

Keysight Technologies

T4110S LTE Protocol Tester



Technical Overview

Introduction

The T4110S LTE Protocol Tester is the Keysight Technologies, Inc. test platform for Protocol conformance testing of LTE devices.

The T4110S belongs to the Keysight LTE product family and, as the other Keysight LTE Test Platforms, is based on the T2010A LTE Wireless Communication Test Set.

The T4110S LTE Protocol Tester provides a set of powerful tools specifically designed for helping users in their conformance testing projects. These conformance tools allow users to enter the information about the User Equipment (UE) and its main features supported, the definition of test plans to be executed, including the customization of test campaigns according to products features, the automatic execution of these test campaigns without user intervention, and the analysis and reporting of the results obtained.

The T4110S LTE Protocol Tester is the perfect tool for in-house and third party test laboratories, as well as LTE device vendors wanting to pre-test the LTE Protocol Conformance test cases.

The T4110S is an official recognized test platform in both GCF and PTCRB Certification Programs, and it is validated in all major LTE Bands against the 3GPP TS 36.523-1 specification.

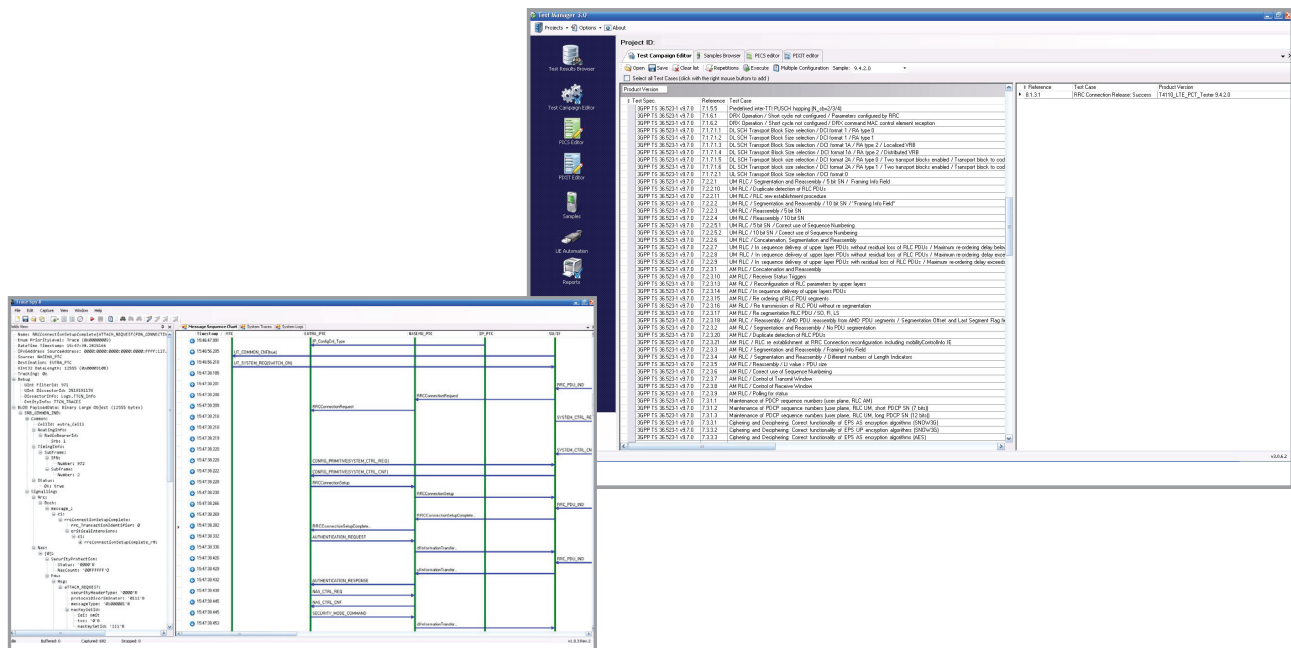
Since it is based in the same hardware platform as the other LTE conformance test systems supplied by Keysight, the T4110S is the perfect tool for being combined with the T4010S LTE RF tester and T4020S LTE RRM tester, in order to provide an unique test system, supporting the widest range of LTE Conformance Test Cases with the most compact possible architecture.



Features Highlights

The main Keysight T4110S LTE Protocol Tester features are listed below:

- More than 80% coverage of GCF/PTCRB Protocol LTE Test Cases with just one dual cell T2010A unit (*).
- Complete coverage of the 3GPP 36.523-1 LTE Protocol conformance test cases with two T2010A units.
- Same hardware configurations as T4020S LTE RRM Tester, allowing software only upgrade between both products, as well as simultaneous support of them in a single hardware setup.
- The T2010A unit allows the additional support of 70% of 3GPP 36.521-1 LTE RF Conformance test cases with just software upgrade.
- LTE FDD, TDD, Inter-band and multi-RAT support in the same hardware platform.
- Easy to use test project management environment for streamlined testing execution and results analysis.
- Powerful test case results and logs analysis tools.
- All hardware configurations support all LTE defined frequency bands up to 3 GHz.
- Complete GCF and PTCRB validated test case coverage, with further ongoing validation efforts to increase validated test case and band coverage as new requirements are introduced.
- Reduced operation and maintenance costs, through the use of the most compact and equipment efficient hardware architecture in the market in terms of testing coverage.
- Test system UE automation capabilities allowing unattended operation of the test system, freeing engineering resources.
- The reporting capabilities of the test system enables clear and direct access to the test result information, providing export capabilities to different formats.



(*) Information based in the latest GCF/PTCRB test cases coverage dated August 2012. Please note that the GCF/PTCRB scope might change with the addition and/or modification of the existing conformance test cases.

Characteristics

3GPP test case coverage according to GCF and PTCRB requirements

The T4110S LTE Protocol Tester (GCF/PTCRB test platform number 94) provides users with the 3GPP TS 36.523-1 conformance test cases, validated according to GCF and PTCRB requirements. For an up to date list of validated tests, please, contact Keysight.

These test cases are provided for all band/bandwidths combinations needed for certification purposes, including bands with different channel bandwidths requirements for GCF and PTCRB.

Also, with just one T2010A unit plus the Keysight T1530A Combiner Unit, more than 80% of the current GCF/PTCRB Protocol LTE test cases scope can be covered.

Easy upgrade options to introduce LTE RF and LTE RRM testing capabilities

The T4110S LTE Protocol Tester can be easily upgraded, by means of just a software option package upgrade, to support the 3GPP TS 36.521-1 LTE RF test cases and TS 36.521-3 LTE RRM test cases, covered in both Keysight T4010S LTE RF Tester and T4020S LTE RRM Tester.

A T4110S platform configuration based on one T2010A unit plus the T1530A Combiner Unit, can cover more than 70% LTE RF test cases and more than 96% LTE RRM test cases of the current GCF/PTCRB requirements (*).

Versatile and cost-effective hardware

The T4110S LTE Protocol Tester is built around the T2010A LTE Wireless Communications Test Set. This powerful multi-RAT network emulator

integrates FDD and TDD LTE network emulator for all 3GPP defined bands and bandwidths, up to 3 GHz, providing the most comprehensive LTE Protocol conformance testing capabilities in a single box configuration.

For those test cases requiring more than one cell, an external combiner unit is provided. The T1530A Combiner Unit is used to interconnect the different cells required with the power levels and timing adjustment required in the Protocol test cases.

Compared to competing LTE Protocol test systems, the T4110S LTE Protocol Tester is the most compact and equipment-efficient test platform available. This leads to reduced maintenance/calibration costs, minimum power consumption (operation costs) and fewer laboratory requirements.

Comprehensive test system automation capabilities

The T4110S LTE Protocol Tester has been designed with automation in mind, enabling unattended operation to maximize laboratory productivity.

The test system can be configured to automatically control the UE under test, using AT commands. Furthermore, the T4110S can be easily configured to use non-standard, UE-specific command sets.

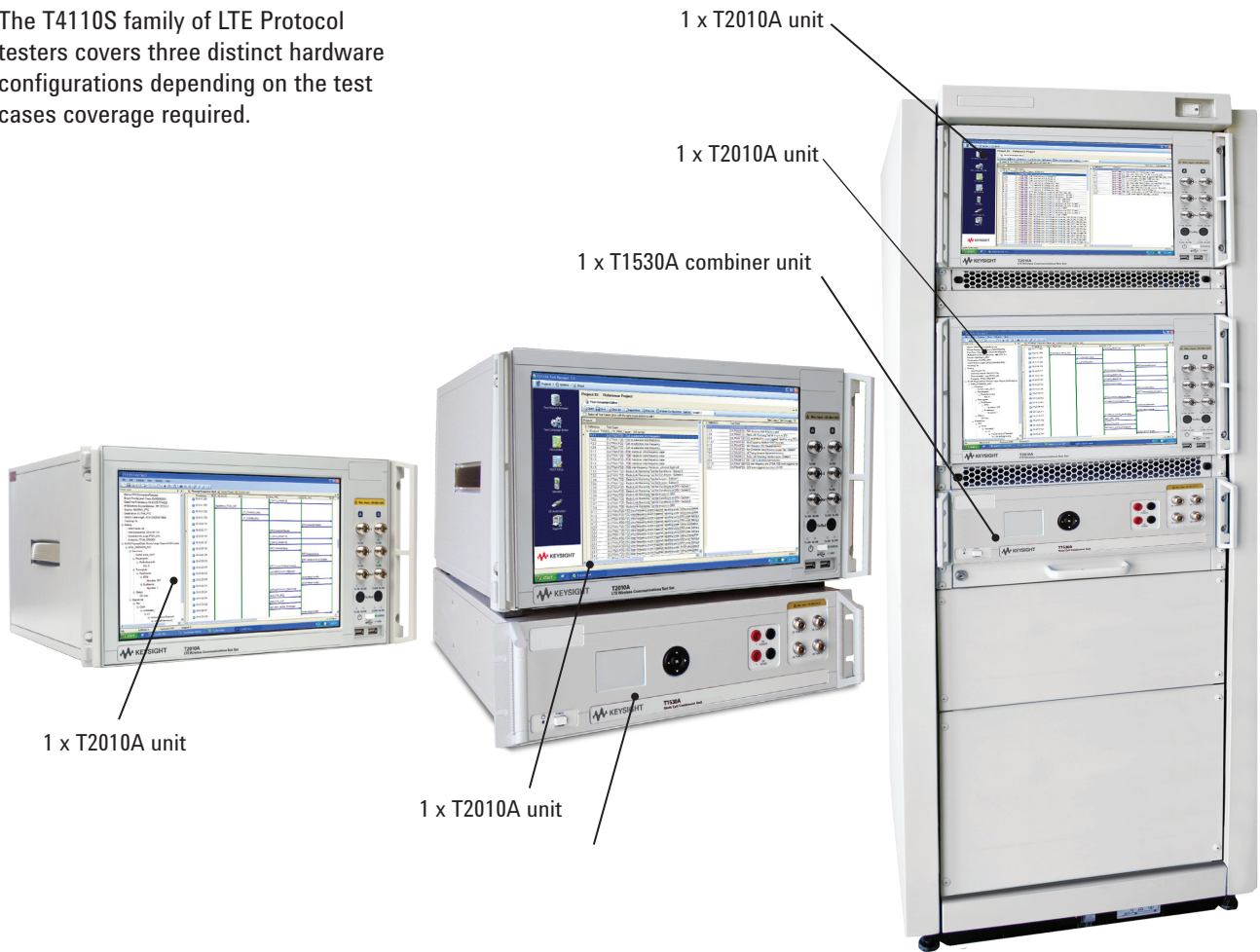
Additionally, for those customers with more involved UE automation needs, Keysight provides access to the API used by the tester to implement the UE automation capabilities, enabling customers to develop their own UE drivers to automate the execution of the tests.



(*) Information based in the latest GCF/PTCRB test cases coverage dated August 2012. Please note that the GCF/PTCRB scope might change with the addition and/or modification of the existing conformance test cases.

System Components

The T4110S family of LTE Protocol testers covers three distinct hardware configurations depending on the test cases coverage required.



One T2010A unit with a single cell configuration

Based in a single T2010A LTE Wireless Communications Test Set equipped with one cell, this configuration enables testing of more than 60% of the Protocol LTE conformance test cases under the scope of the GCF/PTCRB Certification schemes.

One T2010A unit with a dual cell configuration

Composed by a single T2010A LTE Wireless Communications Test Set equipped with two cells, this configuration enables testing of more than 80% of the Protocol LTE conformance test cases under the scope of the GCF/PTCRB Certification schemes.

Two T2010A units configuration

Housed in a single rack, this configuration includes two T2010A units for those scenarios requiring more than two cells.

User interface

The T4110S LTE Protocol Tester is delivered with an intuitive and easy to use set of software tools to support the whole testing cycle; from test project creation to results analysis through test execution.

Users are able to select the test cases to be executed from within the test case libraries developed and validated by Keysight. Different versions of these libraries can be installed at any one time for maximum convenience.

Simple drag and drop operations allow the user to select which test cases shall be run. This sequence of tests can be saved as a custom test plan, for later reuse.

Parameters related to the UE automation and automatic tests retrieval can also be set by the test system operator. These are not specific to the T4110S system only, but common to most Keysight testing products.

Once the test has been performed, Keysight test systems provide data analysis tools, allowing the export of the data to several formats for easy exchange with all the involved parties.

In terms of the results information provided after the execution of test cases, very often during development

it is necessary to debug issues that prevent the measurement process itself to take place. These issues are normally related to protocol IOT problems between the UE and the test system, either due to incorrect configuration of test system/UE or due to implementation problems.

The trace/log analysis tool delivered together with the T4110S LTE Protocol Tester allows quick identification of these issues thanks to its several data views (log, tabular, MSC, etc...) its message decoding capabilities and the depth of the collected data.

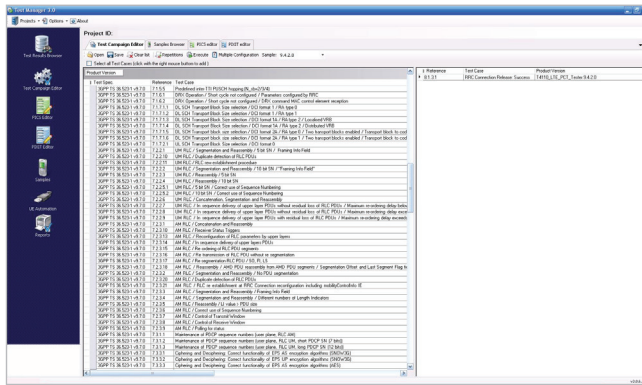


Figure 1. Test plan generation

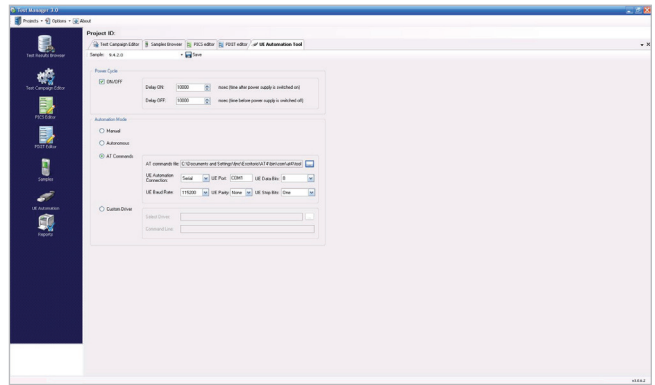


Figure 2. UE automation tool

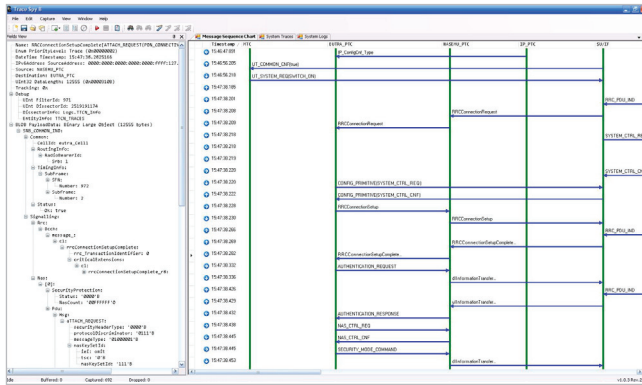


Figure 3. Protocol analysis (MSC view)

Time	Message	Details
18436.000	RRC_CONNECTION_REQUEST	...
18436.000	RRC_CONNECTION_SETUP_REQUEST	...
18436.000	RRC_CONNECTION_SETUP_COMPLETE	...
18436.000	RRC_CONNECTION_SETUP_FAILURE	...
18436.000	RRC_CONNECTION_REJECT	...

Figure 4. Protocol analysis (tabular view)

Appendix 1. Technical Specifications

3GPP LTE eNodeB transmitter

Supported frequency bands		
	FDD	Bands 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 23, 24, 25, 26 and 27
	TDD	Bands 33, 34, 35, 36, 37, 38, 39, 40 and 41
Supported bandwidths		
		1.4, 3, 5, 10, 15 and 20 MHz
Supported cyclic prefix		
		Normal, extended
Supported carrier spacing		
		15 kHz
Output level range for connector configured as		
	TX	-110 to 0 dBm
	TX/RX	-110 to -7 dBm
Output level resolution		
		0.1 dB
Supported MIMO configuration		
		2x2, 4x2

3GPP LTE eNodeB receiver

Supported frequency bands		
	FDD	Bands 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 23, 24, 25, 26 and 27
	TDD	Bands 33, 34, 35, 36, 37, 38, 39, 40 and 41
Input level range		
		+26 to -50 dBm

Appendix 2. Ordering Information

T4110S hardware options

Option	Description
T4110S-H00	T4110S LTE protocol conformance tester single cell T2010A configuration
T4110S-H01	T4110S LTE protocol conformance tester dual cell T2010A configuration
T4110S-H02	T4110S LTE protocol conformance tester triple cell T2010A configuration

T4110S platform software options

Option	Description
T4110S-SOP	T4110S LTE protocol operational software package

T4110S software options

Option	Description
T4110S-C00	Batch 1 single-cell LTE FDD test cases, GCF P1
T4110S-C01	Batch 2 single-cell LTE FDD test cases, GCF P2
T4110S-C02	Batch 3 single-cell LTE FDD test cases, GCF P3
T4110S-C03	Batch 4 single-cell LTE FDD test cases, GCF P4
T4110S-C04	Batch 1 Single-cell Rel9 LTE FDD test cases
T4110S-C10	Batch 1 dual-cell LTE FDD test cases, GCF P1 and P2
T4110S-C11	Batch 2 dual-cell LTE FDD test cases, GCF P3 and P4
T4110S-C12	Batch 1 dual-cell LTE FDD-UTRAN inter-RAT test cases
T4110S-C13	Batch 2 Dual-cell LTE FDD-UTRAN inter-RAT test cases
T4110S-C14	Batch 1 Rel9 Dual-cell LTE FDD-TDD intermode test cases
T4110S-C15	Batch 1 Dual-cell Rel9 LTE FDD-FDD test cases
T4110S-C30	Batch 1 triple-cell LTE FDD test cases , GCF P1, P2, P3, P4
T4110S-C31	Batch 1 triple Cell LTE FDD-UTRAN inter-RAT test cases
T4110S-C32	Batch 2 Triple Cell LTE FDD-UTRAN inter-RAT test cases
T4110S-C33	Batch 1 Rel9 Triple Cell LTE FDD-TDD intermode test cases
T4110S-C34	Batch 1 Rel9 Triple Cell LTE FDD-FDD test cases
T4110S-C50	Batch 1 single-cell LTE TDD test cases, GCF P1
T4110S-C51	Batch 2 single-cell LTE TDD test cases, GCF P2
T4110S-C52	Batch 3 single-cell LTE TDD test cases, GCF P3
T4110S-C53	Batch 4 single-cell LTE TDD test cases, GCF P4
T4110S-C60	Batch 1 dual-cell LTE TDD test cases, GCF P1 and P2
T4110S-C61	Batch 2 dual-cell LTE TDD test cases, GCF P3 and P4
T4110S-C80	Batch 1 triple-cell LTE TDD test cases, GCF P1, P2, P3, P4

Appendix 2. Ordering Information (continued)

T4110S frequency band support options

Option	Description
T4110S-Bxx	T4110S band xx support package (FDD/TDD)

T4110S support options

Option	Description
T4100SC	Support services and contracts for LTE systems

Other Keysight Test Systems

Keysight test systems portfolio offers a broad range of wireless technologies testing solutions, including:

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