5G Non-Signaling Manufacturing Test Solution:
Confidently Verify 5G NR Devices with Test Plans Optimized for Speed

Reduce Cost of Testing LTE and 5G NR Mobile Devices

The need for more efficient mobile networks that support lower latencies and faster data rates is driving the wireless communications industry to adopt 5G at an accelerating pace. The successful roll-out of new wireless technologies depends on mobile operators’ ability to manage this transition. The first 5G networks are expected to work in tandem with long-term evolution (LTE), using 5G New Radio (NR) non-standalone (NSA) mode as described by the third-generation partnership project (3GPP).

Initial deployment of 5G NR will rely on dual connectivity, which means the user equipment (UE) is able to transmit and receive data on the LTE eNB and 5G gNB simultaneously. This will set the stage for the progression of the 5G wireless system, and in the long term, the existing 4G spectrum can be re-farmed to future use cases.

This coexistence of 5G and LTE introduces new spectrum challenges. More than 500 possible band combinations have been defined by 3GPP for the LTE/5G NR coexistence implementation. Prior to market introduction, device manufacturers and mobile operators need to verify the RF performance of each band combination that a device supports. This can be a time-consuming task that can lead to long test times and complex test plans.
5G NR needs to coexist with many of today’s wireless technologies, including LTE, 2G, 3G and 802.11 – in both licensed and unlicensed spectrum. The wider bandwidths supported by 5G can lead to interference in LTE and 5G NR bands, which can result in increased cost of test in manufacturing.

Reducing the cost of testing devices in manufacturing

Keysight’s 5G non-signaling manufacturing test solution efficiently addresses these challenges, enabling the user to verify multiple devices in parallel using an industry-proven platform that supports all bands defined for 5G NR as well as for legacy technologies, including LTE and 802.11ax. Integrated waveform and measurement software based on Keysight’s trusted algorithms delivers accurate test results. Automation using Keysight’s PathWave test and fast sequencing produce efficient test plans optimized for speed. Approval by Qualcomm QDART and other chipset vendors delivers a solution for confidently testing 5G devices.

Figure 1: LTE and 5G NR band combination summary

Five scenarios for co-existence
- LTE + NR
- LTE with CA + NR
- LTE + NR with CA
- LTE with CA + NR with CA
- LTE + NR SUL + NR

Reference: 3GPP RP-1723834
Solution Components

- Keysight EXM Wireless Test Set
- Keysight PathWave for test automation
- Keysight waveform and measurement integrated software
- Keysight source and analyzer sequencers

Key Benefits

- Test 5G confidently with a solution approved by Qualcomm in QDART
- Verify device performance in all sub-6GHz frequency bands for 5G NR and legacy technologies like LTE and 802.11ax using a single solution that eliminates the needs for synchronization between multiple boxes and external cabling and calibration
- Quickly test up to four devices in parallel using fast sequencing
- Improve time to market by developing test plans quickly on an industry-proven platform

Solution Overview

The E6640A EXM wireless test set is a multi-channel platform that supports sub-6GHz 5G NR device manufacturing testing of up to four devices in parallel. The versatile test solution supports both 5G NR and legacy wireless and connectivity technologies, including LTE-A, 802.11ac/ax, Bluetooth® 5.0, 2G and 3G. Verification of multi-format device RF performance is possible without the need for additional test equipment.

Integrated Keysight waveform and measurement software enables users to accurately ensure device performance. A single software application provides waveforms for device receiver verification and measurements such as error vector magnitude (EVM), adjacent channel power (ACP), spectrum emission mask (SEM), power and occupied bandwidth (OBW) for device transmitter verification.
Source and analyzer sequencing techniques deliver faster test capability. Users are able to optimize test plans by selecting the most efficient sequence for the device under test. Automation based on the Keysight PathWave test platform provides quick and simple test plan execution with software that is easily maintained over time.

**Summary**

The Keysight 5G non-signaling manufacturing solution uses an industry-proven platform to support multi-device and multi-format test in a single compact configuration. Integrated state-of-the-art automation and efficient sequencing for optimized speed of execution help reduce 5G device manufacturing cost of test and lead to faster time-to-market.

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