

TECHNICAL
OVERVIEW

T4010S Conformance Test System



Overview

The Keysight Technologies, Inc. T4010S conformance test systems includes LTE and LTE-Advanced carrier aggregation (CA), RF and RRM conformance testing, NB-IOT RF, CAT-M1 RF, RF solutions for design verification and pre-conformance of LTE and NB-IOT & CAT-M1 device. The system goes beyond 3GPP-defined LTE RF and RRM conformance test cases, offering a wide range of supplementary test plans required for network operator acceptance as well as support of Regulatory for Europe EN 301 908-13. Compared to competing RF and RRM test systems, the T4010S is the easiest to use test platform available.

Conformance testing

The T4010S conformance test system caters to the specific needs of laboratories at UE and chipset manufactures and third-party certification test houses. It provides a comprehensive set of tools that helps you through the process of entering UE-under-test data into the test system, defining the test plan to be executed, configuring the system to execute the tests according to the specific UE characteristics, analyzing the tests results, and producing the associated test reports.

With an ever-increasing number of bands and frequency combinations, plus the need to support an expanding set of GCF and PTCRB test cases, Keysight is dedicated to an ongoing program of development and validation to make the Keysight T4010S test platform an invaluable and efficient asset for your test laboratory.

Design verification

To address the unique testing needs of baseband and RF hardware developers, the system provides a comprehensive set of test cases following the 3GPP 36.521-1 test specifications for out-of-the-box pre-conformance testing of LTE and NB-IOT and CAT-M1 UE designs.

During the early phases of development, the T4010S DV system lets you create or customize test cases to verify LTE and NB-IOT and CAT-M1 UE RF parametric design characteristics, preventing costly redesigns and modifications in later project phases. That increases confidence and reduces the time-to-market for new LTE and NB-IOT and CAT-M1 UE designs. Its modularity and flexibility also make the system an ideal tool for quality assurance and manufacturing screening.

Key features

The Keysight T4010S conformance test system has the capabilities you need to speed your LTE and NB-IOT and CAT-M1 designs to market:

- Easy-to-use test campaign management environment streamlines test execution and result analysis through design verification, conformance test, and supplementary testing.
- Reduced operation and maintenance costs—uses the most efficient hardware architecture on the market in terms of testing coverage with standard hardware supporting all active LTE, NB-IOT, FDD CAT-M1 frequency bands and duplex modes.
- Automated and unattended RF path compensation procedures.
- Clear and immediate access to the test results, including export to different formats (html, CSV, and XML) for extended analysis and archival.
- Test beyond the scope of 3GPP conformance. Configure test conditions and LTE signaling to customize your test plan with ease.

Complex testing made simple

This integrated RF and RRM solution will help you from the design and verification stages up to certification of the final product, including operator's acceptance test plans. Your complex testing is made simple thanks to the T4010S configuration options, ease of use, and automation capabilities.

Accelerate Your Time to Market

Complete 3GPP test case coverage for RF and RRM according to GCF and PTCRB requirements

The T4010S E7515A-based system (GCF/PTCRB TP 195) provides you with the complete set of 3GPP TS 36.521-1 LTE and NB-IOT RF, CAT-M1 RF and 3GPP TS 36.521-3 LTE RRM conformance test cases, validated according to GCF and PTCRB requirements. These test cases include all the duplex/band/bandwidths combinations needed for certification purposes, including bands with different channel bandwidths requirements for GCF and PTCRB. And, as new requirements emerge, Keysight continues to add test cases. For an up to date list of validated tests, please contact Keysight Technologies.



Complete set of RF measurement procedures for UE characterization

As part of design verification the system provides you with a complete set of standard and frequency band-independent test procedures that you can customize. These test procedures cover the complete set of measurements typically required to characterize LTE and NB-IOT and CAT-M1 UEs including:

- Power and power control measurements
- Global in-channel measurements
- Receiver measurements
- Receiver performance measurements
- CQI, sub-band CQI, and PMI reporting measurements
- Occupied bandwidth, spectrum mask, and adjacent channel leakage power ratio measurements
- Blocking and intermodulation measurements
- Sustained data rate performance measurements
- feICIC/elCIC

Integration of E7515A UXM wireless test set

The T4010S system is built around the Keysight Technologies, Inc. E7515A UXM wireless test set, extending the UXM functionality to pre-conformance and conformance testing. It also adds following features:

- Receiver test capabilities including flexible channel definitions and closed-loop testing
- Frequency division duplex (FDD) and time division duplex (TDD) options
- Integrated fading
- Out of the channel measurements (OBW, SEM, ACLR)

T4010S conformance test system is based on the E7515A UXM wireless test system and includes the following:

- Support for 1CC, 2CC, 3CC, 4CC band combinations and beyond
- Sustained data rate
- Scalable solution from one box to full system
- Dual-feed antenna UE support
- 2CC FDD/TDD CA intra-band contiguous/non-contiguous inter-band UL CA, and mixed mode test cases
- UL CA 64QAM test cases
- feICIC/elCIC test cases
- 3CC FDD/TDD and mixed mode test cases
- 256QAM DL test cases
- 4CC test cases
- NB-IOT test cases
- CAT-M1 test cases
- 4RX Antenna test cases
- HPUE test cases

Compact and Scaleable Platform

The Keysight T4010S conformance test system can be scaled to your requirements to support both RF CT and DV, and RRM test cases.

Bench-top configuration

To make it easy to adapt to your changing needs, scalability is one of the key aspects of the T4010S. There are two different bench-top configurations available.

A single E7515A wireless test system can generate up to two component carriers and enable testing of in-channel characteristics of the UE's transmitter and receiver, receiver performance, CSI tests, spurious emission, ACLR, SEM, OBW, as well as TDD CA and sustained data rate test cases.

- The single box solution can be easily upgraded to a higher coverage bench-top configuration by adding another E7515A and T1255A LTE multicell combiner unit in order to cover three and four component carrier test cases. Also, this configuration offers dual feed UE antenna support.

Full test system configuration

These configurations are capable of the broadest range of testing, including all UE RF characteristics, adding in-band and out-of-band blocking, intermodulation, transmitter and receiver spurious tests for two, three, and four component carriers. Also, this configuration offers dual feed UE antenna support.

Full rack configurations



T4010S-H33

Dual cell racked configuration

T4010S-H34

Quad cell racked configuration

Benchtop configurations



T4010S-H21

Dual cell benchtop configuration

T4010S-H22

Quad cell benchtop configuration

Create and Customize Your Test Plans with Ease

The Keysight T4010S features an intuitive and easy to use set of software tools to support the whole testing cycle:

- Test case parametrization
- Test project creation and execution
- Results analysis

You can select the test cases or the TAP plans to be executed from within the test case libraries developed and validated by Keysight Technologies as well as from TAP libraries. Different versions of these libraries can be installed at any time for maximum convenience. Simple drag-and-drop operations make it easy to select which test cases to run and the chosen sequence of tests can be saved as a custom test plan for later reuse. Test plans saved can be updated to the last specification versions and estimated testing time is also indicated. Frequency band, channel bandwidth, specific frequency channels, and extreme condition testing settings are automatically configured by the test system based on simple dialog boxes provided by the test system. UE parameters are checked and configured automatically by the test system as well.

When test execution parameters need to be modified, it can easily be done using the test campaign editor window within the project management tool. You can also select a set of parameters for direct modification, allowing test case customization.

Parameters related to the UE automation, power supply, climate chamber management, and automatic tests retrieval can be set by the test system operator. In addition to the T4010S CT system, these parameters are common to most Keysight testing products.

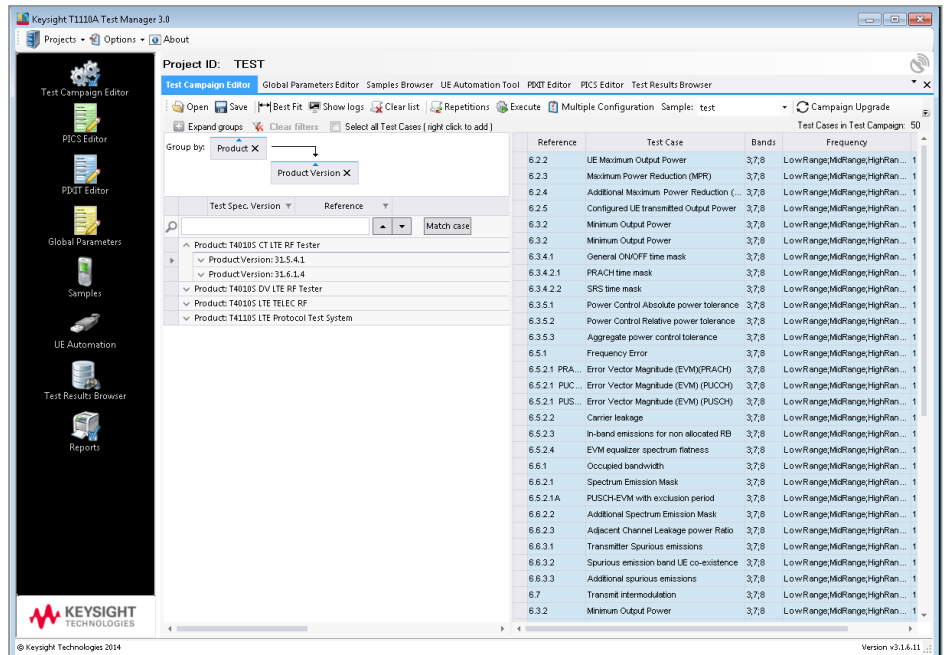


Figure 1. Test plan generation

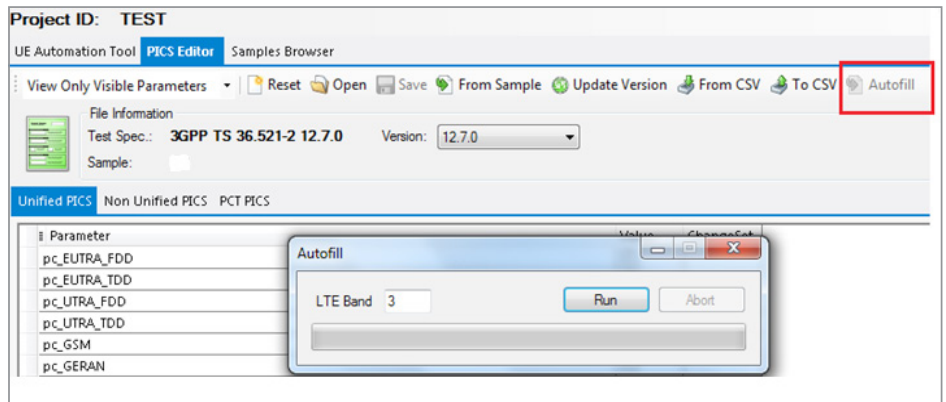


Figure 2. Automatic PICS filling

Once the tests have been performed, Keysight test systems provide data analysis tools and allow the export of the data to several formats (.html, .csv, .xml, and others) for easy exchange with all the involved parties.

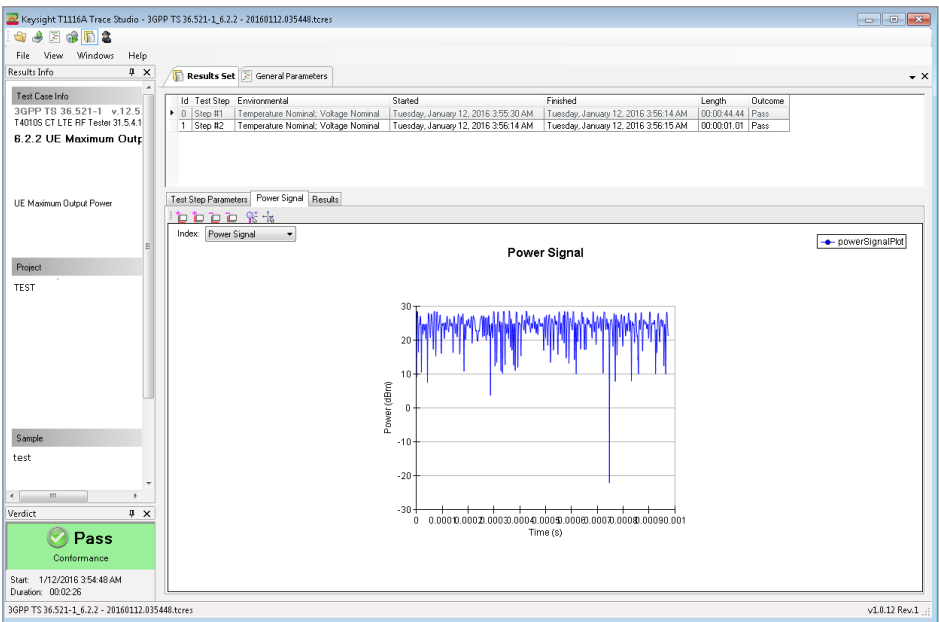


Figure 3. Results analysis (graphic view)

When common interoperability issues arise such as protocol IOT problems between the UE and the test system, the trace/log analysis tool delivered with the T4010S CT system provides data views such as log, tabular, and MSC. Its message decoding capabilities and the depth of the collected data make identifying and resolving issues fast and easy.

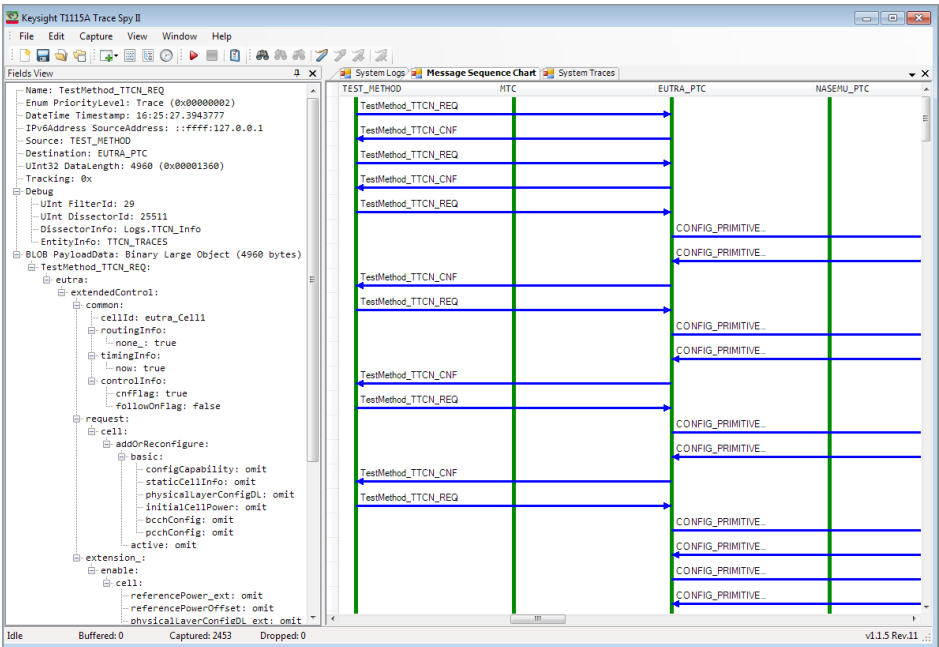


Figure 4. Protocol analysis (MSC view)

Test System Technical Information

Configuration	Dimensions W x H x D	Weight
1: Dual-cell bench-top	435 x 305 (321 with feet) x 445 (504 with handles)	50 kg
2: Quad-cell bench-top	1500 x 305 (321 with feet) x 445 (504 with handles)	110 kg
4: Dual-cell full rack	600 x 1650 x 900 (+500 with keyboard tray)	265 kg
4: Quad-cell full rack	1200 x 1650 x 900 (+500 with keyboard tray)	415 kg

General Data

Environmental conditions	
Temperature	
– Storage	–10 to 50 °C
– Operating	5 to 40 °C
– Operating temperature after RF calibration	20 to 35 °C
	5 to 85% (non-condensing)
Humidity	
– Altitude operating range	Up to 2000 m
Electrical safety	Complies with European Low Voltage Directive 2006/95/EC IEC/EN 61010-1, 3rd Edition CAN/CSA-C22.2 No. 61010-1-12 UL Std. No. 61010-1 (3rd Edition)
EMC	Complies with European EMC Directive 2004/108/EC: – IEC/EN 61326-1 – CISPR Pub 11 Group 1, class A – AS/NZS CISPR 11 – ICES/NMB-001 This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme à la norme NMB-001 du Canada.
Frequency range	Defined by 3GPP E-UTRA operating bands FDD and TDD
Input and output connector	N-type 50 ohms
Supported bandwidths	1.4, 3, 5, 10, 15, 20 MHz

Supported Test Standards

The system design is based on the following standards:

- 3GPP TS 36.521-1
- 3GPP TS 36.521-3
- 3GPP TS 36.508
- 3GPP TS 36.509
- 3GPP TS 36.521-2

Learn more at: www.keysight.com

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