports all seven DL/UL confi gurations and nine special subframe length confi gurations with two-frame (20 ms) modulation analysis.

VSA and Signal Studio screens displaying TD-LTE measurements.

TD-LTE specialized software combined with hardware instruments enable physical layer testing.

TD-LTE Baseband Analysis

In next-generation architectures the physical link between the RF front-end and base-band processing evolves from an analog to parallel, or high-speed serial, digital bus. New interface standards require test equipment to provide appropriate serial digital inputs and outputs.

DigRF Digital Interface

If you are using the DigRF v4 baseband IC to RFIC interface, the Keysight RDX platform provides a comprehensive test solution that brings insight into both the digital and RF domains. The RDX platform allows engineers to work in either the digital or RF domain for digital protocol test as well as RF (digital IQ) physical layer stimulus and analysis. It can also provide emulation for testing either the baseband or RFIC. The integration of the RDX platform with the Keysight RF test portfolio provides cross-domain solutions that will help you rapidly deploy your DigRF designs, aiding both baseband and RFIC development, debug and characterization.

Logic Analysis

The combination of a Keysight RDX radio digital cross-domain tester or logic analyzer and Keysight's VSA software provides the only digital VSA (DVSA) package for digital baseband, IF and RF signal analysis. This combination enables digital signal processing (DSP) designers to effectively design and debug interfaces that were once analog and are now digital. The VSA software performs signal analysis functions such as I/Q analysis, EVM, Fourier spectrum, etc., using the digital signal captured by the logic analyzer as the input.

Battery Current Drain Measurement and Analysis

The Keysight 14565B software and 66319D/21D DC source provide a ready-to-use solution for battery current drain measurement and analysis for optimizing the power consumption of your devices. The 66319D/21D is a specialized DC source for testing TD-LTE and other wireless mobile devices. It has a 15V, 3A output, a high-speed 64KSa/sec 16 bit digitizer, and 3 current measurement ranges for making accurate current drain measurements from micro amps to amps, for testing off, sleep, and active operating modes of the DUT.

Use the Keysight 14565B software with DC source to optimize the power consumption of your devices.

Access DigRF v4 interfaces, as well as digital IQ data, with the RDX test platform.

More Validation Tools Coming for TD-LTE

Wireless Communications Test Set

The Keysight E6620A PXT wireless communications test set is designed to provide early leading-edge solutions for the LTE UE development lifecycle from early development through RF conformance and interoperability test. Built on an advanced and scalable platform, the wireless communications test set uses the same 3GPP-compliant LTE protocol stack across all solutions to shorten design cycles and ensure consistent testing leading to the highest quality UE designs.

The Keysight E6620A is acomprehensive suite of tools which supports all phases of wireless terminal development.

Network Deployment and Optimization

Meets current and future network installation and maintenance challenges for TD-LTE

The Keysight FieldFox RF analyzer (4 GHz/ 6 GHz) is the world's most integrated, fast, and rugged handheld RF analyzer for TD-LTE network installation and maintenance. This six-in-one RF tester combines cable and antenna analysis, spectrum analysis, interference analysis, power meter measurement, vector network analysis, and a vector voltmeter into one rugged, compact, lightweight, and weather-resistant package.

With the FieldFox, verify eNB transmitter performance easier than before using one-button GSM/WCDMA/LTE power measurements. You can detect intermittent signals using the built-in spectrogram and waterfall display, record and playback functions.

Easily locate interfering signals in a complex signal environment with FieldFox's best-in-class dynamic range of 96 dBc, combined with fast sweep times under narrow resolution bandwidths.

Designed for the field environment, the N9912A FieldFox RF Analyzer, Handheld Cable and Antenna Analyzer and Handheld Spectrum Analyzer works to 4 or 6 GHz.

Network Deployment and Optimization

Drive Test

The E6474A drive-test platform is the industry's most flexible, customizable and scalable solution for the optimization of wireless networks. The platform includes measurement receivers with up to eight frequency bands—more than any in the industry—and software that can simultaneously measure and troubleshoot network RF coverage and service delivery across all existing 2G, 3G and 4G technologies, including WiMAX™, LTE and VoIP. For TD-LTE, being able to clear the spectrum for deployment is usually the first task. The built-in spectrum-analysis measurement with threshold alarm allows you to scan for any unwanted interference and record the geographic location and magnitude of any found. This solution also provides LTE TDD signal strength and physical layer cell ID.

To measure the RF coverage of the TD-LTE network, Keysight's drive-test platform incorporates LTE synchronization signal strength and cell sector identification measurements. The measurements are collected together with co-ordinates from the receiver's built in GPS which allows the results to be plotted on a real-time moving map. Flexible export capabilities allow the captured data to be further analyzed in a wide range of post processing tools.

The Keysight E6474A drive-test platform quickly and accurately measures network performance.

Network Protocol Analysis and Diagnostics

The Keysight signaling analyzer platform is an industry-leading solution for 3G, 2G and IMS networks today. With the addition of LTE and SAE technology support, the signaling analyzer software provides a common and intuitive user interface to support all mobile and IMS technologies. Together with a new high-density probing solution, the signaling analyzer software enables passive probing and analysis of LTE network interfaces (e.g. S1, X2, S5, S6a). It is also able to import Uu data for Keysight's NiXT drive test platform and other Uu data sources.

This powerful combination of distributable hardware pre-processing with scalable software architecture meets the current and future performance requirements necessary for the successful deployment of an integrated LTE/SAE network system.

The Keysight signaling analyzer real-time analysis for TD-LTE.

Specific Product Information

For comprehensive information on the products mentioned in this brochure, please visit the following websites:

Keysight SystemVue
www.keysight.com/find/systemvue

Advanced Design System (ADS)
www.keysight.com/find/ads

N7625B Signal Studio for LTE TDD
www.keysight.com/find/signalstudio

N5182A/62A MXG Vector Signal Generators
www.keysight.com/find/mxg

E4438C ESG Vector Signal Generator
www.keysight.com/find/esg

N5106A PXB MIMO Receiver Tester
www.keysight.com/find/pxb

89600 VSA Software
www.keysight.com/find/vsa

N9030A PXA Signal Analyzer
www.keysight.com/find/pxa

N9010A EXA Signal Analyzer
www.keysight.com/find/exa

9000-Series Infiniium Oscilloscope
www.keysight.com/find/scopes

16900 Logic Analyzer
www.keysight.com/find/logic

E6620A Wireless Communications Test Set
www.keysight.com/find/ltemobiletest

J7830A Signaling Analyzer
www.keysight.com/find/sart

E6474A Drive Test and Network Optimization Platform
www.keysight.com/find/drivetest

Keysight's LTE Design and Test Solutions
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A personalized view into the information most relevant to you.

www.axiestandard.org

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www.lxistandard.org

LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Keysight is a founding member of the LXI consortium.

www.pxisa.org

PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.

Three-Year Warranty

www.keysight.com/find/ThreeYearWarranty
Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.

Keysight Assurance Plans

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Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.

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www.keysight.com/find/tdlte

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www.keysight.com/find/contactus

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