

In Partnership with
Topyoung

Spirent[™]
Promise. Assured.



Performance Testing of:

Massive MIMO
with mobile terminals

3D beamforming
with 5G gNBs

Mobility scenarios
in 5G systems

Spirent **Massive MIMO Test Solution** | **Sub 6GHz**

Simplifying 5G Conductive RF Testing

Spirent **Massive MIMO Test Solution | Sub 6GHz**

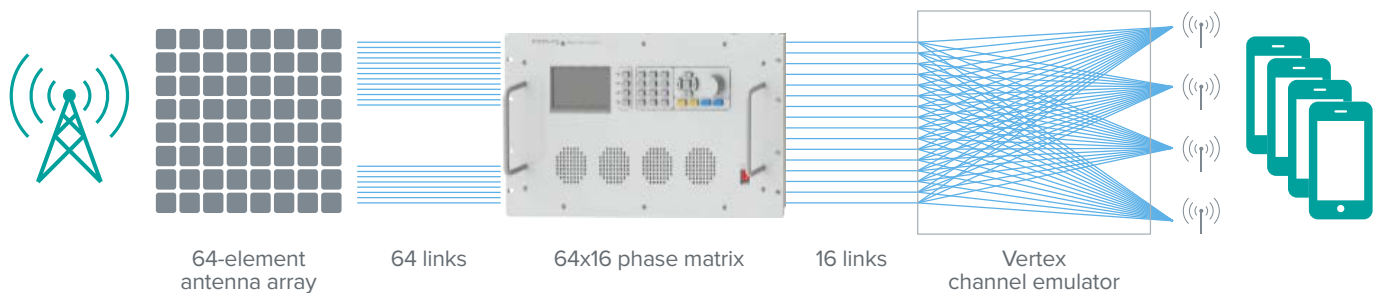
Simplifying 5G Conductive RF Testing

Massive Multiple Input Multiple Output (MIMO) is a key physical layer technology for 5G applications that involves the use of large-scale antenna arrays that contain as many as 256 elements. Implementing 3D beamforming along with massive MIMO technology improves the capacity limitation of an entire 5G system by adding data streams, increasing the signal to noise ratio and reducing interference.

Due to the complexity of propagation environments in massive MIMO scenarios, channel emulation is a critical aspect of testing the performance of 5G base stations (gNBs) and user terminals (UTs). Conductive testing is an important test methodology for frequencies below 6GHz, but traditional channel emulation methods make this testing difficult and expensive due to the huge number of radio links involved.

Spirent and Topyoung have developed an innovative massive MIMO test solution that provides an economic and practical way to test the performance of massive MIMO and 3D beamforming systems in a lab environment. The solution integrates Spirent's industry-leading Vertex channel emulator with Topyoung's MIMO Channel System plus (MCS plus) to provide a low cost, easy-to-use solution that can verify the performance of massive MIMO gNBs or UTs.

The solution can be used to test up to 64x16 one-user or multi-user system scenarios. Optimized 3D Geometric Channel Models (GCMs) are used to create 3D beamforming and channel emulation as in the real network. It can also be used to simulate dynamic scenarios such as one device or multiple devices in motion.



Solution Components:

Spirent Vertex Channel Emulator

The Vertex® channel emulator is an advanced platform that replicates the comprehensive noise and spatial conditions of even the most complex wireless channels. Its cutting-edge capabilities enable users to emulate a real-world radio frequency (RF) environment in the lab, making it possible to isolate and identify performance issues early in the development cycle.



Incorporating a modular RF front end with a powerful signal processing core, Vertex achieves an unprecedented level of scalability and flexibility, enabling it to efficiently address a broad range of applications from low channel density such as 2x2 MIMO to high channel density such as MIMO beamforming, MIMO OTA, carrier aggregation, massive MIMO and antenna array systems (AAS). Vertex can support frequencies from 30MHz to 6000MHz within a single hardware platform. Each RF channel can support up to 200MHz bandwidth and concatenate for widths up to 1GHz.

Topyoung MIMO Channel System Plus

The MCS plus is used for beamforming and beam tracking due to its ability to quickly change the phase and amplitude of each MIMO link.

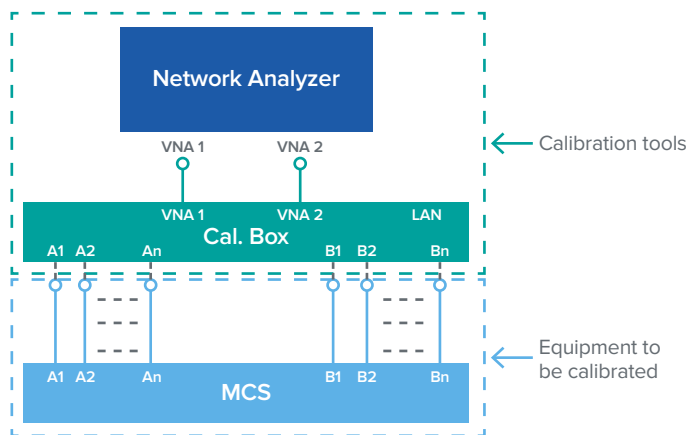
It can support 64x16 or 64x32 MIMO links with phase and amplitude control in independent channels and can create 3D clusters with any RF channel combination of attenuation and phase changes for 3D beamforming tests.

All RF channels can complete attenuation and phase responses within 1ms. This provides beam tracking function verification to test the response speed of the gNBs.

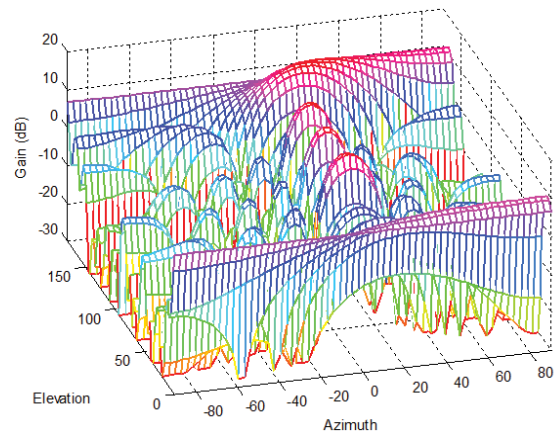


System Calibration

Before testing begins, it is critical to ensure that the end-to-end phase and amplitude of all the channels is aligned, which requires detailed calibration of the measurement channels. Due to the large number of measurement channels needed for dense testing scenarios, a high-precision one-button channel calibration scheme was developed to save time and effort over traditional manual calibration methods.



Calibration architecture



Simulated 3D cluster pattern

An innovative test solution that provides an economic and practical way to test 3D beamforming and massive MIMO performance

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About Spirent Communications

Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks.

We help bring clarity to increasingly complex technological and business challenges.

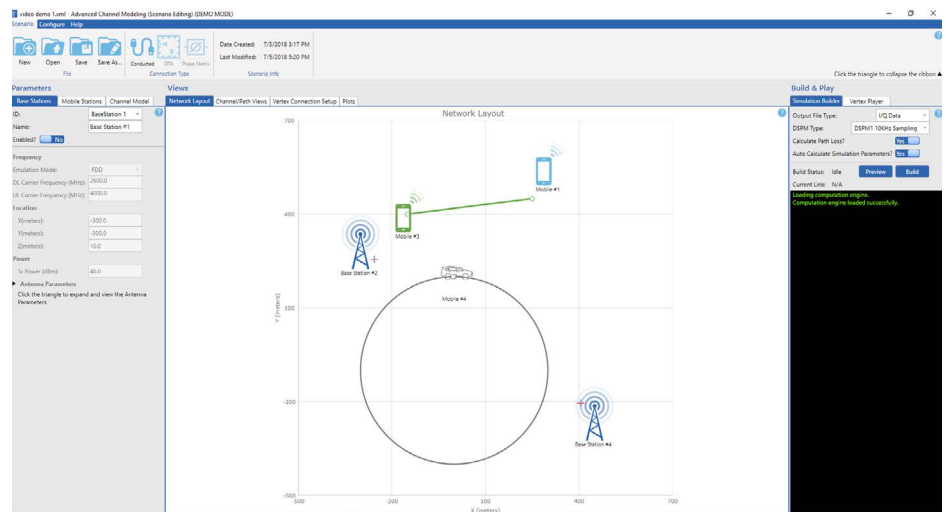
Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled.

For more information, visit: www.spirent.com

Advanced Channel Modeling Software (optional)

Advanced Channel Modeling (ACM) software is a PC-based application designed to create a framework that acts as a common platform to enable the integration of various channel modeling algorithms. It has a graphical user interface (GUI) to edit base station configurations, mobile station configurations, and 3D GCM parameters.

This powerful software tool can generate both IQ playback-based 3D channel models and real-time based channel models, in static and mobility scenarios. It can support the 3G GCM model from both 3GPP 36.873 and 38.901 for 5G applications.



Contact Us

For more information, call your Spirent sales representative or visit us on the web at www.spirent.com/ContactSpirent.

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