S8706A Protocol Carrier Acceptance Toolset

Features and Capabilities

Introduction

5G is disrupting the entire wireless communications industry. Greater complexity and various technical aspects are transforming the mobile ecosystem. Traditionally, the Mobile Network Operators (MNOs) perform device acceptance testing to ensure that the new mobile devices will not impact their infrastructure and create issues with customers. If a device causes dropped calls or crashes the network, consumers typically blame the operator. Network operators must stress test devices to ensure that they live up to customer expectations.

The S8706A Protocol Carrier Acceptance 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. The S8706A Protocol Carrier Acceptance Toolset supports the largest number of tests for Tier-1 operator device acceptance programs. It provides an efficient platform for mobile device evaluation based on the test requirements of major mobile operators, who validate the test supported by the S8706A Protocol Carrier Acceptance Toolset solution as part of their device acceptance programs. The S8706A Protocol Carrier Acceptance Toolset will be used by mobile network operators to verify that devices comply with their device test requirements.

What is S8706A Protocol Carrier Acceptance Toolset?

S8706A Protocol Carrier Acceptance Toolset provides comprehensive access to protocol carrier acceptance test plans mandated by the world's major 5G mobile operators. The toolset flexibly addresses a wide range of test scenarios in sub-6 GHz (FR1) and mmWave (FR2) frequencies, for both non-standalone (NSA) and standalone (SA) mode.

Signaling testing:

- Supplemental protocol test cases
- Error scenarios and negative testing
- Inter-RAT testing

Performance testing:

- Data throughput
- Power consumption
- Quality testing (voice/video)

Application testing:

- Voice/video and IMS test cases
- WiFi integration

In this document we will describe the graphical user interface and functionality provided by S8706A Protocol Carrier Acceptance Toolset in more detail. We will also describe the hardware platform on which S8706A Protocol Carrier Acceptance Toolset is run.

Who benefits from using S8706A Protocol Carrier Acceptance Toolset?

- MNOs to verify that devices comply with their device test requirements
- Device manufacturers to ensure their devices are accepted by the major mobile network operators before launch to the market
- Chipset manufacturers to ensure that their chipsets perform according to the major mobile network operators' specifications
- Test houses and test labs that run tests to independently verify that devices are compliant with the MNO requirements.
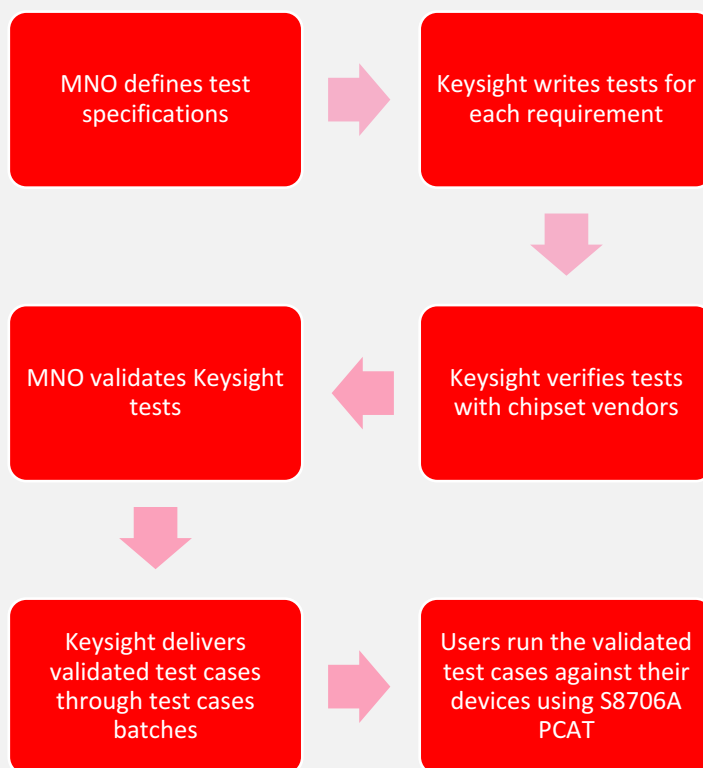
S8706A Protocol Carrier Acceptance Toolset

The S8706A Protocol Carrier Acceptance Toolset is used in the device acceptance phase of the device development lifecycle to validate devices against operator-defined tests. It provides an easy-to-use environment to run and debug carrier acceptance test cases against mobile devices.

Test Case Batches

Keysight supplies test cases in batches which may be run using the S8706A Protocol Carrier Acceptance Toolset solution. Each test case batch requires a specific license to enable execution of the test cases in that batch. The test cases are implemented by Keysight based on the requirements defined by individual MNOs, and are then validated by Subject Matter Experts (SMEs) from the operator against reference devices. Once validated, the test cases can be used to verify mobile devices for use with that operator.

Keysight supports the largest number of 5G device acceptance tests for a range of tier-1 MNOs worldwide, with more test cases and MNO test plans constantly being added. A number of these test plans are confidential in nature, so please contact Keysight for the latest information about the coverage offered.

```
MNO defines test          Keysight writes tests for
specifications            each requirement

MNO validates Keysight    Keysight verifies tests
tests                     with chipset vendors

Keysight delivers         Users run the validated
validated test cases      test cases against their
through test cases        devices using S8706A
batches                   PCAT
```

Figure 1: From requirement to validation

Protocol Carrier Acceptance Toolset Workspace

The Protocol Carrier Acceptance Toolset is used for viewing and running individual scripts from any of Keysight´s suite of licensed protocol carrier acceptance test case batches.

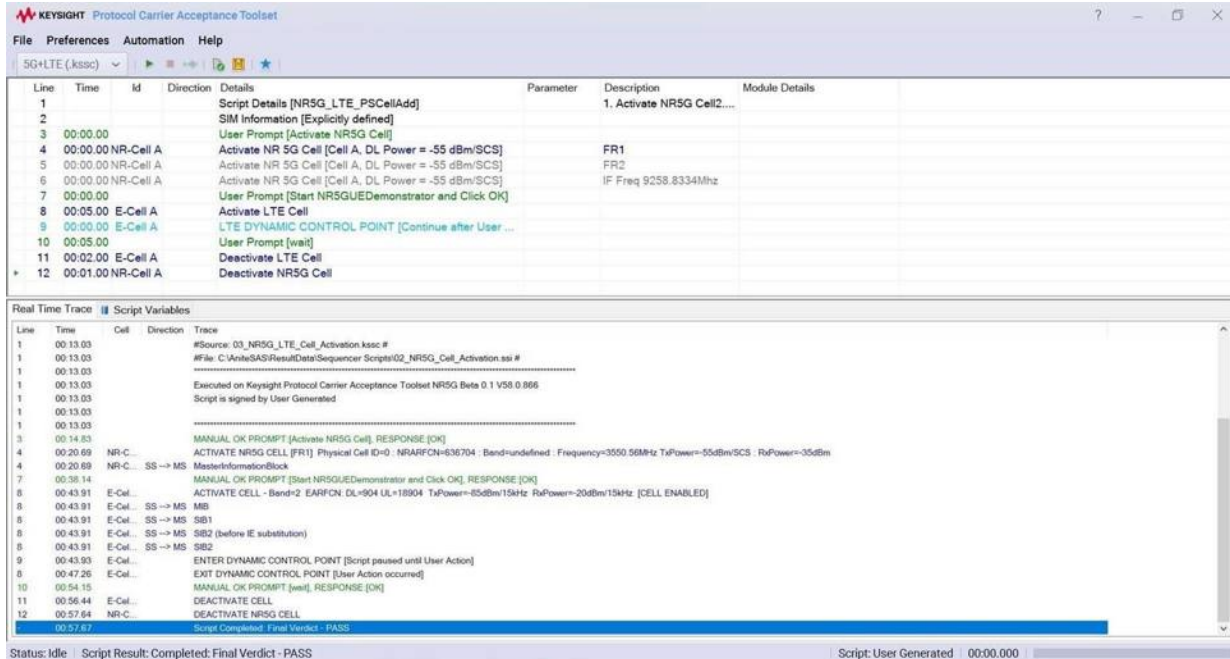To run a single script the user must first load the script and then click play on the toolbar.


Figure 2: Protocol Carrier Acceptance Toolset to view and run individual scripts

Protocol Test Manager and Automation for running large campaigns of tests

Protocol Test Manager offers a user-friendly environment to create, manage and execute test campaigns. A test campaign is a range of tests selected by the user to run in a specific sequence. You can save and rerun these campaigns to test the same device with different firmware or test a different device altogether.

Test campaigns may either be run manually, with the user performing actions (e.g. powering on/off the device) when prompted by the test cases, or they may be automated using Keysight's Terminal Automation Gateway or a customized automation tool, allowing unattended test campaign execution.

You can easily review results with verdicts and launch test execution log files from Protocol Test Manager. Additionally, you can create test reports in Excel or HTML formats.
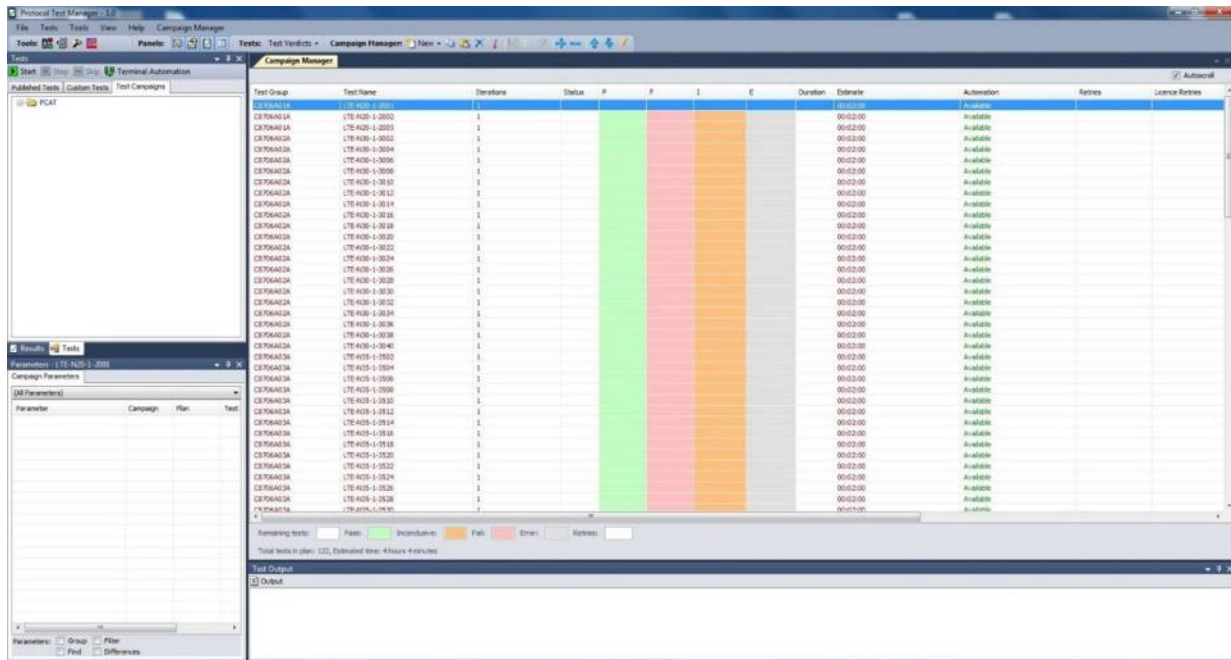
Figure 3: Protocol Test Manager, enabling execution of test- campaigns

Real Time Trace to view signaling trace during execution

The Real Time Trace (RTT) displays the signaling trace during a test execution. This trace, which is easy to read, is saved in a log called the RTT log. Examples of information being displayed include:

- Active cells and the length of time these cells have been active
- Cell information, such as its NR ARFCN, channel allocation, power levels, synchronization, and relative frequency offset
- A trace of the Layer 3 messages exchanged in real time between the network and the device. Messages are displayed in a simplified sequence chart and you can decode these messages to view Layer 2 information
- Progress and error messages; Protocol Carrier Acceptance Toolset reports communication failures, protocol errors, and information about the state of the system, and also prompts for user action, such as turning the mobile device on or off
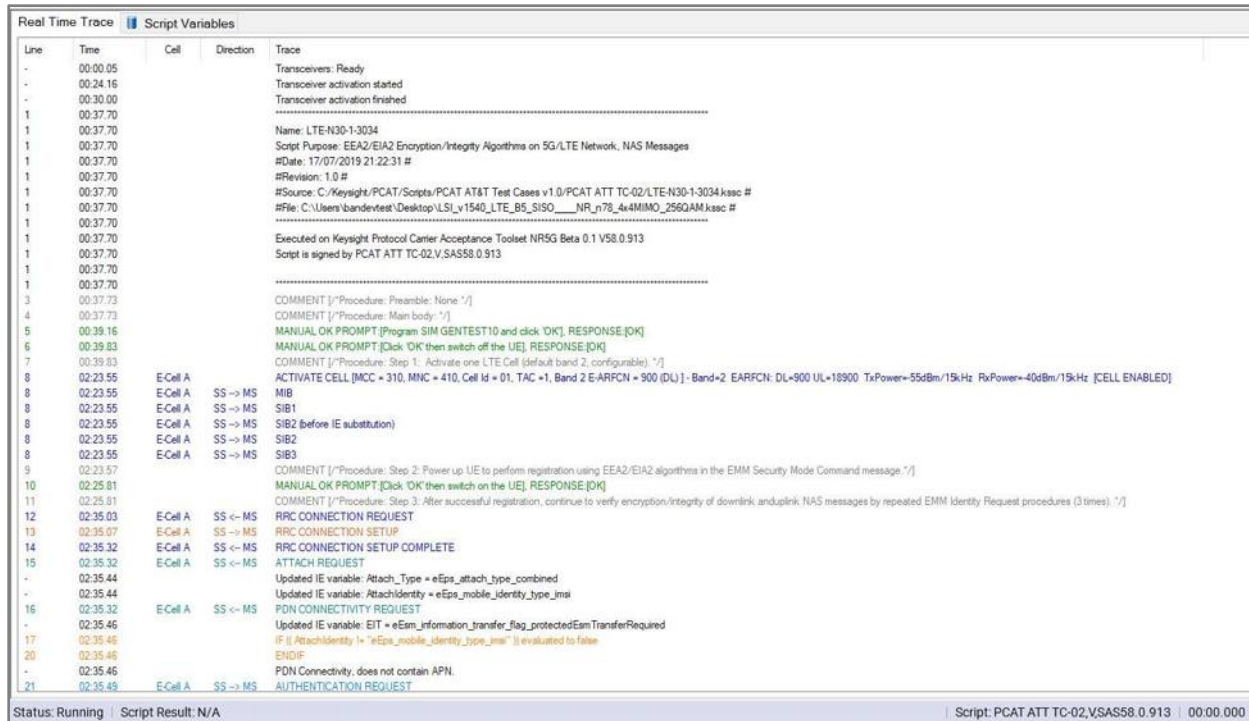- Measurement reports from the device

Figure 4: Real Time Trace- displaying the signaling trace during a test execution

Log Viewer to facilitate troubleshooting

The Log Viewer enables you to view all protocol layers (i.e. PHY, MAC, RLC, PDCP and RRC) in one log. The Log Viewer has a user-friendly graphical user interface where several windows are displayed in one view (see Figure 5). The filtering functionality allows you to view the protocol layers and test information of interest. You can use any of the default filters or create customized ones. Bookmarks enable you to go back to any record in the log thereby facilitating troubleshooting. The Bookmarks tab displays all bookmarks that have been created.

The following records can be logged in Log Viewer:

- LTE and NR protocol messages for all protocol layers (PHY, MAC, RLC, PDCP and RRC)
- All information transmitted and received at the air interface, recorded at the MAC/PHY boundary
- Control information, such as the activation/deactivation of physical and transport channels
- Test System Diagnostic Data

The Log Viewer allows you to analyze the results of tests on the test system PC or a separate PC, thereby freeing the test system PC so that it can be used solely for running tests.

The Log Viewer is a common logging tool also used by other Keysight Network Emulation solutions, including Protocol Conformance Toolset and Protocol R&D Toolset.
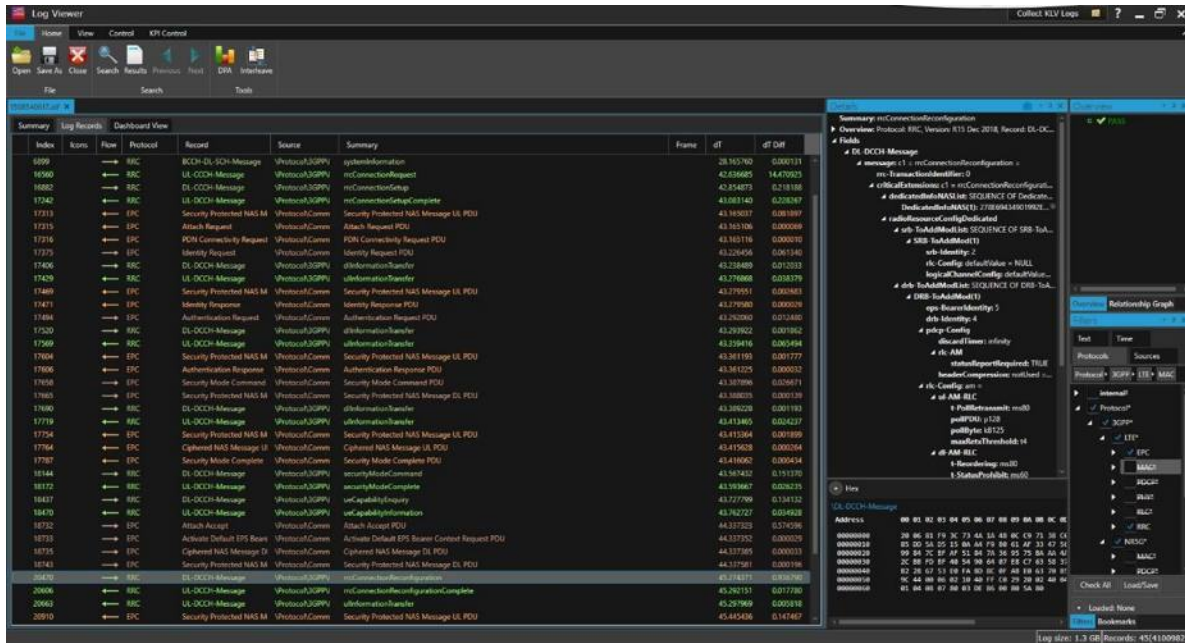
Figure 5: The Log Viewer is useful for debugging

Dashboard Viewer for efficient debugging

The Dashboard Viewer allows you to display predefined or customized graphs using a list of KPIs that have been captured in Log Viewer. Graphs and data of different KPIs can be displayed in the same view by creating a dashboard, see Figure 6. KPI data can be displayed numerically or graphically with a style option, which allows you to select what type of graphs to create, such as a histogram, a time graph or a scatter graph. You have the option of launching a Dashboard Viewer whilst a test is under execution or after a test has been executed.
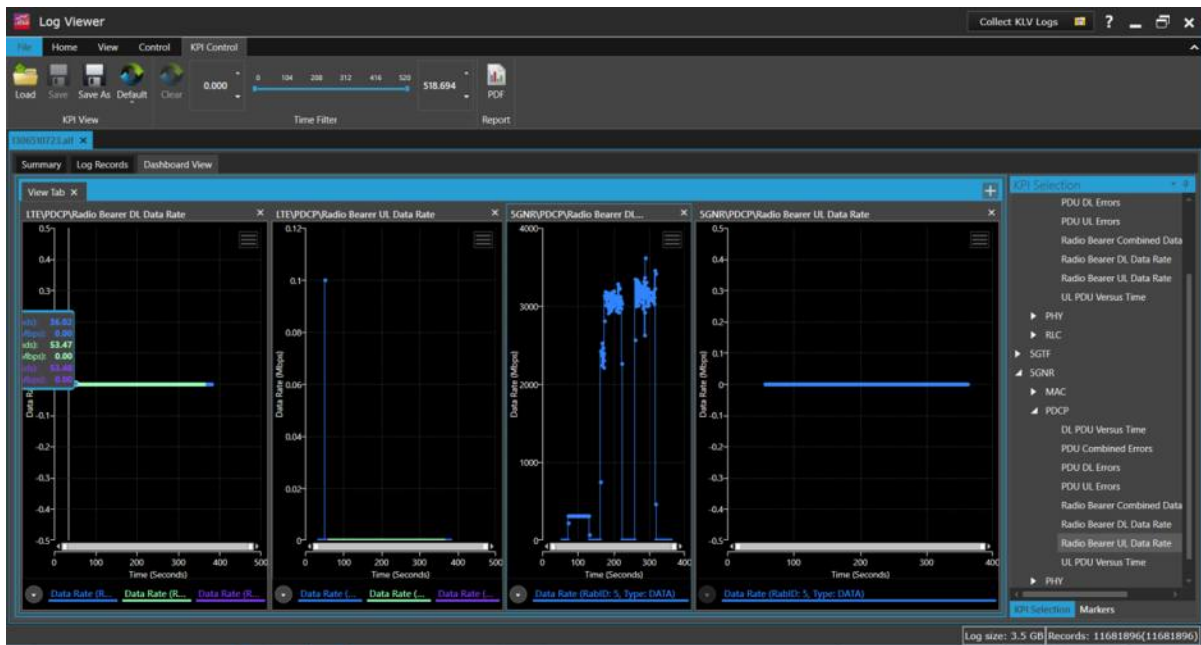

Figure 6: Dashboard Viewer shows graphical KPI data in one view

SIM Programmer Switch

Keysight's SIM Programmer Switch enables users to automate the programming of SIM cards when running test cases with different SIM card requirements in the same campaign. It is supported for MNO test plans that require a large number of different SIM profiles.

Flexible Licensing Options

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

License type	Description
Node locked	License may be used on one specified PC/instrument
Transportable	License may be used on one PC/instrument at a time but may be manually transferred to another via the Keysight Software Manager website
Floating	Networked instruments/computers can access a license from a server one at a time
• Floating single site	License server is based within 1 mile radius from the instrument/computer
• Floating single region	License server is based in the same region as the instrument/computer eg. Americas, Europe and Asia
• Floating worldwide	License server can be based anywhere in the world -export restrictions identified in End User License Agreement (EULA)

License terms	Description
Perpetual	Perpetual licenses can be used indefinitely
Time based	Temporary licenses can be used for a limited duration of 6, 12, 24, or 36 months

Hardware Platform

The S8706A Protocol Carrier Acceptance 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 protocol carrier acceptance test in FR1 and FR2 for both 5G non-standalone (NSA) and standalone (SA) modes.
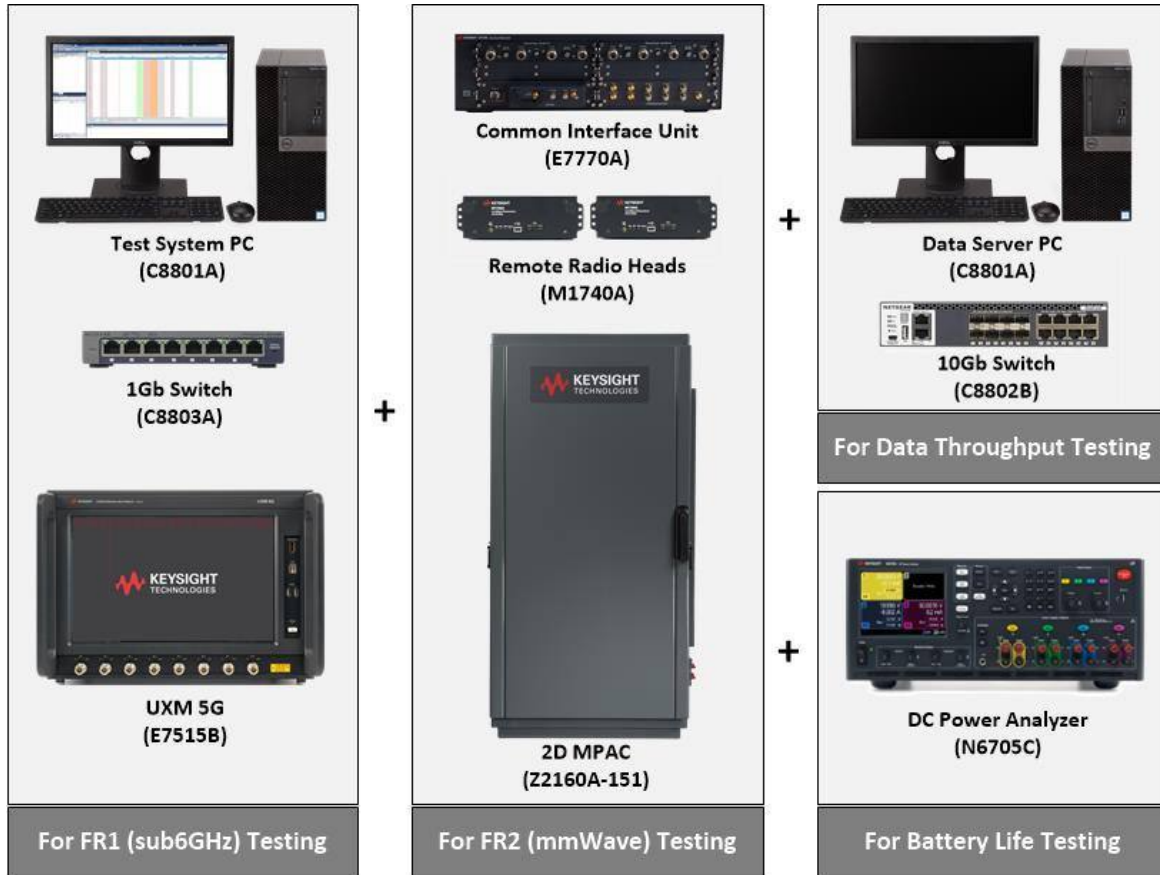
Up to 2 UXMs may be required depending on the number of component carriers required by the operator.

The UXM 5G integrates seamlessly with a Keysight E7770A Common Interface Unit and Keysight M1740A mmWave dual-band (28/39 GHz) transceivers, and over the air (OTA) test chamber to support an extended range of FR2 test cases.

Up to 6 Remote Radio Heads can be required depending on the number of AoA required by the operator.

In order to perform power consumption and data throughput testing a power analyzer and a data server PC must be added to the hardware configuration respectively.

Test System PC (C8801A)

1Gb Switch (C8803A)

UXM 5G (E7515B)

For FR1 (sub6GHz) Testing

+

Common Interface Unit (E7770A)

Remote Radio Heads (M1740A)

2D MPAC (Z2160A-151)

For FR2 (mmWave) Testing

+

Data Server PC (C8801A)

10Gb Switch (C8802B)

For Data Throughput Testing

+

DC Power Analyzer (N6705C)

For Battery Life 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

KEYSIGHT TECHNOLOGIES