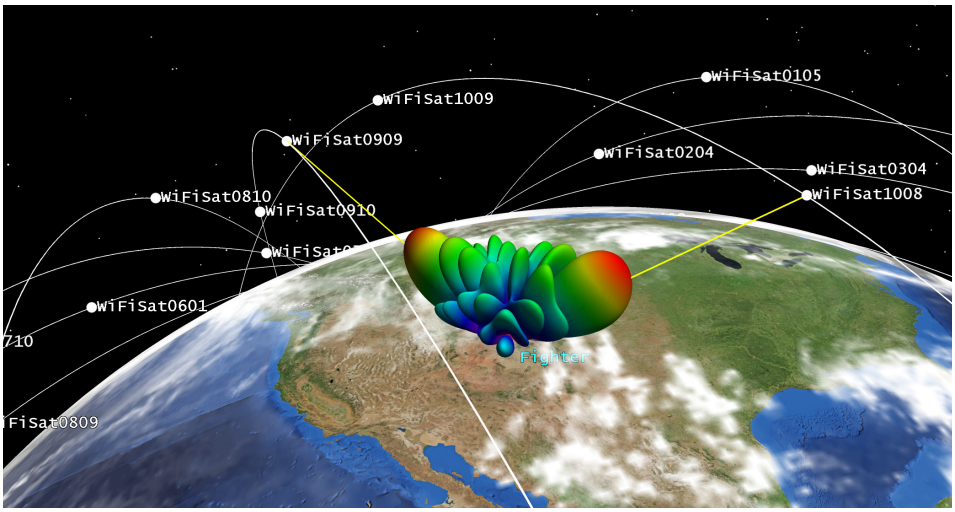
STK COMMUNICATIONS

The Communications module is used to model and analyze real-world RF and optical communications.

Provides high fidelity modeling and analysis that includes:

- Detailed link budget reports and graphs
- Signal performance contours
- Visualization of dynamic system performance
- Detailed rain models, atmospheric losses, and RF interference sources
- Ability to plug in custom models or interference sources
- All system models easily editable from the components browser



System modeling

Provides the ability to model the physical components of each node in any communications system.

- Eight STK receiver types: Simple, Cable, Medium, Complex, Multibeam, Laser, RF plugin, and Laser plugin
- Eight transmitter types: Simple, Cable, Medium, Complex, Multibeam, Plugin, Laser, and GPS Satellite
- Three re-transmitter models: Simple, Medium, and Complex
- Over 60 Antenna types, including multi-beam and phased array
- Over 20 power spectrum filter models for a transmitter or receiver
- Wideband and narrowband jammer modulators, third-party modulators, external file modulators, and script plugin modulators
- Multiple demodulators, including a user-defined demodulator

Multi-beam antennas

- Each beam is an independent antenna with its own frequency, RF power level, polarization state, gain and characteristic type.
- Each beam's boresight directions can also be independently oriented.
- Aggregate contours are displayed in 2D and 3D.
- Variable beam selection criteria.
- Different beam selection criteria, such as maximum gain or minimum boresight angle, or plugin script.

Phased array antennas

- Multiple element configurations: Circular, Hexagon, Linear, Polygon, and external data.
- Define number of elements and spacing.
- Disable/enable individual elements.
- Specify beam direction and Null steering to other STK objects from a data file or script.
- Adaption algorithms include Min. Variance Distortionless Response (MVDR) and user specific weights from a data file or script.

Modeling the RF environment

A full range of environment models is provided.

- Empirical rain models: Crane 1982, Crane 1985, and ITU-R P.618-20, as well as user-definable outage percentage and rain rate.
- Atmospheric absorption models: ITU-R P.676-9 and Simple Satcom. ITU-R P1814 for laser receivers.
- Urban and terrestrial models: Two-Ray and STK Urban Propagation extension.
- Clouds and fog models: ITU-R P.840-3 recommended for attenuation due to clouds and fog
- Tropospheric scintillation model: ITU-R P.618 model with option to compute deep fade
- Custom loss plugin models
- Object specific losses such as local surface atmosphere and system temperature
- Terrain Integrated Rough Earth Model (TIREM)

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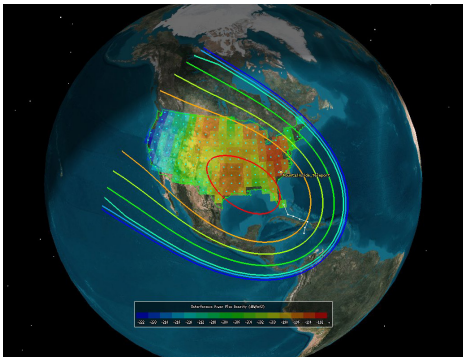
Terrain Integrated Rough Earth Model (TIREM)

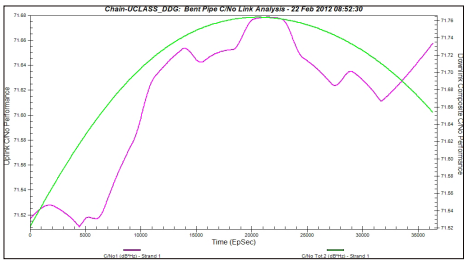
TIREM adds fidelity to the calculation and dynamic modeling of point-to-point, line-of-sight effects for link performance in Communications, by taking into account the effect of irregular terrain, sea water, and non-line-of-sight effects. The maximum height for these models is 30km.



Constraining RF phenomenon

Communications links can be constrained in a variety of ways on a transmitter or receiver.

- Frequency range, received isotropic power level, power flux density, link EIRP, Doppler shift, carrier-to-noise density ratio, power at receiver input, true carrier-to-noise ratio, bit error rate, link margin, bit energy to noise power density ratio
- Relative angle between the transmitter's plane of polarization and the receiver's plane of polarization
- Dynamically computed ratio of the link budget receiver gain value (G) along the link vector and the total receiver noise temperature (T)
- User plugin



Analyzing comm systems

The full power of STK reporting and graphing is available to present analyses of communications links.

Link margin specification and calculations

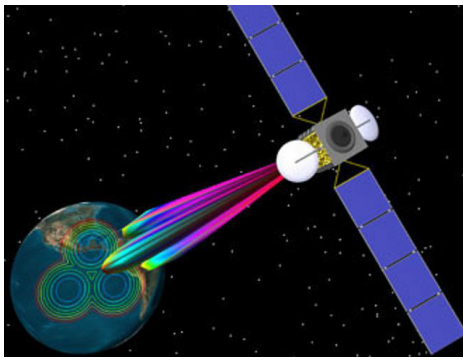
- The Link Information report for a Receiver includes the Link Margin Type (BER, RIP, C/N, etc.), Link Margin threshold value, and the computed Link Margin.
- Report results can be filtered based on the Link Margin calculation.

Interference analysis

- Performs network and target interference analysis as well as target interference analysis.
- Quickly calculates the impact of the interference network into communication links and presents the results as time-ordered data and statistical summaries using probability density functions (PDFs) and cumulative density functions (CDFs).
- Enables you to investigate the C/(N+I), C/I, DT/T and power flux density.
- Interference analysis for a specific link (e.g., ground station to a target) can be accomplished quickly by leveraging the STK Satellite Database.
- Combined with a user-supplied RFI database file, you can quickly identify which satellite may cause or be susceptible to RF interference from a ground station.

Visualize and animate your analysis

Highlights the Communications components, such as interferers, during the STK animation period on both the 2D map and 3D globe.



Fully integrated with STK analysis tools

STK Analysis Workbench tools. Extend the fundamental computational capabilities of Communications by using the Time, Vector Geometry, and Calculation Tools. (Requires Pro and Analysis Workbench licenses.)

Coverage and Volumetric analysis. Evaluate spatial conditions and calculations across a number of grid points. (Requires Coverage and Analysis Workbench licenses.)

Coverage or SatPro. Display jamming/interference contours on 3D coverage grids or on the 3D attitude sphere. You can also investigate the C/(N+I), C/I, DT/T and power flux density.

Integration with third party tools

Connect and Object Model. Automate and interface custom software using the Connect engineering-level interface or the finer grain MS Com-compliant Object model interface.

MATLAB. Generate link budget data between a transmitter and a receiver that is suitable for the STK MATLAB interface.

QualNet interface. Combines network performance evaluation from QualNet with the platform mobility models, wireless link calculations and mission visualization environment of STK.