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Spirent 5G FR2 Device MIMO OTA Test System

Assess the performance of millimeter wave devices and chipsets in real-world conditions to address design, development, and optimization challenges.

Unlike earlier network technologies, 5G devices contain a high order of multiple antenna elements. As a result, device performance relies not only on baseband algorithms to deal with complicated propagation conditions, but also on the antenna design of the device. Therefore, it is very important to verify the performance of 5G devices with Over-the-Air (OTA) test methods to ensure the antenna arrays are included in the evaluation.

5G New Radio (NR) technologies are divided into two different frequency ranges. The first is Frequency Range 1 (FR1), which includes frequency bands below 7.125GHz, and the other is Frequency Range 2 (FR2), which includes millimeter wave frequency bands from 24.25GHz to 52.56GHz. Millimeter wave propagation differs from traditional signal frequencies that are below 7GHz because the wavelength is very short. A millimeter wave signal can easily be blocked or scattered, providing increased challenges to 5G FR2 device design.

FR2 devices deploy beamforming to combat high propagation path loss. Phased array antennas are needed to achieve acceptable performance with beamforming to overcome these millimeter wave challenges. The array antennas in 5G NR devices include a high number of elements that create a beam pattern, i.e., multiple beams filtering the spatial domain of propagation. Each beam must be tested, characterized and optimized in every plane. This requires 3D channel modeling capabilities; therefore existing MIMO OTA test systems are not applicable, as they were designed for 2D environments. To meet performance expectations, devices must be validated against complicated test conditions in a new, specialized test environment.

3GPP's TR38.827 and TS38.151 specification documents detail the test methods needed to verify the performance of 5G devices in an OTA mode. A critical piece of the test system is the 3D arrangement of probes in the device chamber. Spirent has been actively contributing to 3GPP based on extensive research and was instrumental in defining a layout for a solution that can effectively test device beamforming capability, shown in Figure 1.

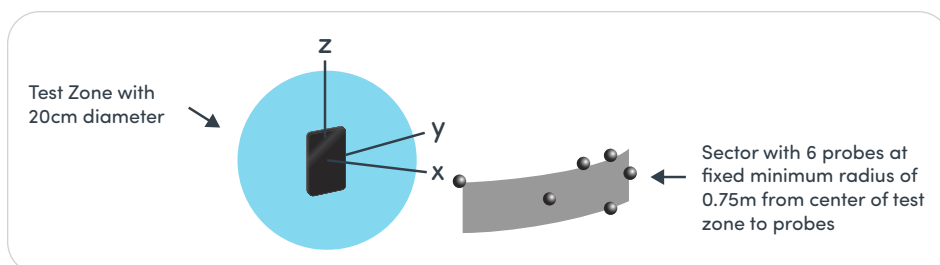


Figure 1: 5G FR2 MIMO OTA probe layout as given in 3GPP TR38.827 and TS38.151

Applications

- Chipset and prototype device debugging and performance verification
- 5G device MIMO OTA performance test
- 5G MIMO antenna design and performance test
- Device certification test

Key Features

- Complete 5G FR2 MIMO OTA automated test system
- Graphical view of results during testing
- Log and export detailed test progress and results
- Open API to support any qualified mmWave chamber and positioner preferred by the customer
- Supports CDL-C Urban Micro and CDL-A Indoor Office channel models defined by 3GPP as well as customer-defined channel models
- Supports SA or NSA devices
- Supports n257, n258, n259, n261 (24.25 to 29.5GHz); n260 (37-40.5GHz); and n262 (47.2-48.2GHz) bands

The Spirent 5G FR2 Device MIMO OTA Test System is a comprehensive yet affordable end-to-end solution that is based on (but not limited to) the test methodologies given in TR38.827 and TS38.151. It can be used to test device performance over the proposed millimeter wave bands (n257, n258, n259, n260, n261, n262). The solution builds geometrical propagation models to test data throughput at all beam orientations through the use of a 3D positioner that can rotate the device under test.

The Spirent solution includes the Vertex Channel Emulator, Vertex High Frequency Converters (HFCs), a 5G/LTE network emulator, and a small millimeter wave chamber (approx 3'W x 4'H x 2'D). Associated software includes Spirent's Advanced Channel Modeling, 5G MIMO OTA environment builder, and TestDrive automation test software. This powerful combination provides an integrated, comprehensive solution for 5G FR2 device testing and offers unique flexibility and scalability for customization with a different network emulator, different size and shape of chamber, and different frequency bands, if desired.

With years of experience working on radiated OTA tests, Spirent was the key contributor to 3GPP on FR2 MIMO OTA system configuration, modeling, and model validation methodology. 5G NR FR2 devices require a new type of MIMO OTA test solution using 3D probe distribution. As a trusted partner, Spirent experts can work with you to develop customized test scenarios appropriate to your specific needs, offering a **complete solution for demanding 5G NR FR2 MIMO OTA device testing**, without the need for external system integrators, as in the past.

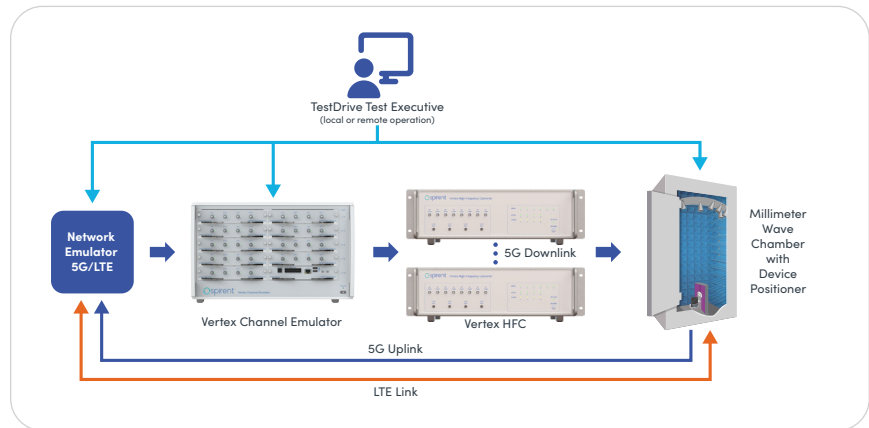


Figure 2: Spirent 5G FR2 Device MIMO OTA Test System setup

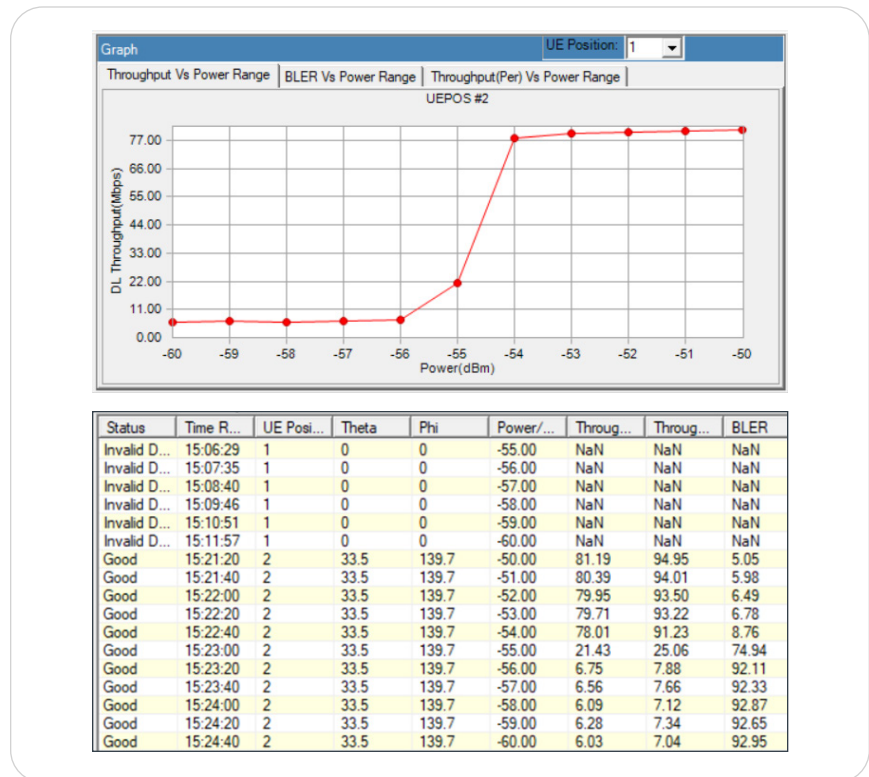


Figure 3: Sample downlink throughput test results for a particular device and orientation as shown in TestDrive user interface

About Spirent

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

About Spirent Channel Emulation Solutions

Spirent's state-of-the-art channel emulation solutions can replicate the comprehensive impairment and spatial conditions of even the most complex wireless channels, making it possible to conduct repeatable lab tests that have real-world relevance, lower costs, and improve test program outcomes while minimizing risk.

The Spirent Vertex Channel Emulator provides the modularity, flexibility and high density needed for a myriad of challenging test configurations, while the graphical user interface of the Advanced Channel Modeling software simplifies the design of your propagation scenarios and allows creation of downloadable 3D channel models. The Spirent multi-band active HFC offers unprecedented coverage for the FR2 bands. Refer to the links below to review the datasheets for the solution components.

A trusted provider for over 25 years, Spirent has led the definition of complex fading with multiple radios spanning several generations of mobile technologies. Our team of world-renowned experts are here to help. [Contact us](#).

For detailed information on individual components of the solution, please reference:

[Vertex Channel Emulator](#) | [Vertex Multi-Band High Frequency Converter](#) | [Advanced Channel Modeling Software](#)

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