

# Spirent Vertex Channel Emulator

The world's most scalable channel emulation platform, Spirent's Vertex Channel Emulator is an advanced test and measurement system that accurately simulates the complex effects of signal fading on wireless transmissions.

The system enables the test and evaluation of a broad range of applications with a variety of channel densities, from basic applications like 2-channel SISO to complex, high channel density applications like MIMO OTA and carrier aggregation.

The Vertex platform combines modularity, scalability and ease-of use into a powerful test and measurement solution that addresses the needs of a constantly evolving wireless market.

## Applications

- Basic SISO or 2x2 MIMO testing
- High channel density applications
  - MIMO Beamforming
  - MIMO OTA
  - Carrier Aggregation
  - Massive MIMO
  - AAS
- Device Conformance
- Virtual Drive Test
- Mesh network application

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 RF environment in the lab, making it possible to isolate and identify performance issues early in the development cycle.

Vertex is the newest addition to Spirent's family of channel emulation solutions, backed by a history of product leadership and industry-recognized expertise. Incorporating a modular RF front end with a powerful signal processing core, the Vertex Channel Emulator achieves an unprecedented level of scalability and flexibility, enabling it to efficiently address a broad range of applications from low channel density like SISO or 2x2 MIMO to high channel density like MIMO beamforming, MIMO OTA, carrier aggregation, massive MIMO and antenna array systems (AAS).

Easy to set up and operate, Vertex includes Spirent's industry-recognized user-friendly graphical control interface that allows measurements to be set up and performed quickly and accurately, without error.

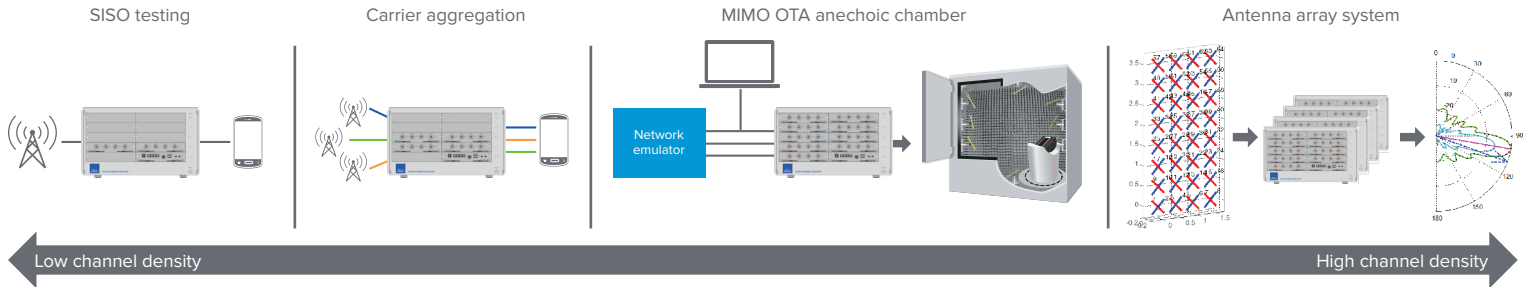


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## Features & benefits

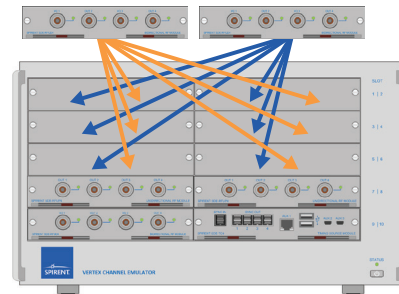
### Scalability

The Vertex Channel Emulator is scalable to a broad range of applications. The hardware is capable of supporting as few as two bidirectional RF channels for basic RF testing, and up to as many as 32 unidirectional RF channels to support high channel density such as MIMO OTA, all in one single, small form instrument.



### Modularity

Separate RF modules are optimized for unidirectional or bi-directional applications and support a variety of different frequency bands. This allows the Vertex Channel Emulator to be configured for specific test needs using minimal hardware. Field-replaceable RF and DSP modules facilitate upgrades and enhance serviceability.



### High channel density in a compact space

The Vertex Channel Emulator system supports up to 36 RF ports and 64 digital links in one rack height of 6U. It enables more efficient use of hardware for tests that require higher RF channel counts.

### Remote programming interface (RPI)

Remote programming is supported through TCP/IP. The RPI commands provide seamless backward compatibility to the Spirent VR5 HD channel emulator.

### Comprehensive channel modelling support

The built-in Vertex propagation library offers a vast selection of standard channel models, while making it easy to edit and save changes to both the standard as well as user-defined models. Classical and geometrical channel models are supported, and the independent channel modelling feature allows one Vertex Channel Emulator to support up to 8 nodes for a mesh network application test.

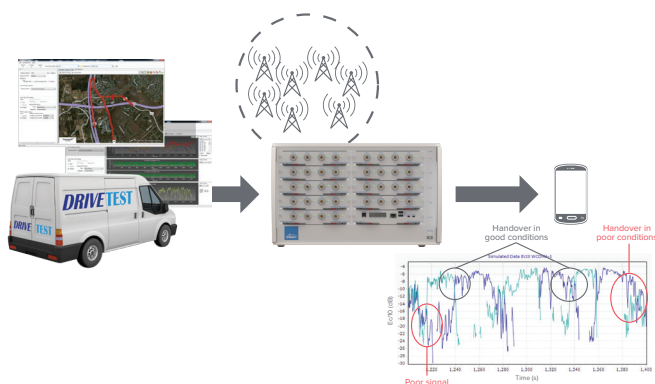
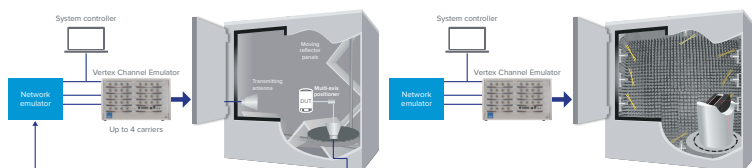
### Ease of use

Complicated test setups are made easy with an easy-to-use Graphical User Interface (GUI). Intuitively-designed libraries of connection setups make it easy to navigate through complicated configurations by presenting information in a clear way. For debugging purposes, important information is displayed in real time, including power level tracking of each RF port.

## Key test applications

### MIMO OTA

MIMO OTA applications require high channel density, based on the number of probes used in the test setup. The Vertex Channel Emulator can be used in both anechoic and reverberation chamber test setups and can switch between chamber types in minimal time. For anechoic chambers, Vertex supports up to 32 RF probes and two carriers with 16 dual polarized probes or 8 dual polarized probes on one instrument. For reverberation chambers, up to four carriers can be aggregated on one instrument.



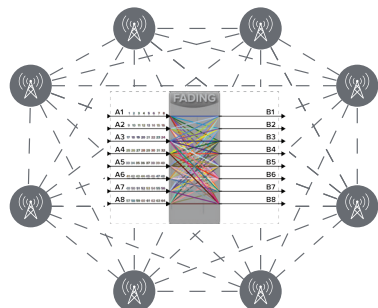
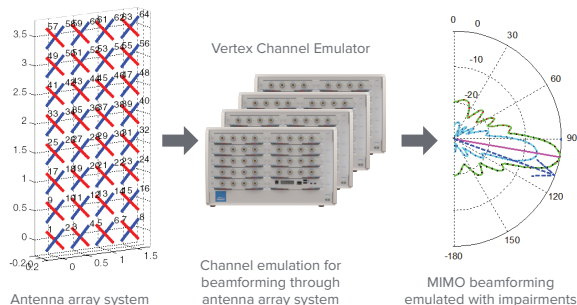
### Virtual drive testing

Supporting up to 16 SISO Cells or eight - 2x2 MIMO cells on one instrument, the Vertex Channel Emulator accurately reproduces real network conditions in the lab.

The ability to emulate a high number of cells in the lab, combined with Spirent's Virtual Drive Test - Conversion Tool (VDT-CT) software makes the laborious process of drive testing easy and repeatable in the lab. The VDT-CT application can convert a large variety of log file types (QXDM, JDSU, Accuver, Transcom, Anite Nemo, etc.) into reproducible drive route simulations. Additionally, the Vertex Channel Emulator allows easy debugging of power level issues by being able to dynamically monitor the power level on each port.

### AAS, massive MIMO and MIMO beamforming

Up to four Vertex instruments can be integrated into a system to support 64 independent RF channels. This can be used for channel emulation in massive MIMO applications with real-time fading.

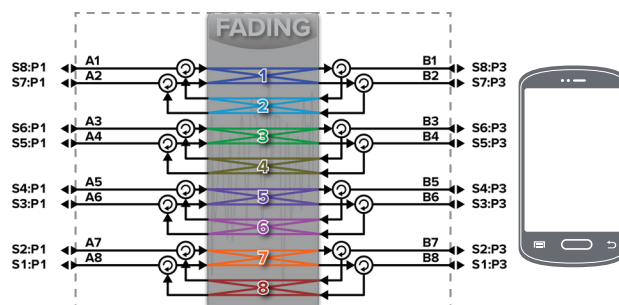


### Mesh network application

Mesh network applications require that each node independently communicate with each other. From a channel emulation perspective, this implies that each radio link needs to be emulated with a different fading profile simultaneously, placing heavy demand on the number of RF antenna ports required in addition to the processor load. The Vertex Channel Emulator supports up to 8x8 independent channel models on a single instrument, providing the capability to test up to an eight node mesh network.

### Carrier aggregation

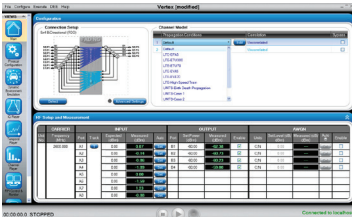
Supporting up to four - 2x2 bi-directional carriers on one instrument, the Vertex Channel Emulator can be used for carrier aggregation scenarios. Each radio link can be independently modelled, simulating channel conditions to represent multiple carriers on the same eNodeB or from different eNodeB's. The same setup can also be used for simulating channel conditions that trigger handovers and on Coordinated Multipoint (CoMP) applications as well.



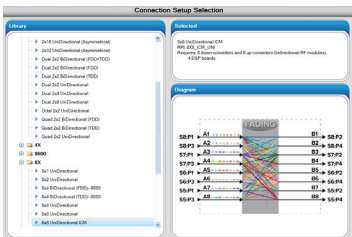
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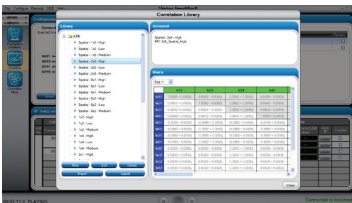
## Graphical User Interface



For users familiar with Spirent's VR5 HD Channel Emulator, the Vertex Channel Emulator presents a seamless transition as it has been developed with the same GUI features. The Vertex GUI is very easy to use and presents clear and concise information even for the first-time user. The GUI can be accessed using a cable hooked up to the display port on the Vertex Channel Emulator or through the controller laptop. Connection setup and RF parameters for channel modelling can be easily configured to run in real-time mode. A comprehensive set of ready-to-run standard models is provided, making it easy to select and play. Setup of most test cases is a matter of using a few mouse clicks and drop down menus.



The GUI provides an easy-to-read display for high-channel density features that can be complicated to setup. For example, the connection setup for an 8x8 MIMO application, or 64 radio links, can be easily made using the pre-loaded option from the Connection Setup library.



Configuring the MIMO correlation matrix is easy and convenient to do on the Vertex Channel Emulator GUI. Complicated matrices such as a 2x8 configuration can be created using spreadsheet-type entries, rather than spending the time writing elaborate test scripts for creating the correlation matrices.



The Vertex Channel Emulator GUI displays real-time information regarding channel power with respect to fading. This instantaneous display enables quick detection of deviations from expected behaviour and the ability to efficiently debug problems.



The cable connection diagram built-in to the GUI presents the actual cabling connections that need to be made. This feature makes it easy to cable complicated connection setups and minimizes cabling error. The image shown is the cabling setup for an 8x8 unidirectional configuration.

Additionally, the temporal player feature built-in to the GUI facilitates real-time tracking of power levels at each port. This is especially useful for handover scenarios which are based on power levels between the serving cells.

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