

Keysight Technologies

T4020S LTE RRM Test System

Technical Overview



Overview

The T4020S LTE RRM test system is the Keysight Technologies, Inc. test platform for LTE RRM conformance testing of LTE devices. The T4020S belongs to the Keysight LTE product family and, as the other Keysight LTE test platforms, is based on the T2010A broadband wireless test set.

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 device under test (DUT) and define the test plan. It also provides you with the ability to customize test's features. Using T4020S LTE RRM tools you can 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.

The T4020S is an officially recognized test platform in both GCF and PTCRB certification programs, and it is validated in all major LTE bands against the 3GPP TS 36.521-3 specification.

By combining the T4020S with the Keysight T4010S LTE RF test system and T4110S LTE protocol test system you can create a unique test system that supports the widest range of LTE and LTE-Advanced conformance test cases. Since these test devices share the same hardware platform, the solution also provides the most compact architecture possible, lowering your operating and maintenance costs.

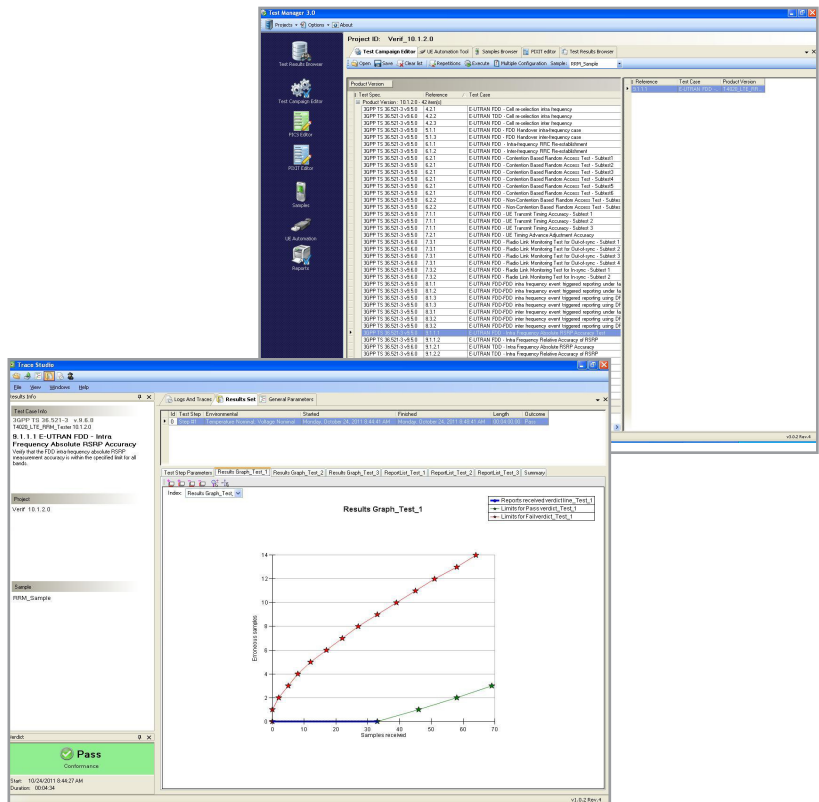


Main Features

T4020S LTE RRM test set features include:

- More than 95% coverage of GCF/PTCRB RRM LTE test cases with just one dual-cell T2010A unit*.
- Complete coverage of the 3GPP 36.521-3 LTE and LTE-A RRM conformance test cases with two T2010A units.
- Same hardware configurations as T4110S LTE protocol tester, allowing software only upgrade, LTE-A carrier aggregation.
- The T2010A unit supports 70% of 3GPP 36.521-1 LTE RF conformance test cases with just a software upgrade.
- 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.
- 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 cases 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 on the market in terms of testing coverage.
- Automated and unattended RF path compensation procedures.
- Test system UE automation capabilities allowing unattended operation of the test system, freeing engineering resources.
- The reporting capabilities of the test system enable 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 2013. Please note that the GCF/PTCRB scope might change with the addition and/or modification of the existing conformance test cases.



Characteristics

Versatile and cost-effective hardware

The T4020S LTE RRM test system is built around the T2010A broadband 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.

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 unit 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 units and a T1530A combiner provides a solution with RRM carrier aggregation conformance test cases for testing the latest LTE-A carrier aggregation test requirements defined by the 3GPP.

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 unit 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*.

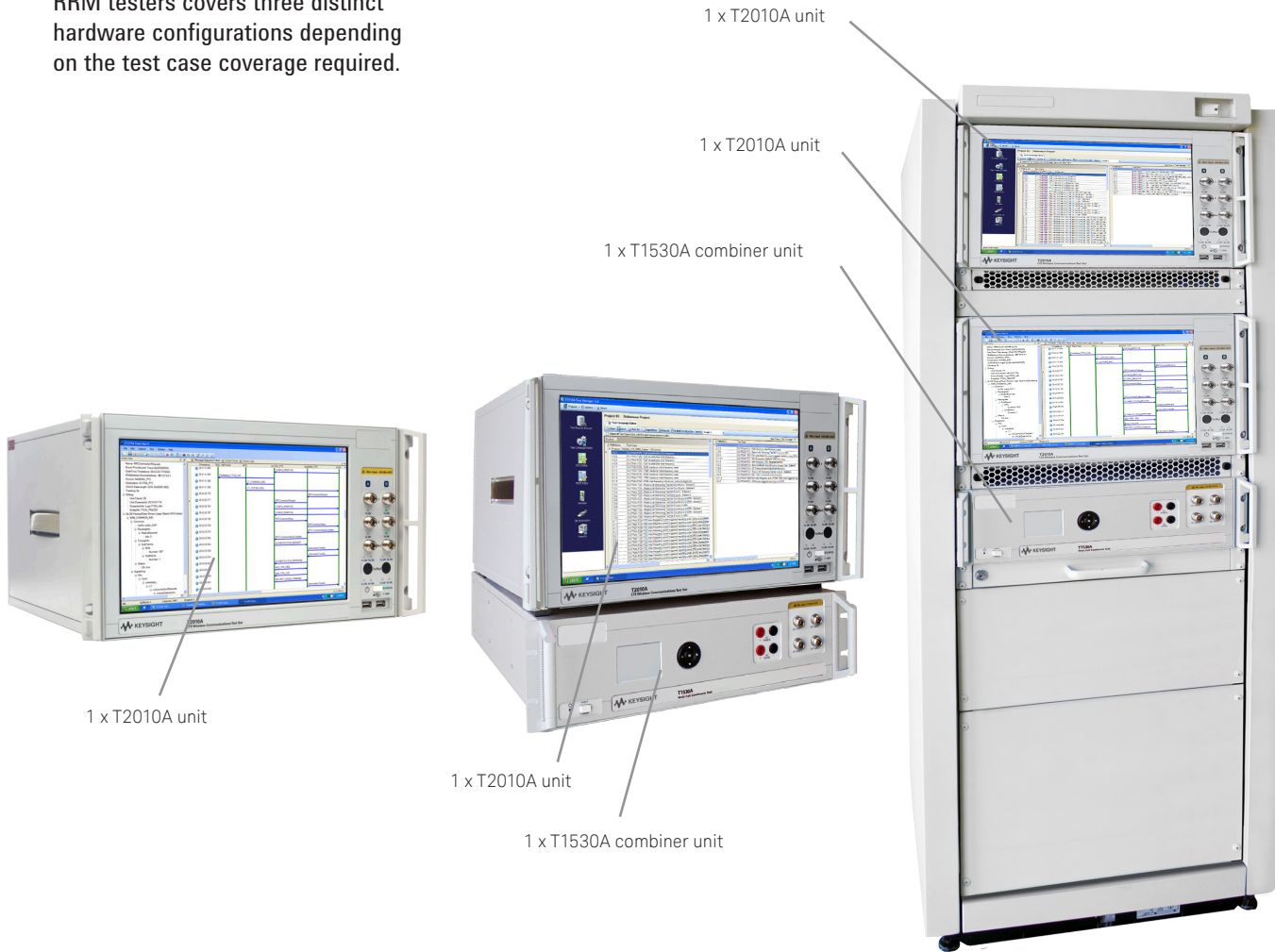
Comprehensive test system automation capabilities

The T4020S LTE RRM test system 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 T4020S can be easily configured to use non-standard, UE-specific command sets. Finally, 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 2013. Please note that the GCF/PTCRB scope might change with the addition and/or modification of the existing conformance test cases.

System Components

The Keysight T4020S family of LTE RRM testers covers three distinct hardware configurations depending on the test case coverage required.



One T2010A unit with a single cell configuration

Based in a single T2010A broadband 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 unit with a dual cell configuration

Composed of a single T2010A broadband 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 units configuration

Housed in a single rack, this configuration includes two T2010A units 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 to results analysis through test execution.

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 settings are automatically configured by the test system based on simple dialog boxes provided by the test system.

Finally, parameters related to the DUT automation, power supply, climatic chamber management, and automatic tests retrieval 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.

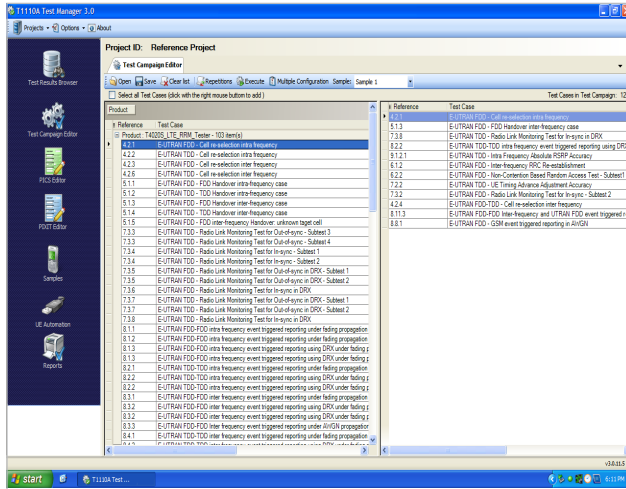


Figure 1. Test plan generation

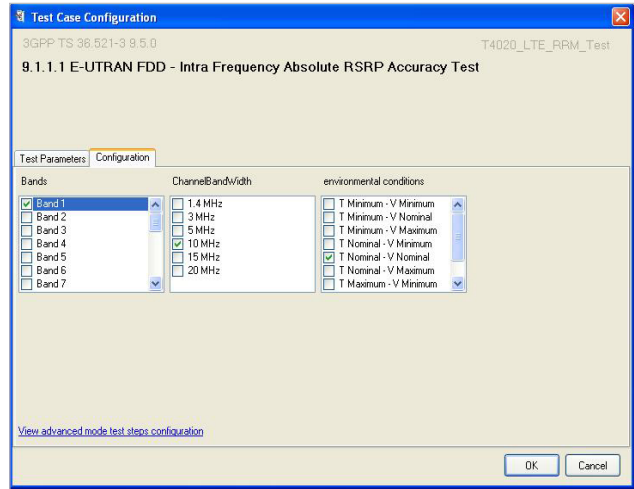


Figure 2. Test case execution - easy selection of execution parameters

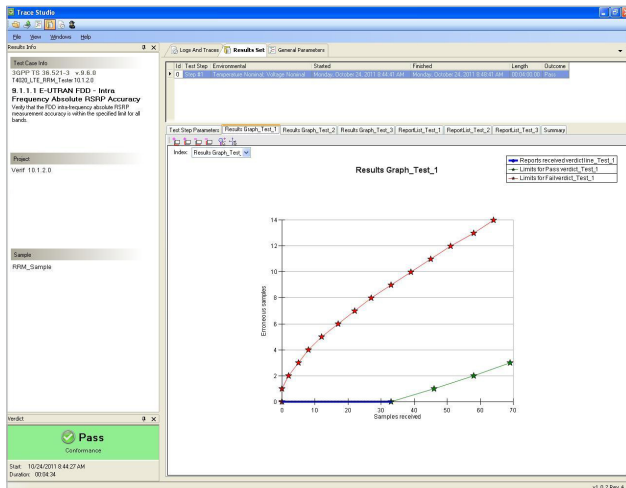


Figure 3. Results analysis (graphic view)

The screenshot shows the 'Trace Studio' window displaying test results in a tabular format. The table has columns for 'T', 'Su', 'Power Type', 'Inverion', 'TargetCell', 'CellPowerFwd', 'RequestPower', and 'Verdict'. The data shows multiple test runs for 'RSRP_Absolute' across different power levels (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33) and target cells (e.g., eutra_C42, eutra_C43, eutra_C44). All results are marked as 'Pass'.

T	Su	Power Type	Inverion	TargetCell	CellPowerFwd	RequestPower	Verdict
1	1	RSRP_Absolute	1	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	2	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	3	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	4	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	5	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	6	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	7	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	8	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	9	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	10	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	11	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	12	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	13	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	14	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	15	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	16	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	17	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	18	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	19	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	20	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	21	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	22	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	23	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	24	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	25	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	26	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	27	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	28	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	29	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	30	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	31	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	32	eutra_C42	RSRP_39	(26, 46)	Pass
1	1	RSRP_Absolute	33	eutra_C42	RSRP_39	(26, 46)	Pass

Figure 4. Results analysis (tabular view)

User Interface (continued)

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 DUT and the test system, either due to incorrect configuration of test system/DUT 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.

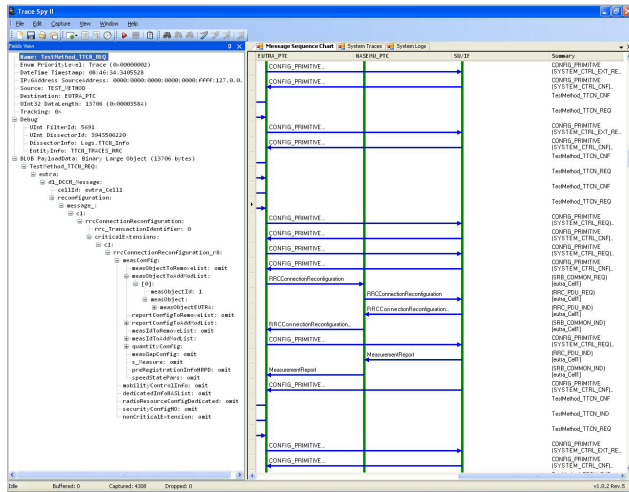


Figure 5. Protocol analysis (MSC view)

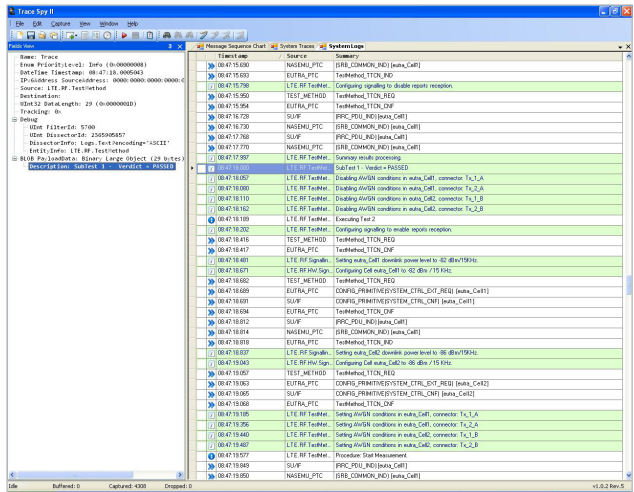


Figure 6. Protocol analysis (tabular view)

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

Ordering Information

Option	Description
T4020S hardware options	
T4020S-H00	T4020S LTE RRM conformance test system single-cell one-box-tester configuration
T4020S-H01	T4020S LTE RRM conformance test system dual-cell one-box-tester configuration
T4020S-H02	T4020S LTE RRM conformance test system triple-cell one-box-tester configuration
T4020S platform software options	
T4020S-SOP	T4020S LTE RRM operational software package
T4020S software options	
T4020S-C00	Single LTE FDD cell test cases
T4020S-C10	Dual LTE FDD – FDD cell test cases
T4020S-C11	Dual LTE FDD – UTRAN FDD cell test cases—Batch 1
T4020S-C12	Dual LTE FDD – UTRAN FDD cell test cases—Batch 2
T4020S-C13	Dual LTE FDD – TDD cell intermode Rel-9 test cases—Batch 1
T4020S-C14	Dual LTE FDD – FDD cell Rel-9 test cases—Batch 1
T4020S-C15	Dual LTE FDD – UTRAN FDD cell Rel-9 test cases—Batch 1
T4020S-C16	Dual LTE FDD – TDD cell intermode Rel-9 test cases—Batch 2
T4020S-C30	Triple LTE FDD cell test cases
T4020S-C31	Triple LTE FDD – UTRAN FDD cell test cases
T4020S-C32	Triple LTE FDD cell Rel-9 test cases—Batch 1
T4020S-C40	FDD Rel-10 CA RRM Inter-Band 1 UL test cases—Batch 1
T4020S-C50	Single LTE TDD cell test cases
T4020S-C60	Dual LTE TDD – TDD cell test cases
T4020S-C61	Dual LTE TDD – TDD cell Rel-9 test cases—Batch 1
T4020S-C80	Triple LTE TDD cell test cases
T4020S-C81	Triple LTE TDD cell test cases Rel-9 test cases—Batch 1

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

Ordering Information (continued)

Option	Description
T4020S CT frequency band support options	
T4020S-BX	T4020S Band X support package (FDD/TDD)
T4020S support options	
T4100SC	Support services and contracts for LTE systems

Other Keysight Test Systems

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