

Advanced Channel Modeling Software

Create complex wireless propagation scenarios using a simple graphical user interface



As telecommunications networks continue to move toward 5G and pre-6G and merge with satellite communications networks, scenarios for radio frequency (FR1 and FR3) and millimeter wave (FR2) propagation continue to increase in complexity. One of the complexities occurs as a result of massive MIMO, a key physical layer technology for 5G applications that involves the use of large-scale base station (gNB) antenna arrays, which contain as many as 256 elements. Similarly, end user devices will have to accommodate large internal antenna arrays with as many as 32 elements. This combination of high-order antenna arrays results in extremely complicated and intricate environments that are difficult to model in a lab setting for testing purposes. Not anymore.

Design, View, Build and Play Real-World 3D Propagation Scenarios

VIABI's Advanced Channel Modeling (ACM) software allows **simple creation of highly complicated scenarios** without the need to fully understand all the involved channel model propagation characteristics. Simply select from an intuitive menu of parameters for various aspects of the scenario (or import any or all of them such as gNB and device antenna models or chamber design) and then build the desired environment in a few clicks. Users can select from a variety of real-world propagation scenarios dependent upon the connection type, including end-user mobility:

Circular: Basic scenario where one or more devices are moving in a circle around a gNB; useful to test beam tracking and beamforming algorithms inside a gNB

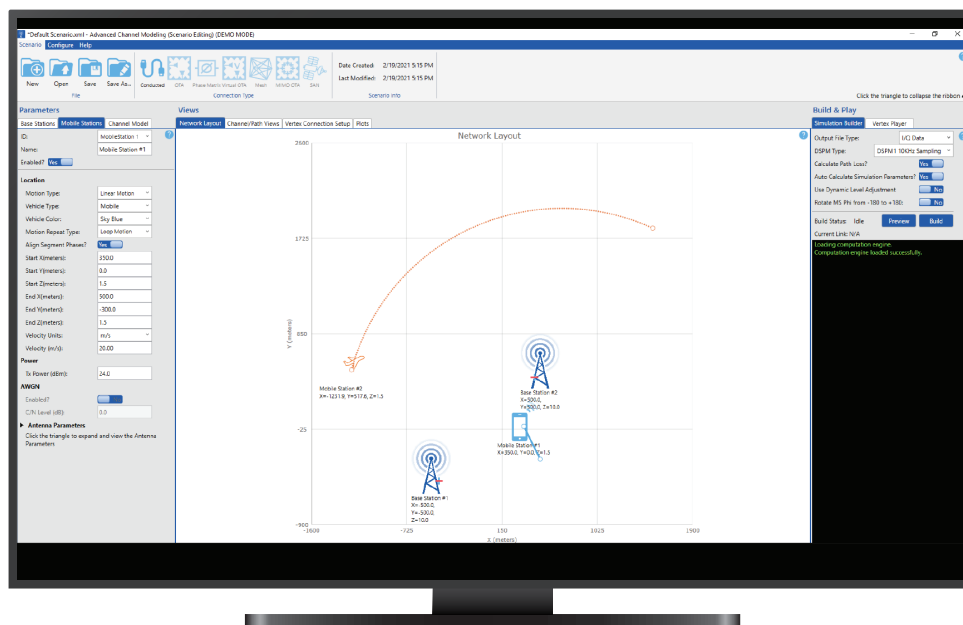
Linear: High speed scenario with either a train or other vehicle; allows testing of beamforming, beam tracking, power control, handover, or other algorithms

Piecewise Linear Motion: Mobile stations move in an arbitrary path as defined in the piecewise definition file; this file contains the cartesian coordinates and velocity for each segment to create a custom path

Static: Classical performance testing of gNB or end-user devices

With simple and streamlined visual aids, ACM lets users quickly design any of these complex 3D propagation scenarios, then **automatically creates and downloads channel samples** to the Vertex channel emulator in accordance with the indicated test environment.

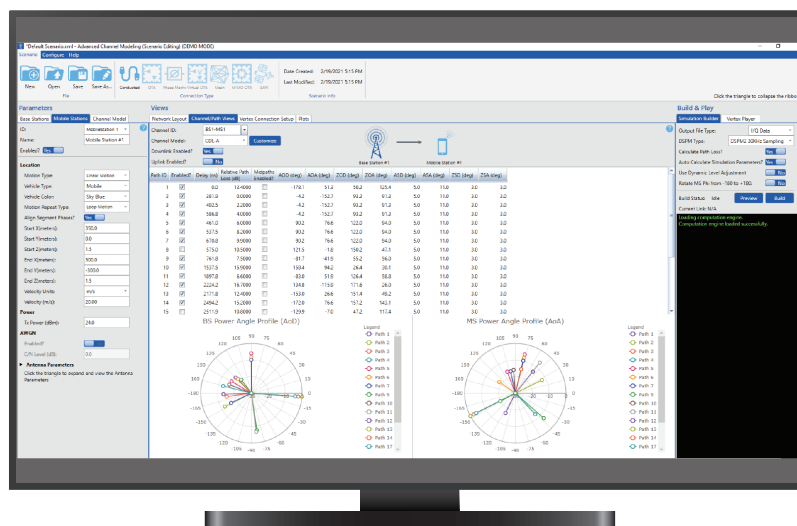
Environment templates include scenarios for conducted testing, massive MIMO over-the-air testing (via an anechoic chamber), massive MIMO conductive testing via a phase matrix instrument, virtual over-the-air testing, mesh topology applications, 5G device MIMO over-the-air applications, and satellite and aeronautical applications.



Intuitive graphical user interface simplifies creation of complex 3D propagation scenarios

Powerful Visualization of Channel Models

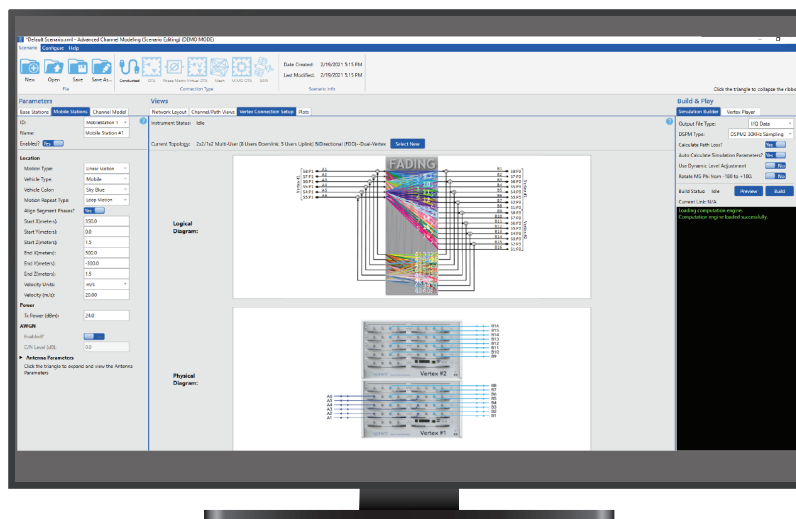
Users can visualize the power angle profiles of both the base station and mobile device, relative path loss, delay, and expected path direction of every emulated channel path.



Propagation Condition Editor

Automatic Creation of Connection Setups

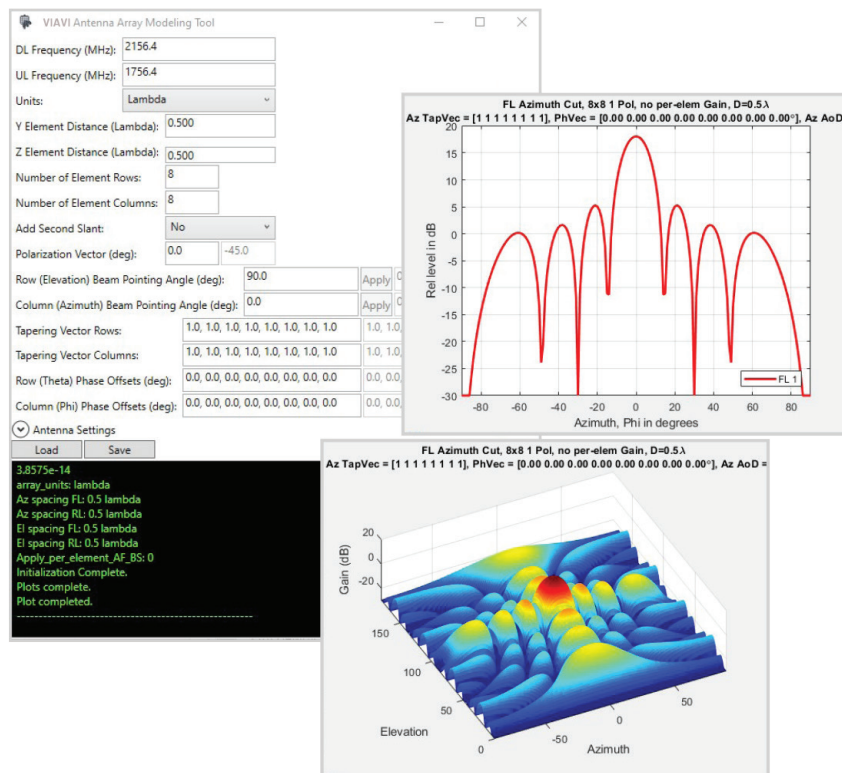
ACM automatically creates and displays the required connection setup based on the elected system configuration to assist with Vertex cabling implementation.



Topology Selector

Visualize Antenna Array Theoretical Performance

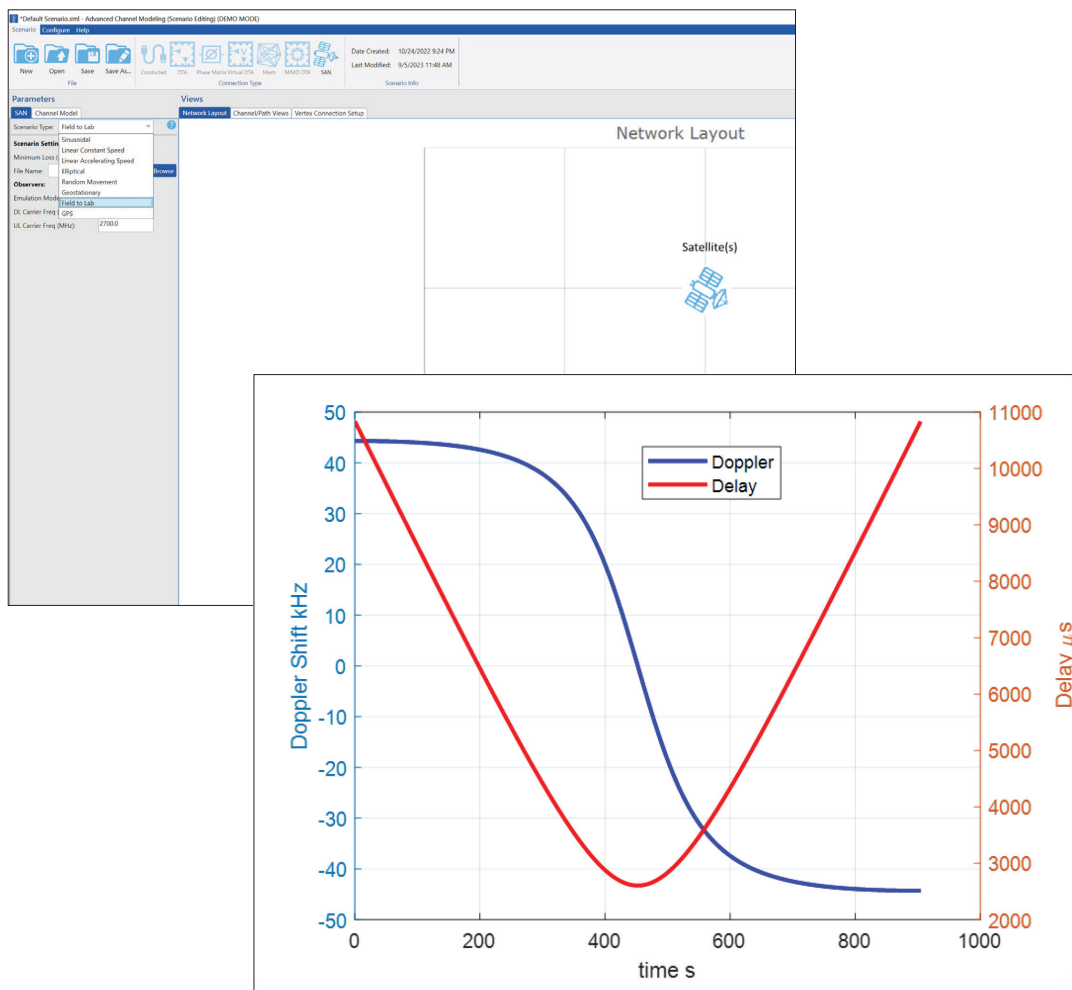
VIAMI's Array Modeling Tool (AMT) is a plug-in to VIAMI's ACM software. It is used to investigate various array designs, enabling you to plot and view a graphical representation of how an antenna array will perform and visualize how spatial filtering will occur. With a few inputs, AMT can quickly provide the resulting array factor of complex planar or linear arrays. It supports arbitrary polarizations, number of rows, columns, element separation, and pointing angles (in elevation and azimuth). In addition to plotting the 2D and 3D array factors, it provides the phase progression needed to steer beams in elevation/azimuth. The tool also supports tapering vectors to quickly assess tradeoffs between directivity and sidelobe suppression.



Array Factor Visualizer

Easily Emulate Complex Satellite Trajectories

ACM software can import arbitrary trajectories in a very simple text format describing x, y, z coordinates vs. time, making the emulation of complex trajectories straightforward. Additionally, simpler scenarios like linear motion, elliptical motion, and linear motion with acceleration are available with a touch of a button. Also, ACM can easily import trajectories from VIAVI's GPS simulator.



Non-Terrestrial Network (NTN) Delay-Doppler Trajectory

Create Realistic 3D Channel Models for Prototype Design and Beyond

ACM produces a text file output that can be used directly in any software simulator. With this capability, developers can create realistic field-like tests for early system simulations, even before formal gNB or device prototypes exist. As a result, field tests can be performed earlier in the development cycle, reducing or preventing defects that typically don't appear until the design is in hardware and changes are difficult or nearly impossible. Later, the same channel models can be used in every stage of R&D testing, enabling faster overall time to market.

Smooth Integration with Vertex Channel Emulator for Real-World Testing in the Lab

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 100 GHz with a single hardware platform (add the Vertex High Frequency Converter family to address channel emulation needs in the millimeter and sub-THz frequency ranges). Each RF channel can support up to 200MHz bandwidth, with wider bandwidths achieved by concatenating multiple RF carriers. The ACM software application requires a Windows 10 or newer operating system with a minimum 16 GB RAM.





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