

# Setting the standard in 5G NR

Keysight plays a pivotal role in advancing 5G test technology development and commercialization with leading contributions to key global wireless standards development organizations (SDOs) like 3GPP and CTIA as well as related organizations. Here are the highlights:

- **3GPP** – the 3rd Generation Partnership Project is developing the specifications that define 5G New Radio (NR) as well as refining earlier 3GPP generations
- **CTIA** – represents the U.S. wireless communications industry. CTIA and its members oversee certification programs, test labs and test plans
- **GCF** – Global Certification Forum manages conformance testing for European cellular standards
- **PTCRB** – a certification forum (similar to GCF) comprised of select leading North American cellular operators
- **NGMN** – aligning on mobile operator-focused needs from policy-makers as well as 3GPP
- **O-RAN Alliance** – leading the industry towards open, interoperable interfaces and RAN virtualization



“Keysight has contributed more to the development of 5G NR test standards than any other test vendor.”

—Roger Nichols, 5G Program Office Manager

Keysight’s contributions in 3GPP cover many test topics, including signaling, radio frequency (RF) measurements and over-the-air (OTA) test. Below are highlights of a few of Keysight’s key achievements in 3GPP RANWG 4 and RAN WG5.

## Key Achievements in 3GPP RAN WG4

- **Introduction of indirect far field (IFF) as permitted and subsequently de-facto user equipment (UE) RF test methodology:** Keysight introduced this concept for consideration to be a permitted test method and influenced 3GPP RAN4 to accept the compact antenna test range (CATR) as an IFF 5G OTA test method for UE conformance testing. The CATR methodology subsequently became the de-facto, industry baseline for New Radio (NR) Frequency Range 2 (FR2) UE RF testing.
- **Definition and measurement uncertainties (MU) Analyses of FR2 Measurement Grids:** Since all FR2 test cases are based on OTA tests, each test case requires at least one test point of a discrete set of measurement



points around the device under test (DUT). Keysight influenced RAN4 to accept the concepts of measurement grids for beam peak search, spherical coverage, and total radiated power (TRP) including integration quadratures.

- **3D MPAC (Multi-Probe Anechoic Chamber) test methodology for FR1 & FR2 NR MIMO OTA:** Keysight influenced RAN4 to accept the Multi Probe Anechoic Chamber (MPAC) test methodology as the baseline for NR FR1 and FR2 MIMO OTA testing.
- **RTS test methodology for NR FR1 MIMO OTA Testing:** Keysight influenced RAN4 to accept the Radiated Two Stage (RTS) test methodology as a harmonized methodology for NR FR1 MIMO OTA Testing.

## Key Achievements in 3GPP RAN WG5

- Collaboration with China Mobile results in **first GCF validation approval of 5G NR RF test cases using Standalone Mode (SA)**
- **Industry First TTCN-3 5G Conformance Test Case Submission to 3GPP RAN5:** Keysight submitted industry's first 5G test case for Protocol Conformance. Keysight's 5G Conformance Toolset was first to gain both 3GPP RAN5 and PTCRB approval for 5G NR device certification.
- **MU Definition and Analyses:** Keysight is leading the Measurement Uncertainty (MU) activities to define the expanded MUs for various test cases using empirical results and theoretical analyses.
- Keysight has made significant contributions to the development of several **5G NR RF test cases** for both NSA and SA, including OBW, SEM, ACLR, ACS, and In-Band blocking.

## Keysight's 5G Conformance Toolset

Based on Keysight's UXM 5G Wireless Test Platform

- Offers industry's widest range of GCF and PTCRB 5G NR test cases for RF and protocol conformance validation of 5G devices
- Supports the first and only 5G RF test case validated to help device manufacturers verify compliance to the 3GPP 5G NR NSA (Non-Standalone) requirements for minimum output power generated by a 5G mobile device in sub-6GHz frequencies
- First platform to gain GCF approval for 5G NR RF SA test cases

Learn more at: [www.keysight.com](http://www.keysight.com)

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“The completion of the standalone 5G new radio specification marks a distinct milestone and offers a playbook for a connected ecosystem to move forward, making 5G a reality and unlocking huge potential for society. Keysight is engaged with market leaders, contributing to the 3GPP standardization development and providing scalable 5G test and measurement solutions all the way from L1 to L7.”

—Satish Dhanasekaran,  
President, Communication  
Solutions Group at  
Keysight Technologies

