Keysight Technologies
Characterization of LTE Devices Made Simple

Application Brief

The Long-Term Evolution (LTE) cellular standard includes thousands of pages of specifications. It can be very challenging to first understand the LTE specifications and then implement products and systems that meet the needs of real-world consumers. Signal analyzers are a key measurement tool often used test LTE designs. These instruments have evolved, providing greater flexibility through software capabilities such as embedded measurement applications that automate standards-compliant measurements. Today, the touch-enabled user interface (UI) technology widely used in smartphones and tablets can be readily adapted to the large displays that are increasingly common in signal analyzers. Consequently, signal analyzers now provide new levels of interaction that enable intuitive connections between cause and effect during development, debugging and troubleshooting.

KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

Viewing and analyzing multiple component carriers simultaneously

Release 10 of the LTE specifications introduced carrier aggregation (CA) based on the component carriers (CC) defined in Release 8. The purpose of CA is to increase the available bandwidth to and from the user equipment (UE) by aggregating two to five CCs to create an instantaneous bandwidth of up to 100 MHz. The channel bandwidths of the aggregated carriers need not be the same and the aggregation can be contiguous or non-contiguous. The non-contiguous CCs can occupy non-adjacent channels in a single band (i.e., intra-band) or in separate bands (i.e., inter-band) (Figure 1).

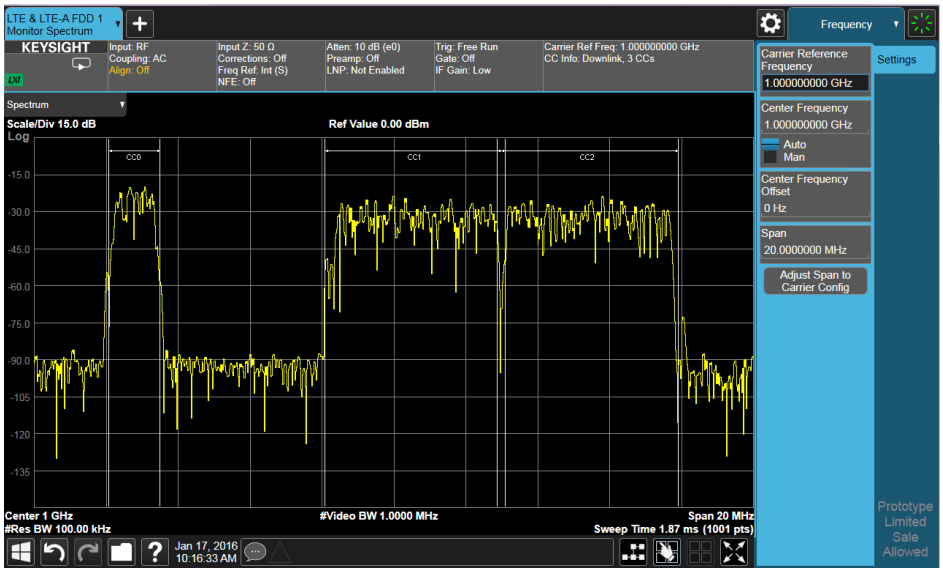


Figure 1. In this example the LTE measurement application is measuring non-contiguous CA with three CCs.

Because the CCs are part of an aggregated transmission bandwidth, it is useful to view them simultaneously on a signal analyzer display (Figure 2). The N9080C/N9082C LTE FDD and TDD measurement applications provide quick and intuitive display configuration, supporting up to five CCs and six window views. Additionally, the LTE modulation-analysis measurement provides more than 20 measurement views for in-depth signal analysis.

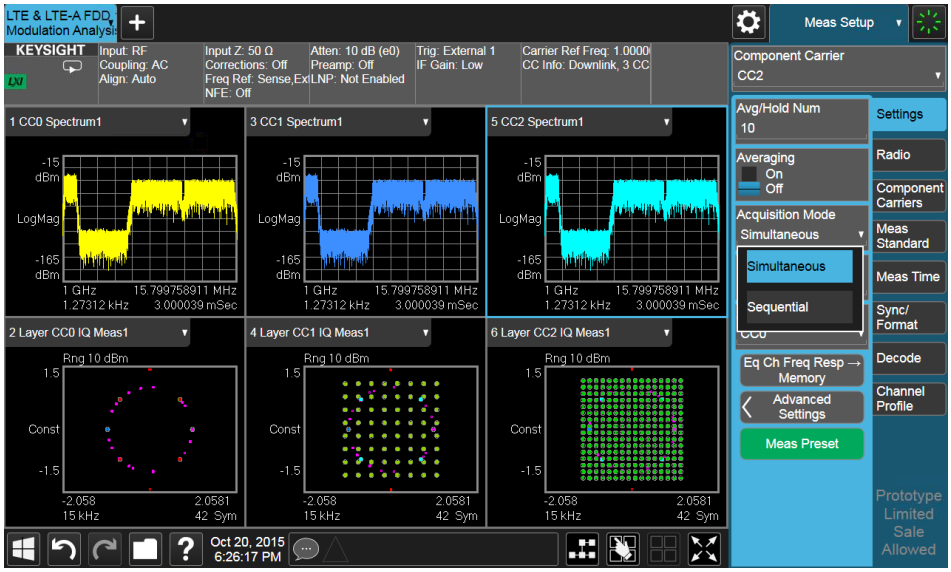


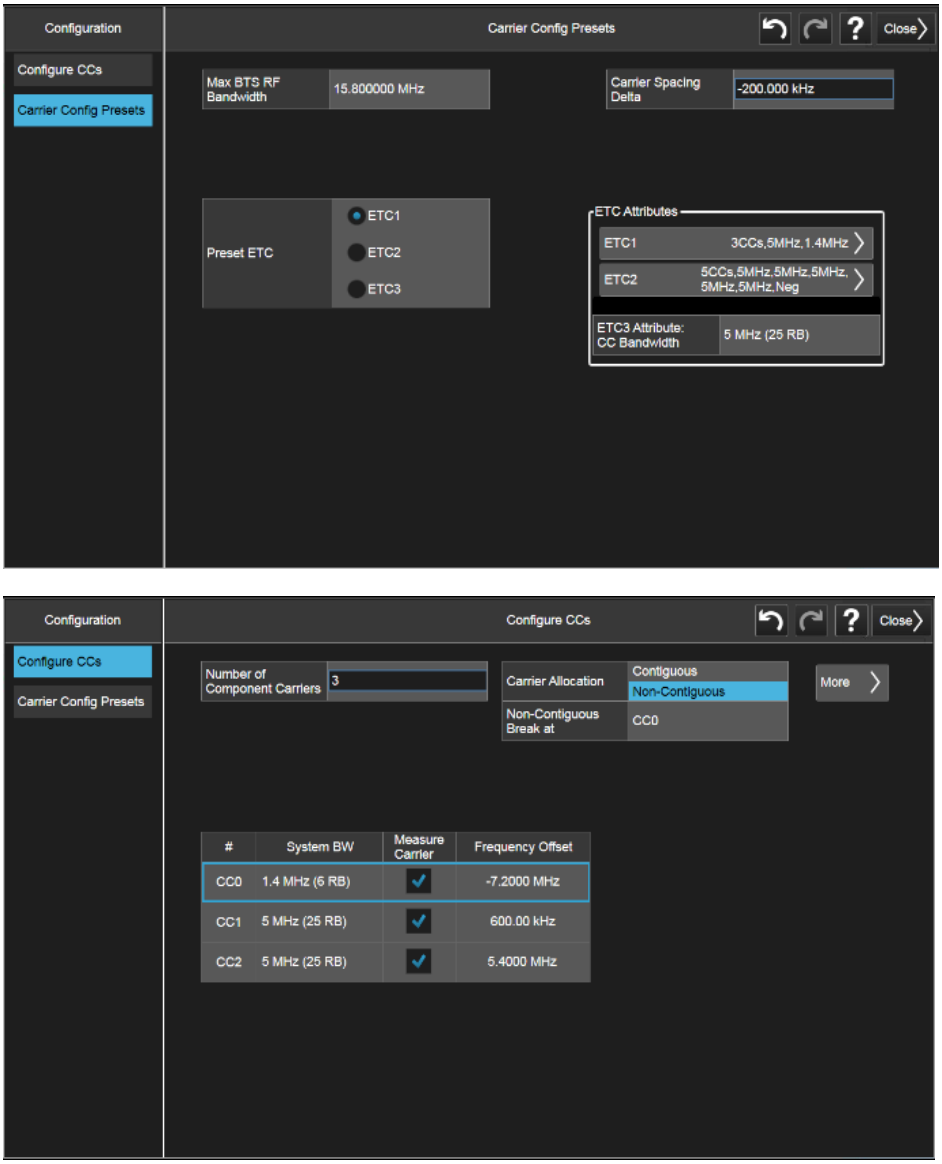
Figure 2. Simultaneous modulation analysis of three CCs makes it possible to view spectrum and constellation data together.

Frequently Used Settings Available on Touchscreen

The Keysight Technologies, Inc. N9020B MXA signal analyzer, multi-touch provides a touchscreen UI that includes features such as drop down menus and customizable user menus. Rather than navigating through hardkeys, softkeys and long menus, most of the capabilities can be accessed with the tap of a finger. In addition, many frequently used display settings can be modified in the menu bar, measurement bar and annotation hotspot areas. It's as easy as tapping the settings tables and diagrams, or you can interact with the selected trace by stretching, pinching, dragging or tapping.

Simplifying conformance tests

Release 10 defines extensive E-UTRA Test Configuration (ETC) conformance tests for multi-carrier (MC) and CA operation. The N9080C/N9082C LTE FDD and TDD measurement applications have pre-defined ETC configurations that make measurement set-up fast and efficient. After you enter a few measurement parameters, the signal analyzer pre-populates the necessary measurement information based on the selected ETC definition (Figures 3a and 3b).



Figures 3a and 3b. The ETC1 carrier configuration preset accelerates the measurement process.

Characterizing higher-order modulation

Demand for higher data throughput and greater efficiency continues to grow, especially in areas that have high-density cellular networks. 256QAM is the most recent higher-order modulation scheme added to the LTE standard and it will help maximize data throughput in areas with limited wireless spectrum. The latest version of the X-Series LTE application supports 256QAM measurements (Figure 4).

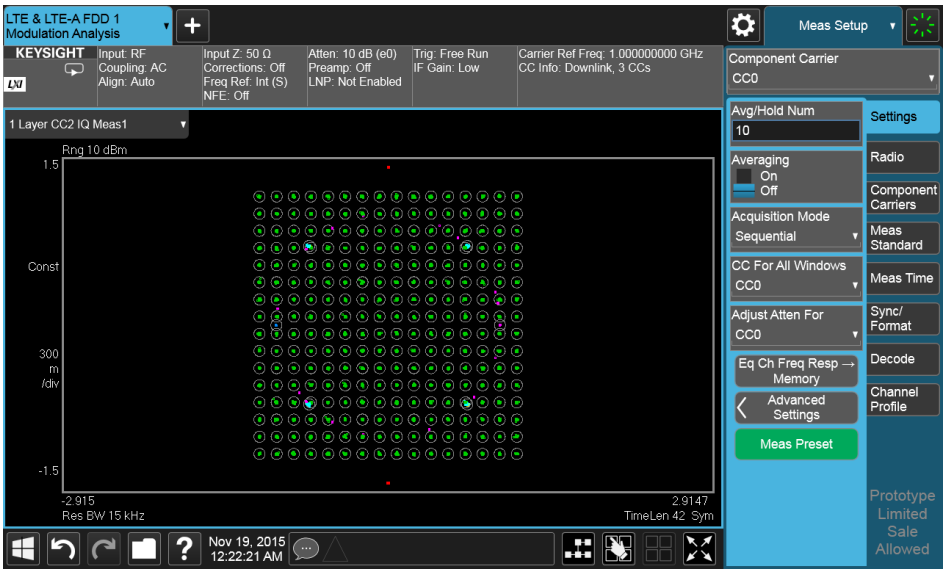


Figure 4. The LTE application makes it easy to configure and display the constellation of higher-order modulation such as 256QAM.

It is often necessary to isolate a segment of a signal's time record for further viewing and analysis. When you set up a measurement window with Meas Interval and Meas Offset, the analyzer will test an individual signal at a specific position and within a specific length in the LTE frame. All modulation-analysis results in different traces will correspond to the specified measurement window. The Capture Time Diagram automatically accesses the CC configuration parameters and displays the time-capture information in a configurable, easy-to-view window (Figure 5).

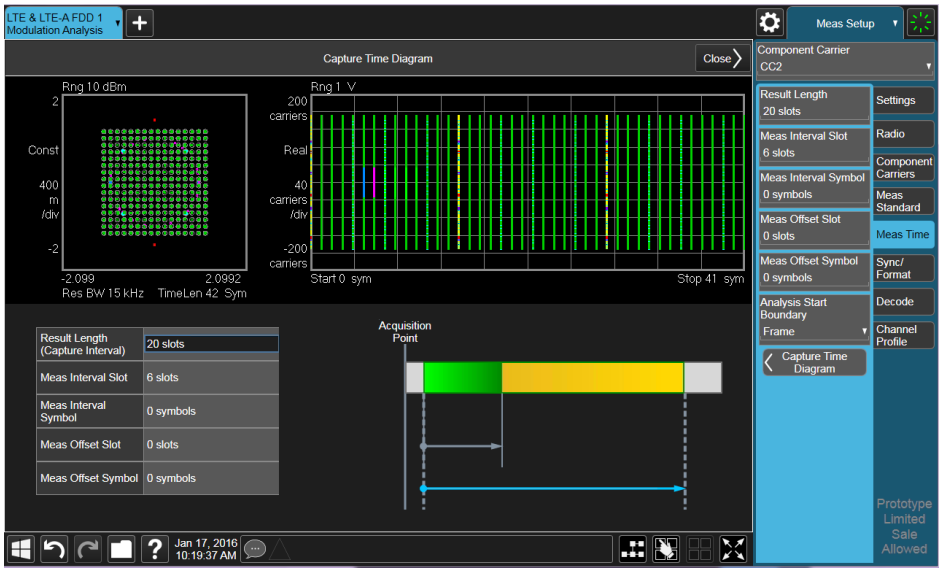


Figure 5. You can use the Capture Time Diagram to diagnose CC2 higher-order modulation in a 256QAM symbol.

Conclusion

The X-Series signal analyzers are the benchmark for accessible performance that puts you closer to the answer by easily linking cause and effect. Across the full spectrum—from CXA to UXA—you'll find the tools you need to design, test and deliver your next breakthrough.

The MXA is the optimum choice for wireless as you take new-generation devices to market. It has the flexibility to quickly adapt to evolving test requirements, today and tomorrow.

From Hewlett-Packard through Agilent to Keysight

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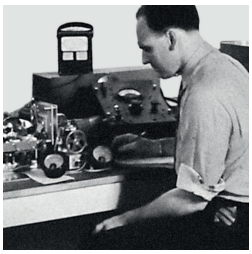

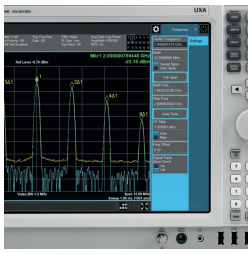

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