RF Signal Environment Generation
Testing Sophisticated Communications Systems

ENSURE BETTER COMMUNICATIONS SYSTEM PERFORMANCE AND DEVELOPMENT SAVINGS WITH REALISTIC RF SIGNAL ENVIRONMENT GENERATION

COMPLEX RF SIGNAL GENERATION

As the world's RF signal environment grows increasingly complex and diverse, today's communications systems must be able to perform in the midst of extreme signal depth and diversity. With Viasat's RF Signal Environment Generation, you can ensure your communications systems are ready for the real world before operational deployment. Our RF Signal Environment Generation goes beyond ordinary simulation to actually create a true-to-life avionics environment with signals of RF energy behaving in a realistic manner.

REPEATABLE

Viasat's RF Signal Environment Generation creates real life RF signal activity in a repeatable environment to test communications systems and uncover design issues early. This real-world environment enables you to resolve issues before your first flight test, so you can:

» Save millions of dollars in development, flight test and deployment costs
» Speed time to market
» Optimize system performance
» Reduce deployment risks

SCALABLE

Viasat can tailor the RF Signal Environment Generation technology to meet your unique test requirements. Our systems are scalable and programmable using a flexible and powerful user interface.
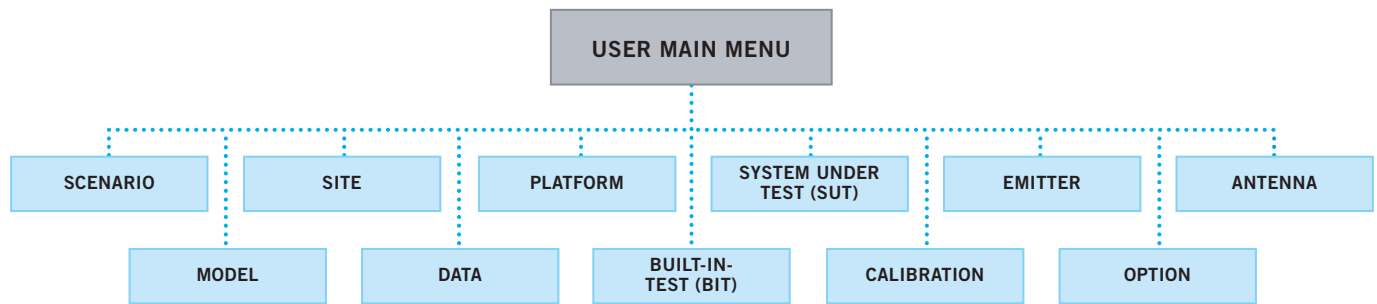
LARGE EXISTING SIGNAL LIBRARY

Viasat offers a large library of over 100 signals for realistic environment generation, as well as custom signals for your specific needs. We are continually expanding our waveform library to enhance the fidelity of testing in modern military and commercial environments.

» **Realistic Signal Environment** A simulated environment generating real RF
» **High-Density Signal Environment** Hundreds of independent signals
» **Dynamic RF Environment** Independent signal behavior
» **Behavioral Emitter Models** Coherent signals that react to the environment
» **Independent Platform Motion** 6 DOF motion models
» **Independent Signal Control** Frequency, amplitude, delay, Doppler, pulse characteristics, and more…

RF SIGNAL GENERATION EXPERIENCE

For over 20 years, systems designers have relied on Viasat's signal modeling expertise to help successfully launch better avionics and communications systems. Our RF Signal Environment Generation can shake out design problems during developmental testing in a true-to-life environment. Signal scenarios are controlled, repeatable and dynamic to help you optimize your system's performance. Viasat has delivered large-scale systems for platforms including the F-22 and F-35.

BUILDING AN RF SIGNAL ENVIRONMENT GENERATION SCENARIO

Adjust and control every aspect of the RF environment generation via the system's intuitive user interface.

Begin by defining the physical location of the desired RF environment. The "scenario" can be at any geographic location in the world. The system uses a Defense Terrain/Elevation Database (DTED) to provide real-world topography. You can then place static or dynamic "platforms" (objects) in the scenario.
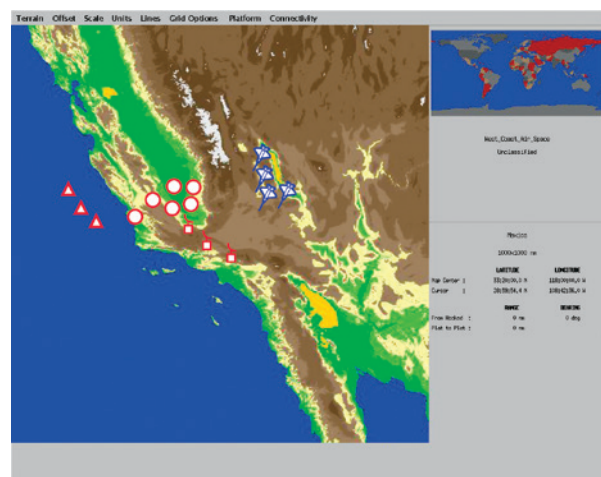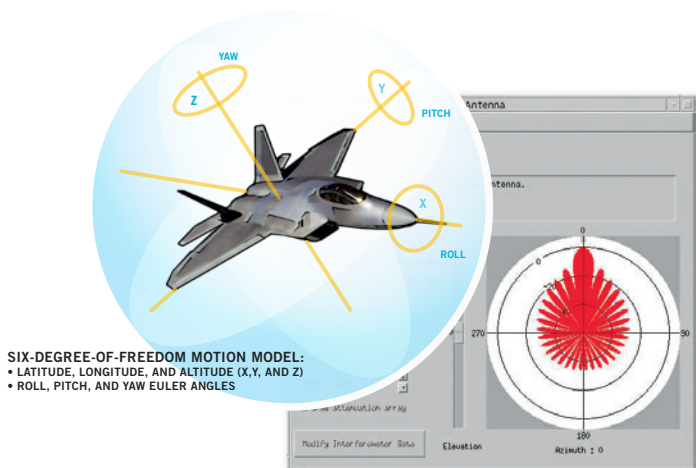
Dynamic motion can be established through set velocity parameters or via waypoint definition. Computation of dynamic platform position uses a six degrees of freedom (6-DOF) motion model that tracks both position and altitude of the platform with update rates as high as 100 Hz.

Next, you can add "emitters" to the platforms, defining all the transmitted signals from the real-world objects. The user interface enables you to select from a set of emitter modulation types and also associate an antenna pattern with the emitter. The antenna patterns can be selected from our predefined data base or imported to represent custom antennas in a high-fidelity gain pattern modeled by an azimuth and elevation look-up table.
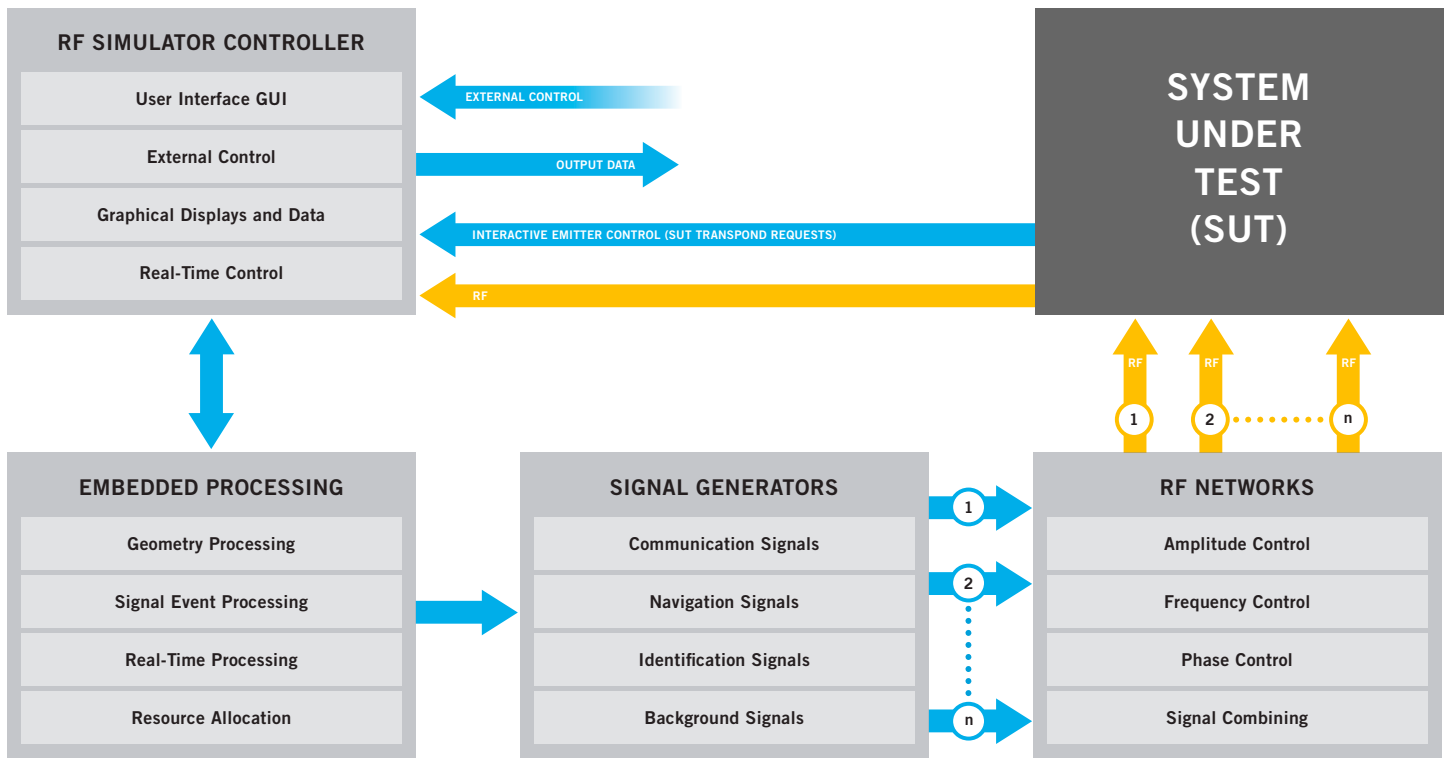
Platform and emitter models can be replicated throughout the scenario to create a high-density, real-world RF environment. The system supports predefined platform models that represent real-world objects such as an air defense network. The technology offers emitter behavioral models, changing modes, turning transmissions on and off, and setting fixed power levels at specified times.

The System Under Test (SUT) is also defined using emitter and antenna models. The SUT can be either static or dynamic using the 6-DOF motion models. You can also import detailed antenna models that reflect the unique features of your communication system. For complex systems, this can include multiple antenna patterns that feed into multiple sensors on a specific platform.

During run time, the system generates the correct amplitude, frequency and pulse characteristics for each transmitted signal of each platform. For a SUT with interferometer sensors, accurate signal phase is also presented to each antenna port. The operator has the flexibility to stop and resume a scenario, as well as to make dynamic changes to platforms and emitters during run time. This virtual environment emulates the real-world RF environment to the SUT with a high degree of fidelity, flexibility and repeatability.

SIX-DEGREE-OF-FREEDOM MOTION MODEL:
• LATITUDE, LONGITUDE, AND ALTITUDE (X,Y, AND Z)
• ROLL, PITCH, AND YAW EULER ANGLES

Viasat RF Signal Environment Generation

RF SIMULATOR CONTROLLER
- User Interface GUI
- External Control
- Graphical Displays and Data
- Real-Time Control

EXTERNAL CONTROL
OUTPUT DATA
INTERACTIVE EMITTER CONTROL (SUT TRANSPOND REQUESTS)
RF

SYSTEM UNDER TEST (SUT)

RF RF RF
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EMBEDDED PROCESSING
- Geometry Processing
- Signal Event Processing
- Real-Time Processing
- Resource Allocation

SIGNAL GENERATORS
- Communication Signals
- Navigation Signals
- Identification Signals
- Background Signals

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RF NETWORKS
- Amplitude Control
- Frequency Control
- Phase Control
- Signal Combining

RF SIGNAL ENVIRONMENT GENERATION ARCHITECTURE FOR YOUR SPECIFIC NEEDS

Viasat's RF signal generation technology provides a mature development environment for custom user requirements. We offer engineered-to-order systems, with customer-driven requirements for signal types, processing throughput, interfaces to other systems, quantities of signal generation elements and RF networks and output ports. Our architecture facilitates scalability and extensions to the existing stimulator signal set and functionality. The RF Stimulator Controller hosts the Graphical User Interface (GUI) for scenario development, data storage and display and real-time scenario control.

Embedded processors perform the computationally intensive tasks of platform motion and geometry calculations between the scenario platforms and the SUT. The embedded processing components also keep the timing for signals and control the parameters for the programmable signal generators.

The signal generation uses a unique arbitrary waveform generator subsystem to emulate a wide variety of pulsed and continuous RF waveforms. The signal generators output the waveforms at baseband with rates as high as 40 Megasamples/second. Viasat offers a large library of over 100 signals for realistic environment simulation. Viasat's experienced signal modeling team can also leverage our flexible stimulation architecture to develop additional waveforms for your needs.

Viasat's RF signal generation architecture provides a scalable and flexible test and evaluation environment for your communications system. Using the baseband signals, RF networks adjust the amplitude, frequency and phase of the signals based on the geometry, range and antenna characteristics of the platforms and the SUT. The technology supports signal generation from as low as 500 kHz up to as high as 18 GHz. Frequency is controllable in 1 Hz increments. As the communications system designer, you can determine the number of signal generators based on the required signal density of the real-world application. Multiple emitter signals are combined to present a composite signal to the SUT. You can also specify the number of RF output ports, which correlates to the number of input antenna ports needed to stimulate the SUT. The phase control of the signal allows directional sensing from an interferometer to an accuracy of one degree.
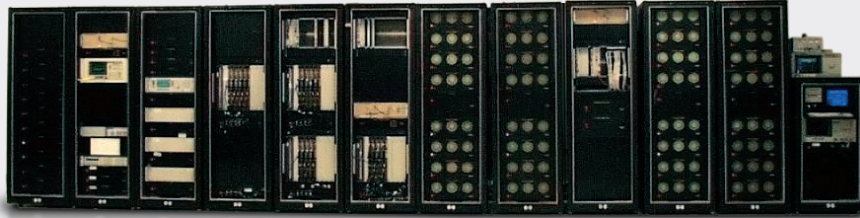
The physical configuration of the system is highly dependent on the specific customer requirements for signal density and communications system complexity. Viasat has delivered customized systems in many forms, ranging from a one-device system to over a dozen racks. We continue to develop smaller and more modular stimulators that promise additional flexibility for your needs.

Testing with Viasat's RF Signal Environment Generation reduces net system costs by lowering the probability and risks of discovering and fixing design problems after fielding a communications system.

Viasat RF Signal Environment Generation

The Viasat RF Stimulation engineering team is committed to helping you successfully design and launch your complex communications system. We deliver the highest quality RF stimulators for your communications system testing needs, to help you gain savings in time and development costs, while ensuring optimal system performance.

LARGE-SCALE RF ENVIRONMENT GENERATOR

PORTABLE RF SIGNAL ENVIRONMENT GENERATOR

VRG-1000
PORTABLE IFF ENVIRONMENT GENERATOR

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