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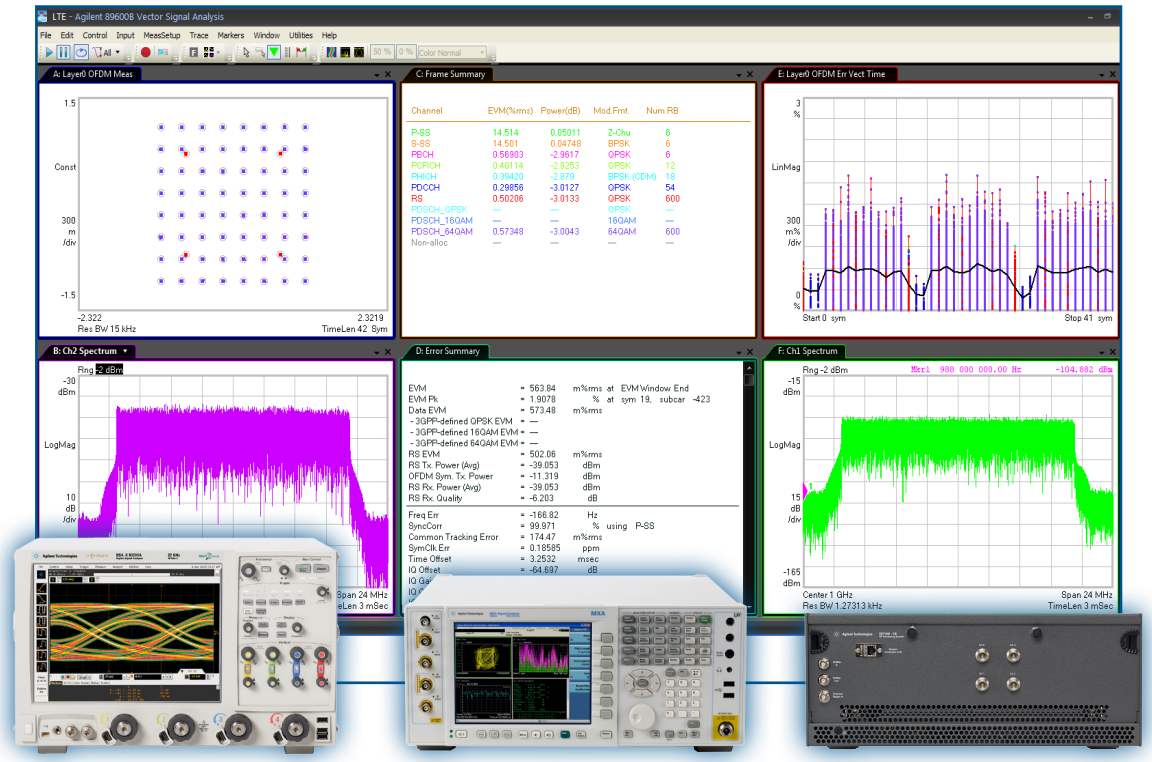
MIMO Tx/Rx Test Solutions

Selection Guide



Fourth-generation wireless communication systems like Long Term Evolution (LTE) and LTE-Advanced rely on Multiple-Input Multiple-Output (MIMO) technology to deliver on the promise of higher data rates, greater coverage areas and lower operational costs. These benefits come at the cost of more complex base stations and mobile devices, which challenge the capabilities of traditional measurement equipment and test software.

Measuring LTE MIMO operation during receiver (Rx) and transmitter (Tx) device testing requires the right combination of test instruments and techniques to evaluate the performance of LTE components and systems under real-world conditions. Agilent offers multiple solutions to meet this need.

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Solutions for MIMO LTE Rx Test

Due to its departure from previous cellular communications networks, LTE requires fundamental changes in base station/handset design and test. Receiver testing must evaluate the receiver as a whole and test its subblocks and components to better understand their contribution to the receiver's overall performance. In cases where multiple receivers are used, each receive chain must be tested separately, prior to verifying the performance of the receivers with multiple antennas.

Agilent's solutions for MIMO LTE Rx test include the:

- N5106A PXB Multi-Channel Baseband Generator/Fader
- MXG/ESG RF signal generators
- Signal Studio software

Working together, these solutions create MIMO signals and apply real-time fading for Rx test at RF and baseband. The PXB generates MIMO signals up to 4x2 and then applies flexible real-time fading to the signals. The MXG/ESG is used as an RF upconverter (one per receive antenna). Signal Studio creates the LTE signals that are used with both the PXB and MXG/ESG hardware.

Solutions for MIMO LTE Tx Test

MIMO Tx test in LTE-based wireless communications systems requires measurement of broadband and narrowband power, overall quality metrics (e.g., EVM), and more. Measurements are also needed to control an LTE transmitter's edge-of-band characteristics, trading off out-of-band attenuation without affecting in-channel performance. Additionally, MIMO analysis adds measurements specific to multi-channel (typically 2-4) transmitters (e.g., channel phase/timing and modulation quality), made on two or more input and output channels.

Agilent's solutions for MIMO LTE Tx test include the:

- N9010A EXA/N9020A MXA signal analyzers
- Infiniium 90000 X-Series oscilloscopes
- N7109A Multi-Channel Signal Analysis System

Agilent's 89600B Vector Signal Analysis (VSA) software runs on all three hardware platforms, providing a window into what's happening inside complex LTE-based devices. Various 89600B VSA software options are available, including: LTE-Advanced, LTE, HSPA+, Mobile WiMAX™, and 802.11n/ac.

Which Hardware Platform is Right For You?

Dual MXAs/EXAs features:

- Up to 2 channels
- Best EVM/dynamic range
- Fully characterized RF specifications
- General-purpose application

90000 X-Series features:

- Up to 4 channels
- Widest analysis bandwidth
- General-purpose application
- Phase coherent

N7109A features:

- > 4 channels
- Extendable/scalable hardware
- Fastest measurement speed
- Phase coherent
- Pre-selected tuner, off-air measurements

Simulation-based MIMO Solutions

SystemVue is an open simulation and modeling environment that supports MIMO investigations, as well as direct connection to test equipment for verification. For algorithm designers, SystemVue supports closed-loop Throughput and BER simulations with full coding and fading models for up to 8x8 MIMO, for LTE and LTE-Advanced, complete with antenna directivities, fading, and impairments.

For verification, SystemVue can be used to model, encode, and download MIMO test vectors for a wide variety of emerging standards, and even post-process received signals. With this capability, SystemVue can also be used to manually close feedback loops, using combinations of simulation, measurements, and one's own baseband IP, thus validating system-level performance earlier in R&D.

Agilent's solutions for simulation include:

- W1461BP SystemVue Comms Architect
- W1918EP LTE-Advanced baseband library (among other standards supported)
- W1715EP MIMO Channel Builder

Evaluating MIMO LTE Rx/Tx Solutions

When evaluating a solution, ensure it:

- supports the basic functionality you need today and in the future (e.g., the number of channels and analysis bandwidth at a given frequency).
- has the performance required for in channel measurements (e.g., EVM).
- supports other measurements you might make, such as out-of-channel measurements.
- has enough speed to work for your manufacturing timeframe.

System Type	Product	Technology							R&D Life Cycle					
		LTE-Advanced	LTE-FDD	LTE-TDD	Mobile WiMax	HSPA+	WiCon-802.11n	WiCon-802.11ac	Design	Baseband	RF	Integration	Protocol	Verification Performance
Transmitter	Dual N9020A MXAs/ N9010A EXAs	● BW Limited 25 MHz	■	■	■	■	● BW Limited 25 MHz	● BW Limited 25 MHz		■	■	■	●	■
	89600B VSA	■	■	■	■	■	■	■	■	■	■	■	●	■
	N7109A	■	■	■	■	■	■	● BW Limited 40 MHz			■	■	●	●
	Infiniium scope	■	■	■	■	■	■	■			■	■	●	●
	SystemVue	■	■	■	■	■	■	●	■	■	■	■		■
Receiver	N5106A PXB		■	■	■	■			■	■	■	■		■
	MXGs	■	■	■	■	■	■	■	■	■	■	■		■
	X-Series Signal Studio	■	■	■	■	■	■		■	■	■	■		■
	SystemVue	■	■	■	■		■	●	■	■	■	■		■
Signaling	E6621A PXT		■								■	■	■	■

Product has full capability ■ Product has general capability ●

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