Overview

The Keysight Technologies, Inc. T4020S family of automated test systems includes LTE and LTE-Advanced carrier aggregation (CA) RRM solutions for design verification and conformance testing of LTE user equipment (UE). The T4020S family is a validated test platform enabling the execution of 3GPP-defined LTE RRM conformance test cases plus supplementary test plans that go beyond the scope of RRM conformance.

The T4020S LTE RRM test system provides powerful tools specifically designed to help you with your conformance testing projects. Using these tools, you can enter information about the features of the UE and define the test plan. Using T4020S LTE RRM tools you can customize the test plan to your needs and run test campaigns automatically, eliminating user intervention. Final analysis of the device’s performance is simplified using the test report of obtained results.

The T4020S LTE RRM test system is the perfect tool for in-house and third party test laboratories, as well as LTE device vendors wanting to pre-test the LTE RRM conformance test cases.

- Officially recognized test platform in both GCF and PTCRB certification programs. Validated in all major LTE bands against the 3GPP TS 36.521-3 specification.

- Easy-to-use test campaign environment streamlines test execution and result generation.

- Standard hardware supports all active LTE frequency bands and duplex modes up to 3 GHz.

- Reduced operation and maintenance costs—the most compact and efficient hardware architecture on the market in terms of testing coverage.

- T4020S RRM test capability can be combined with the Keysight T4010S LTE RF test system and T4110S LTE protocol test system.
Key Features

T4020S LTE RRM test system includes:

- Complete GCF and PTCRB validated test case coverage, with further on-going validation efforts to increase validated test cases and band coverage as new requirements are introduced.
- Supplementary RRM test plans simplify the task of network operator acceptance.
- Same hardware configurations as T4110S LTE protocol tester, allowing software only upgrade, LTE-A carrier aggregation.
- Reduced operation and maintenance costs, through the use of the most compact and equipment-efficient hardware architecture on the market in terms of testing coverage.
- All hardware configurations support all LTE-defined frequency bands up to 3 GHz.
- LTE FDD, TDD, LTE-A carrier aggregation, and multi-RAT support in the same hardware platform.
- Easy-to-use test project management environment for streamlined test execution and results analysis.
- The reporting capabilities of the test system enable clear and direct access to the test result information, providing export capabilities to different formats.
- Test system UE automation capabilities allowing unattended operation of the test system, freeing engineering resources.
- Automated and unattended RF path compensation procedures.
3GPP test case coverage according to GCF and PTCRB requirements

The T4020S LTE RRM test system (GCF/PTCRB test platform number 112) provides you with the complete set of 3GPP TS 36.521-3 conformance test cases, validated according to GCF and PTCRB requirements. For an up to date list of validated tests, please, contact Keysight Technologies.

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 test set plus the Keysight T1530A combiner unit, more than 95% of the current GCF/PTCRB RRM LTE test cases can be covered.

Now supporting LTE-A carrier aggregation testing capabilities

Using the T4020S LTE RRM test system with two T2010A test sets and a T1530A combiner provides a solution with RRM carrier aggregation conformance test cases for testing the latest LTE-A carrier aggregation requirements defined by the 3GPP.

Versatile test platform

The T4020S LTE RRM test system is built around the T2010A LTE wireless 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 and LTE-A RRM 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 RRM test cases.

Compared to competing LTE RRM test systems, the T4020S 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.

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

Using a software option package, the T4020S LTE RRM test system is easy to upgrade. It provides support for the 3GPP TS 36.521-1 LTE RF test cases and TS 36.523-1 LTE protocol test cases, covered in both the T4010S LTE RF test system and T4110S LTE protocol test system.

A T4020S platform configuration based on one T2010A LTE wireless test set plus the Keysight T1530A combiner unit, can cover 70% LTE RF test cases and more than 84% LTE protocol test cases of the current GCF/PTCRB requirements*.

* Information based in the latest GCF/PTCRB test cases coverage dated August 2013. Please note that the GCF/PTCRB scope might change with the addition and/or modification of the existing conformance test cases.
Compact and Scaleable Platform

The Keysight T4020S LTE RRM test platform can be scaled as appropriate to your test-coverage requirements.

One T2010A with a single cell configuration
Based in a single T2010A LTE wireless test set equipped with one cell, this configuration enables testing of more than 18% of the RRM LTE conformance test cases under the scope of the GCF/PTCRB certification schemes.

One T2010A with a dual cell configuration
Composed of a single T2010A LTE wireless test set equipped with two cells, this configuration enables testing of more than 95% of the RRM LTE conformance test cases under the scope of the GCF/PTCRB certification schemes.

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

This configuration also supports the recently-introduced LTE-A inter-band carrier aggregation RRM test cases.
User Interface

The T4020S LTE RRM test system is delivered with an intuitive and easy to use set of software tools to support the complete testing cycle; from test project creation through test execution to results analysis.

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 you to select which test cases shall be run. This sequence of tests can be saved as a custom test plan for later reuse.

Frequency band, channel bandwidth, and extreme condition testing settings are automatically configured by the test system based on simple dialog boxes provided by the test system.

Finally, parameters related to the UE automation, power supply, climatic chamber management, and automatic tests retrial can also be set by the test system operator. These are not specific to the T4020S system only, but common to most Keysight testing products.

Once the test has been performed, Keysight test systems provide data analysis tools, and allow 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 in the T4020S LTE RRM test system 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.
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, 27, 30, and 31
  - **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**
  - **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, 27, 30, and 31
  - **TDD**
    - Bands 33, 34, 35, 36, 37, 38, 39, 40, and 41

- **Input level range**
  - +26 to –50 dBm

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Note: For further details about the test cases packages contents, please contact Keysight Technologies.
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## Other Keysight Test Systems

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

- Bluetooth®
- LTE
- RFID, NFC
- GSM, GPRS, EDGE
- UMTS, HSPA
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