The fastest path to 5G mobile device certification

5G RF/RRM Conformance Toolset

Evolving with the Latest 3GPP RF/RRM Conformance Test Requirements

Around the world, commercial development and deployment of 5G technology is accelerating to address a wide range of exciting use cases for consumers and industry verticals. This means mobile device manufacturers need to gain early and continuous access to the latest Radio Frequency (RF), Radio Resource Management (RRM) and protocol conformance 3GPP test specifications for timely 5G NR device certification. Conformance tests adopted by certification bodies such as GCF (Global Certification Forum) and PTCRB help ensure commercial 5G devices comply to the latest 3GPP Release 15 specifications and operate as expected on mobile networks.

The 5G RF/RRM Conformance Toolset is part of Keysight’s 5G Network Emulation Solution portfolio that addresses the entire device development workflow – from early design, to acceptance and manufacturing. As a compact solution that supports the entire device certification process, Keysight’s 5G Network Emulation Solution easily scales to facilitate mobile device verification and certification across Radio Frequency (RF), radio resource management (RRM) and protocol. 5G RF/RRM Conformance Toolset enables users to certify new designs across both FR1 (sub-6GHz frequencies) and FR2 (mmWave frequencies).
Uncertainty surrounds every organization's ability to prove device compliance in time for crucial market windows while staying within cost targets. Although the inherent difficulties in testing mmWave devices are often well understood, 5G NR introduces additional complexities, leading to a need to better understand what to test and how to test it.

**Comprehensive Access to GCF and PTCRB RF/RRM Test Cases**

The 3GPP conformance test specifications cover three main classes of test cases for ensuring new 5G NR devices work correctly with the radio access network:

- Protocol
- Radio frequency (RF)
- Radio resource management (RRM)

The 5G RF/RRM Conformance Toolset provides up-to-date and comprehensive access to 3GPP conformance test cases validated according to GCF and PTCRB requirements. These include:

- RF transmission and reception: TS 38.521-1,38.521-2,38.521-3:
- Demodulation performance and reporting: TS 38.521-4
- Radio Resource Management (RRM): TS 38.533

Keysight's extensive solution support service provides 5G Conformance Toolset users with regular software releases of up-to-date test cases, including the latest industry-approved change requests. Each test case is fully validated for both GCF and PTCRB certification schemes.

**Complete set of pre-conformance test capabilities to test beyond conformance**

Pre-conformance testing enables users to customize and parameterize the 3GPP test cases beyond the certification requirements. This capability is valuable when verifying 5G NR UE RF parametric design characteristics and reduces the need for costly redesigns and modifications in later project phases.
The 5G RF/RRM Conformance Toolset uses the Keysight E7515B UXM 5G Wireless Test Platform to flexibly address a wide range of requirements and support a comprehensive set of 5G RF and RRM conformance test cases in FR1 and FR2 for both 5G non-standalone (NSA) and standalone (SA) modes. The UXM 5G integrates seamlessly with a Keysight E7770A Common Interface Unit and Keysight M1740A mmWave dual-band (28/39 GHz) Transceivers, and an Over-the-Air (OTA) test chamber to support an extended range of FR2 test cases.

Keysight 5G Network Emulation Solutions leverages a common set of building blocks, including the hardware platform, protocol stack, measurement libraries and software tools. This modular software and hardware approach means test system capabilities can be extended whenever required. This ensures consistency in results throughout the device R&D lifecycle, from early device prototyping and R&D, through to conformance and carrier acceptance testing.
Flexible Licensing Options

Keysight offers a wide range of license options to fit into your testing needs, allowing cost-effective use of assets:

<table>
<thead>
<tr>
<th>License Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node-locked</td>
<td>License may be used on one specified instrument</td>
</tr>
<tr>
<td>Transportable</td>
<td>License may be used on one instrument at a time but may be manually transferred to another via the Keysight Software Manager website</td>
</tr>
<tr>
<td>USB portable</td>
<td>License may be used on one instrument at a time but may be transferred to another via a USB dongle</td>
</tr>
<tr>
<td>Time-limited</td>
<td>Temporary licenses for a limited duration of 6 months, 24 months or 36 months</td>
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Keysight’s software solutions and licensing tools simplify the task of managing license usage, via the inclusion of features such as automatic reservation of licenses required by a test campaign, reservation of floating licenses for guaranteed availability on an individual test system, and automatic test case retries if the required license is currently in use.

Easily configure and execute campaigns and analyze test results

Keysight’s 5G RF/RRM Conformance Toolset consists of a suite of software tools to support the entire device certification process, covering:

- Device and parameter configuration ahead of testing
- Test case configuration
- Test plan creation and execution
- Device control and automation
- Logging and debug analysis
- Test results reporting
Simplify test campaign creation and test case configuration

Simple drag-and-drop operations make it easy for the user to select which test cases to run. 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 for pre-conformance mode, it can easily be done using the test campaign editor window within the project management tool.

Monitor test case progress

Messages exchanged between the device and test system are displayed in real time during test case execution, enabling users to monitor test case progress and immediately identify issues.

Quickly analyze test results

The Log Viewer logs all messages exchanged between the device and network simulator. It provides:

- Bookmarks to highlight key areas of interest when sharing logs with other teams;
- Customizable filters that allow different teams to investigate issues efficiently;
- Export options for other file formats and plug-ins that allow third party tools to be used for additional analysis.
Generate reports

The 5G RF/RRM Conformance Toolset allows the user to generate reports in different formats that summarize results obtained during device testing.
Tap into Keysight’s Proven mmWave and RF Test Expertise

At Keysight, we have been working with mmWave technologies for decades, creating off-the-shelf instruments such as our 110 GHz vector network analyzers and the 110 GHz UXA signal analyzer. In the wireless world, we applied this expertise to create the industry’s first 5G solutions and are now delivering 5G NR device acceptance solutions developed in collaboration with the major chipset vendors.

Keysight’s device acceptance solutions have a long track record of leading the market. This leadership was initiated with the introduction of GSM and has been extended through to the latest LTE-Pro technology.

Work with proven mmWave and conformance testing experts who understand the entire device R&D lifecycle, from R&D through to conformance and carrier acceptance testing. With expert assistance, you’ll be able to confidently test in accordance with the 5G specifications:

- Know WHAT to test and HOW to test it—accurately and repeatably
- Know what you CAN or CAN’T test, and why
- Know which type of solution will deliver what you need: chamber, hardware, software, and accessories

Take the fastest path to 5G device certification with Keysight’s 5G RF/RRM Conformance Toolset that provides the latest 3GPP test cases for quick and comprehensive testing.

Learn more at: www.keysight.com

For more information on Keysight Technologies’ products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus