

# STK for Electronic Warfare – GPS Jamming

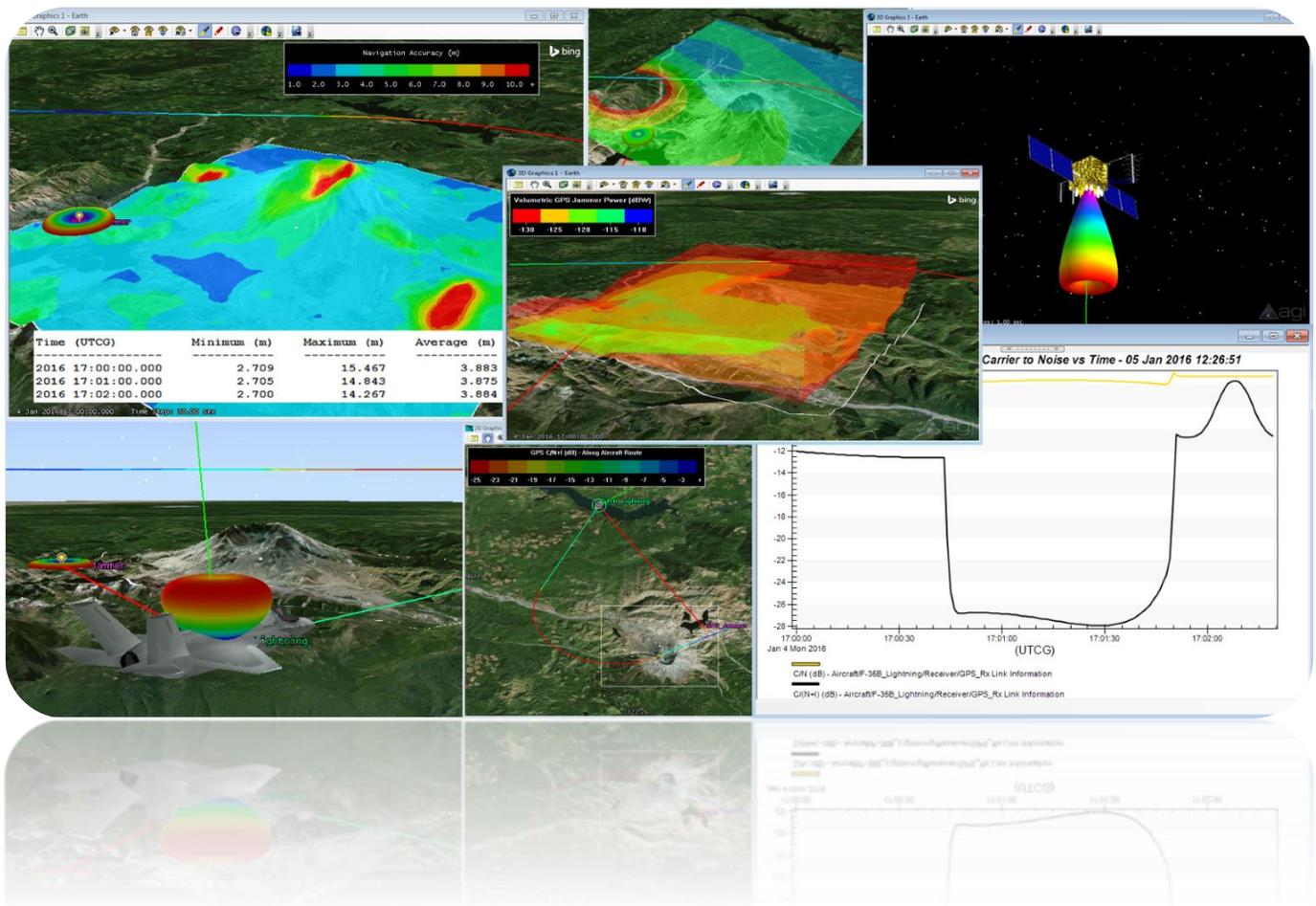
## Required Licenses:

STK Pro | Analysis Workbench | Coverage | Communications | TIREM

## Introduction:

STK supports Electronic Warfare (EW) mission planning and operations. Engineers and system planners can leverage STK's extensive analytical capabilities to promote an integrated picture of their EW mission in one tool, allowing them to optimize and more effectively manage electronic assets during a mission.

This scenario models the GPS jamming from an emitter in a mountainous region to an aircraft flying overhead. Additionally, this scenario shows the regional navigation accuracy and the GPS jamming power over the region.



## Related Tutorials:

This scenario was built using a combination of the following tutorials:

- [GPS Jamming using Communications](#)
- [Position Accuracy in Mountainous Terrain](#)
- [STK 11 New Features Tutorial](#)

## Exploring this demo:

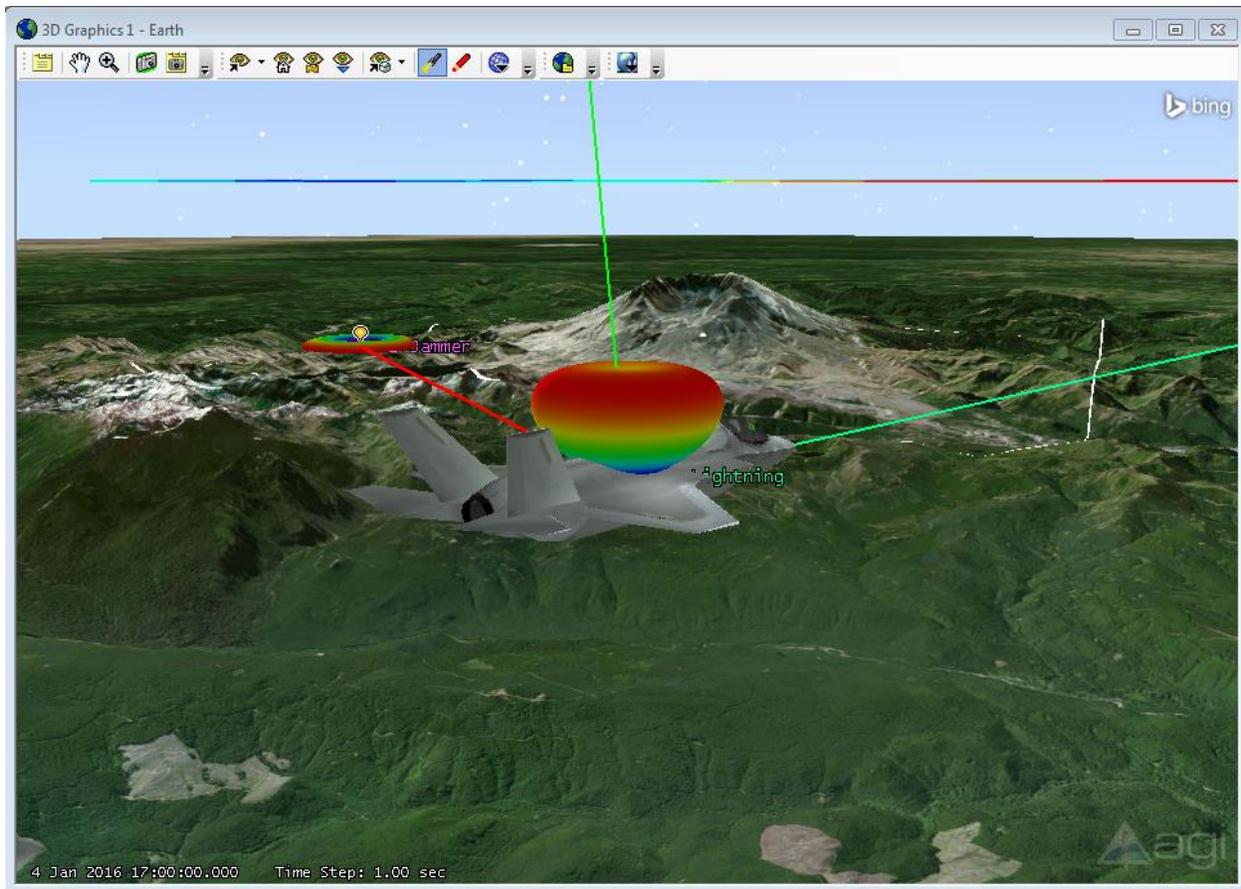
- Use the Animation toolbar to put the scenario into motion:



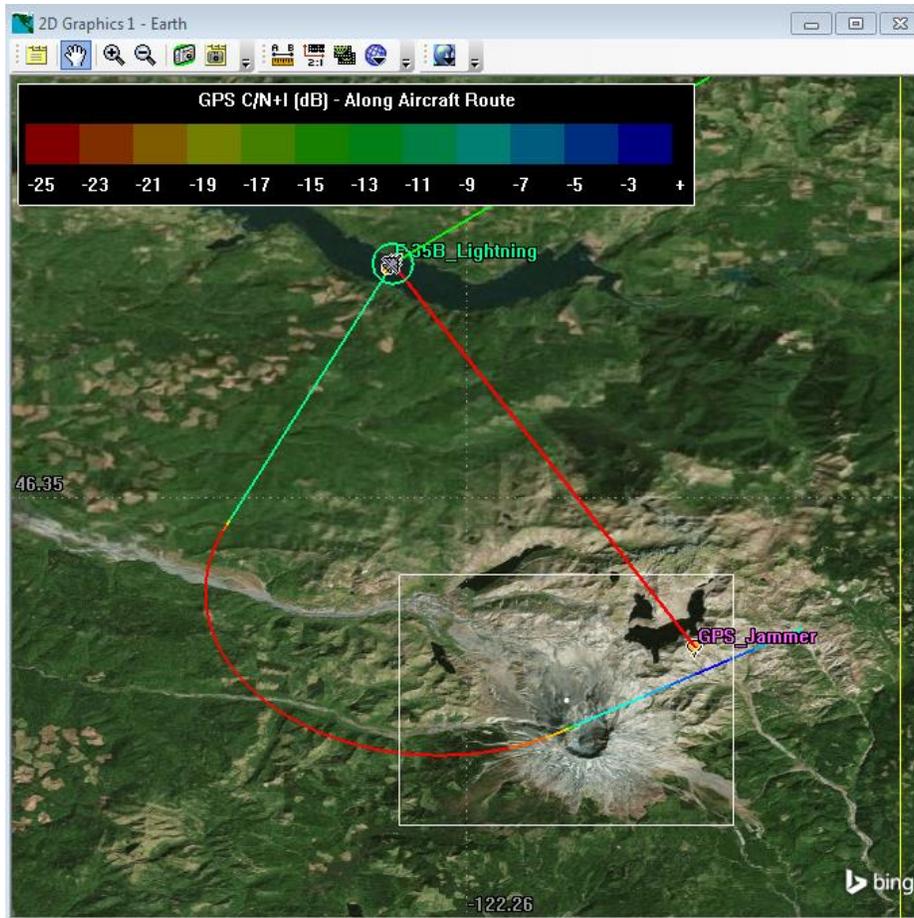
- Use Stored Views to visualize each section 
- Use Quick Reports to evaluate each section 
- Toggle the various Coverage and Volumetric coverage graphics:

-  GPS\_Coverage
-  GPS\_Jamming
-  Vol\_JammerPower

 **Stored View:** Jump to the “1\_AircraftView” stored view:

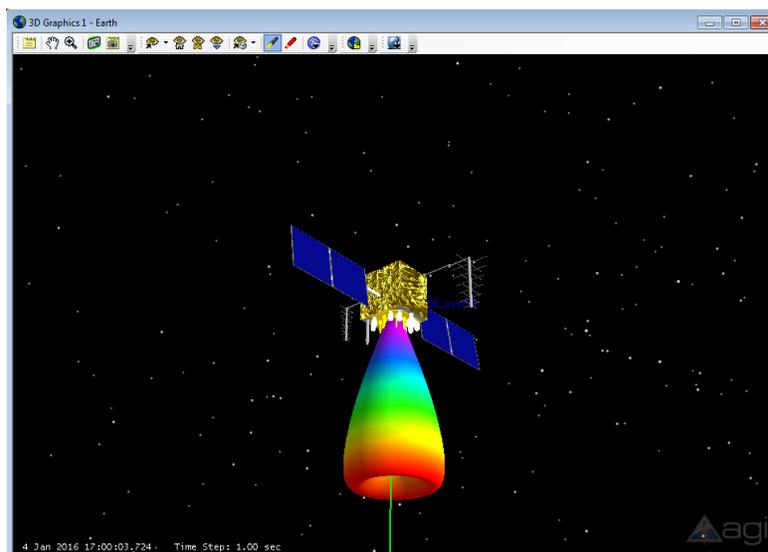


This view shows the F-35 aircraft at the beginning of the scenario. The aircraft route was built using STK Aviator, although it is a very simple route that flies over the region. The route is colorized based on the Carrier to Noise plus Interference ratio, which is displayed in the 2D Graphics window:



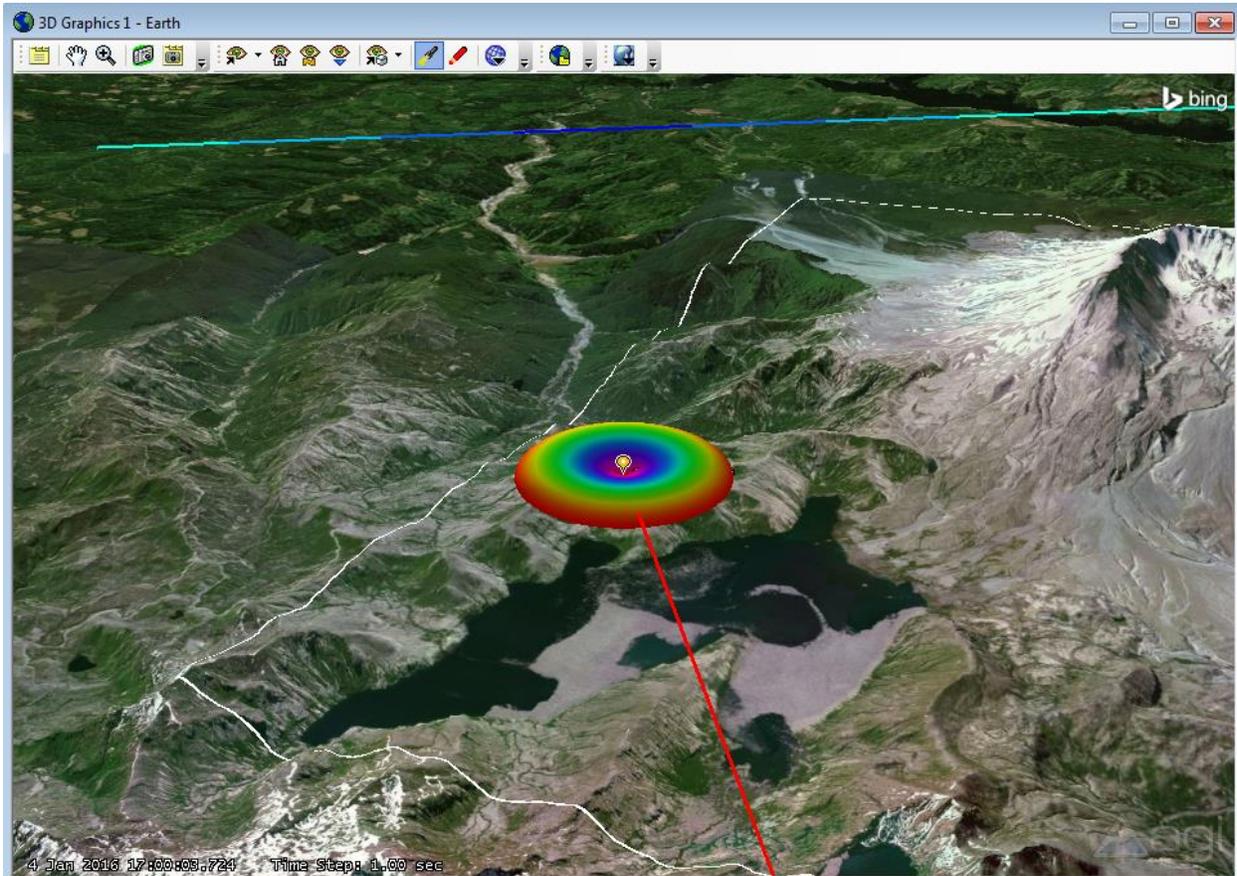
The notional F-35 receiver is modeled with a GPS FRPA antenna and the GPS transmitters are using a Block IIR L1 GPS Global antenna.

 **Stored View:** Jump to the “2\_GPS\_View” stored view:



The jammer is modeled as a relatively cheap system with a 2 W, 7.4 inch dipole antenna.

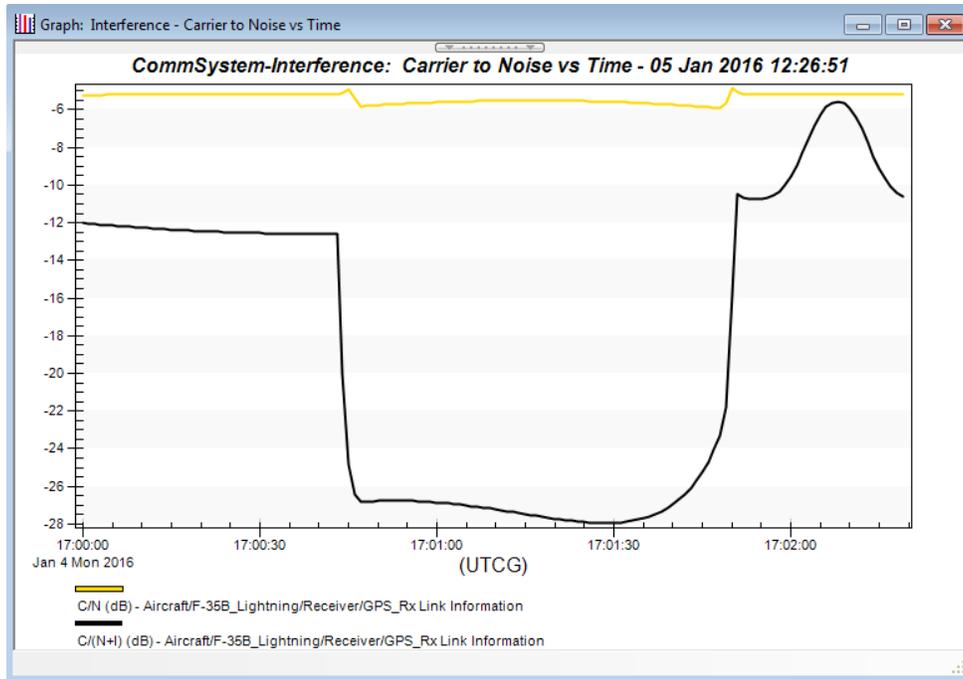
 **Stored View:** Jump to the “3\_JammerView” stored view:



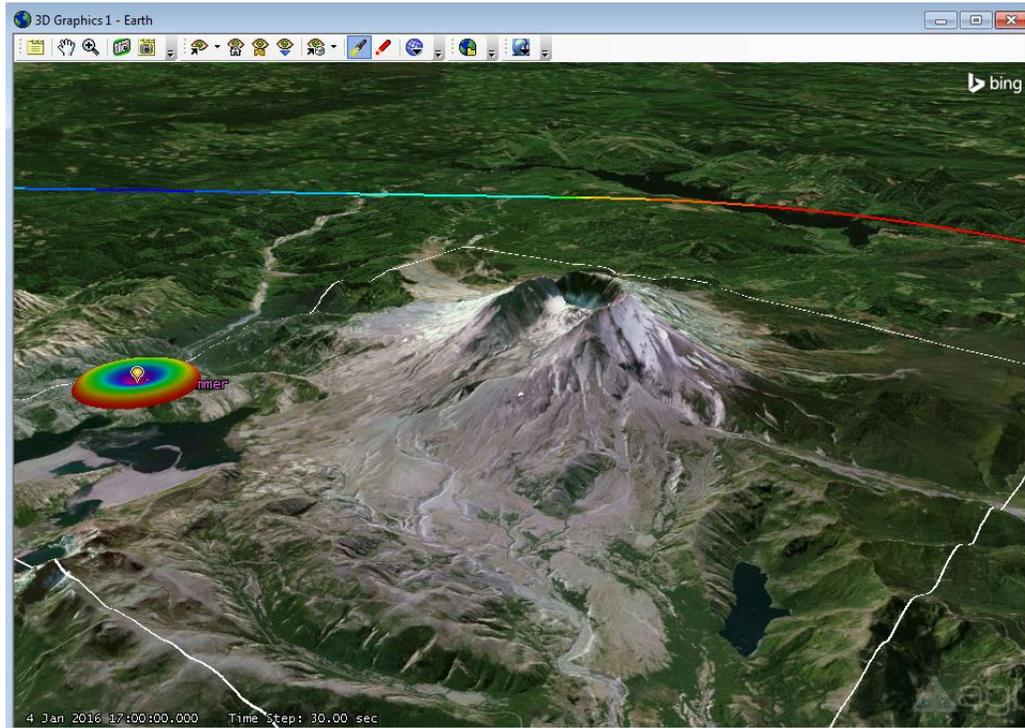
The “Interference” Comm system incorporates the ground based jammer as an interference source to the link between the F-35 receiver and the GPS transmitters. The interference source is identified by the red line.

**Note:** When you have a comm system object in your scenario, STK will automatically incorporate the interference source identified in that object throughout the rest of your scenario, including coverage and object coverage.

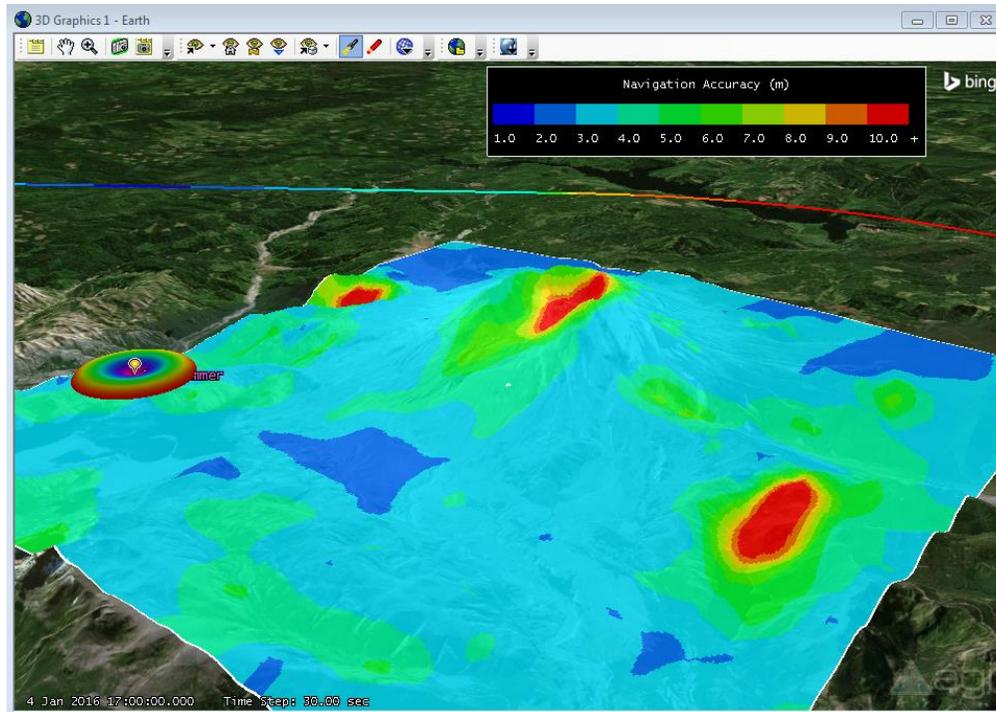
 **Quick Report:** Select the “Carrier to Noise” quick report to generate a graph of C/N and C/N+I:



 **Stored View:** Jump to the “4\_JammingRegion” stored view:



Enable the checkbox for   GPS\_Coverage

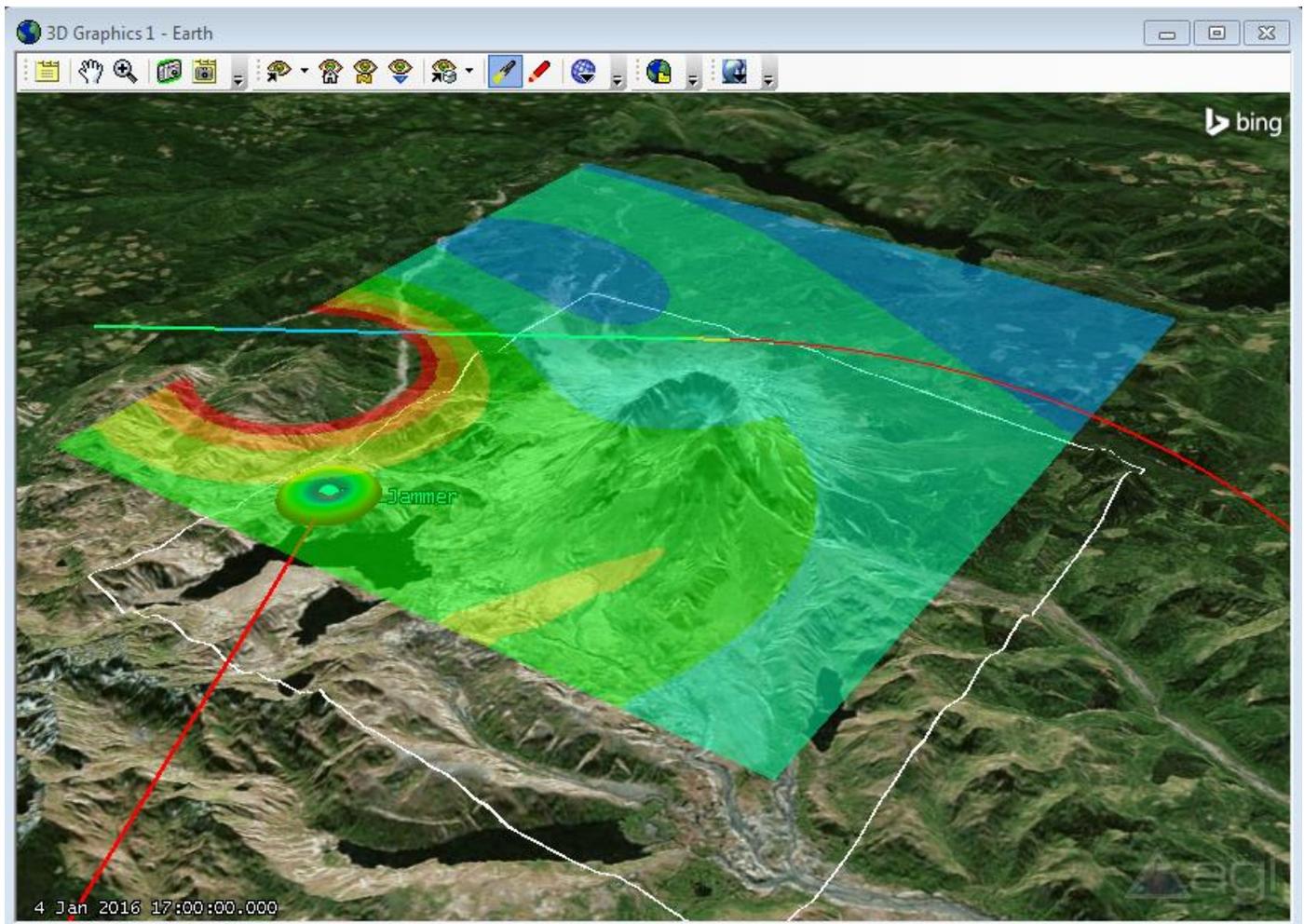


This image shows the navigation accuracy anywhere on the ground within the defined area based on the surrounding terrain. The Navigation Files Support UI Plugin was used to incorporate the uncertainties for each of the GPS satellites. The Coverage Definition object was used to create a grid throughout the ExerciseArea target on the terrain, and compute accesses to the GPS constellation. The “NavAcc” Figure of Merit was then used to compute the Navigation accuracy throughout the region and specify the contour levels.

- 🚩 **Quick Report:** Select the “Grid Stats Over Time” quick report to generate a report of the NavAcc statistics throughout the grid over time.

Time (UTCG)	Minimum (m)	Maximum (m)	Average (m)
4 Jan 2016 17:00:00.000	2.709	15.467	3.883
4 Jan 2016 17:01:00.000	2.705	14.843	3.875
4 Jan 2016 17:02:00.000	2.700	14.267	3.884
4 Jan 2016 17:03:00.000	2.695	13.735	3.879
4 Jan 2016 17:04:00.000	2.689	13.242	3.862
4 Jan 2016 17:05:00.000	2.684	12.784	3.858

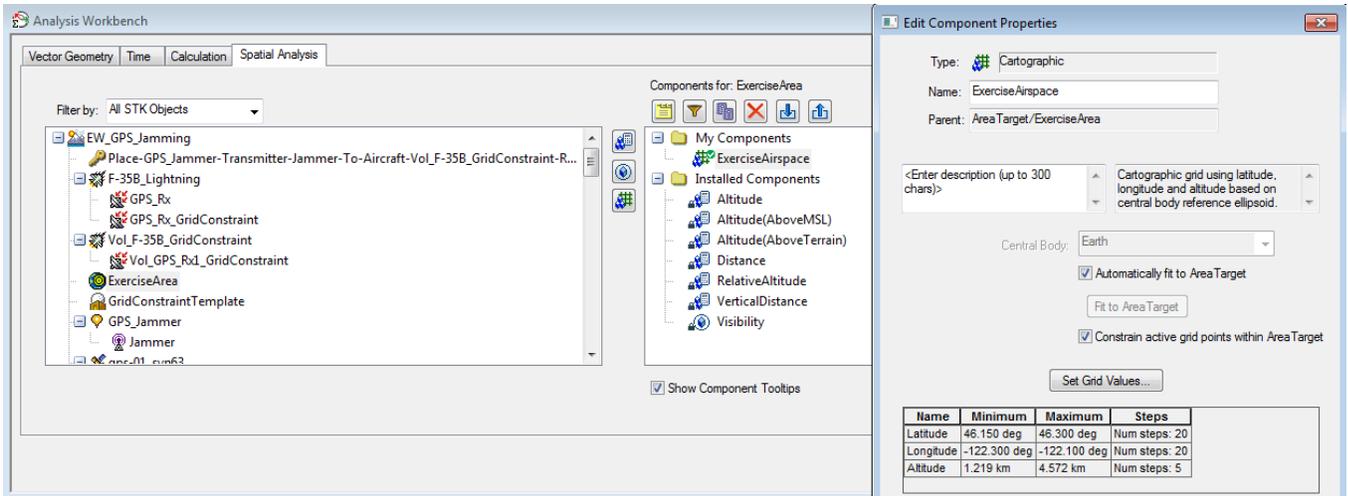
Enable the checkbox for  GPS\_Jamming



This image shows the jammer power throughout the exercise area at 15,000 ft MSL, which is the altitude our aircraft is flying at. You can see the impacts of the dipole antenna with a null above the jammer location. You can use the grid constraint option in the Coverage Definition to apply a receiver to the grid so that you can specify comm data providers as an access constraint Figure of Merit.

### Volumetric Coverage:

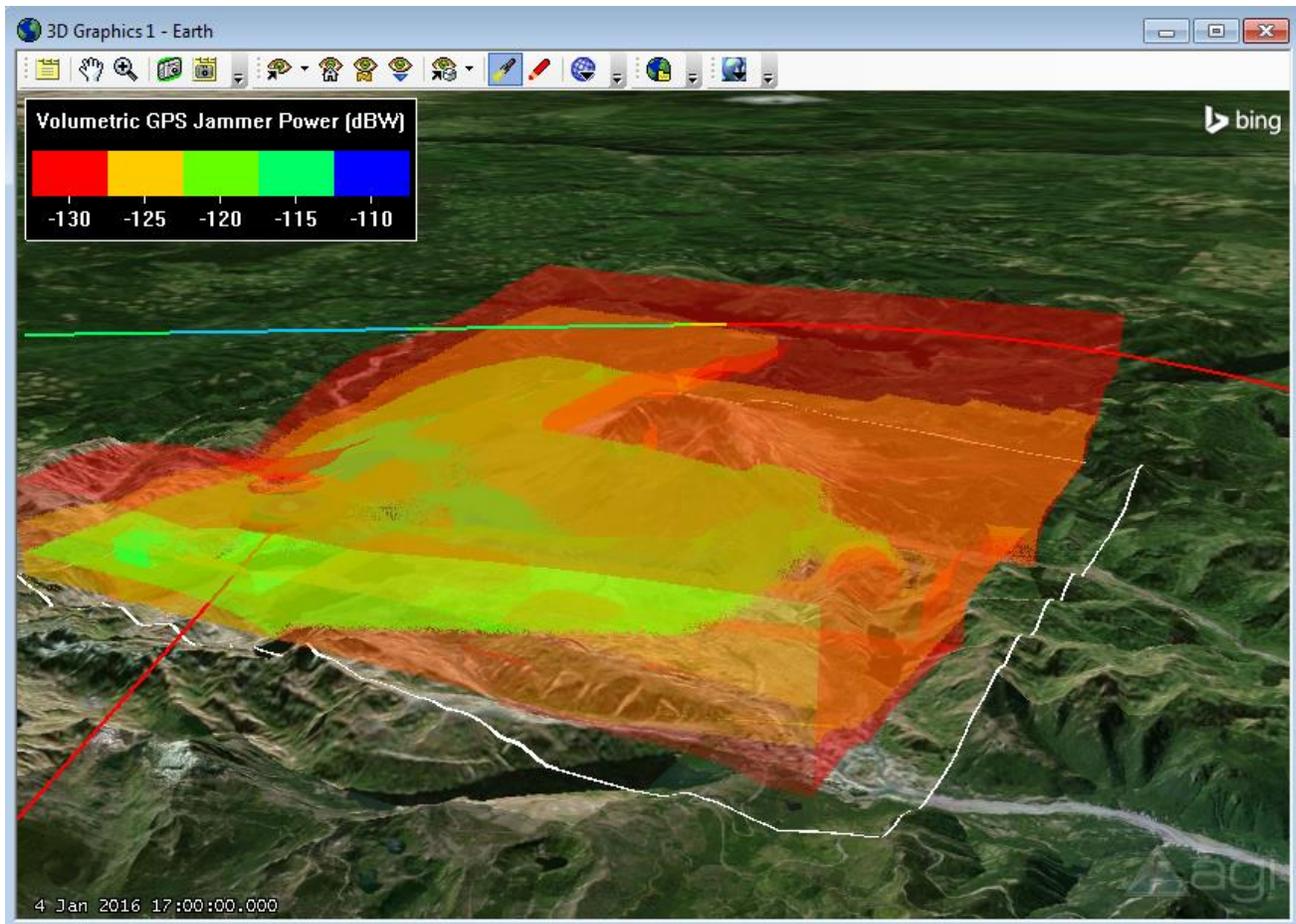
STK 11 introduced a new capability for Volumetric coverage that allows users to compute spatial calculations to user-defined 3D grids. The grid was created with the Analysis Workbench using the Exercise Area Target boundary and altitude slices from 4,000 ft to 15,000 ft:



The spatial calculation was defined by the “Scalar At Location” time which placed the GPS receiver on the “Vol\_F-35B\_GridConstraint” aircraft throughout the volumetric grid and calculated the received power from the Jammer.



Toggle the checkbox for  Vol\_JammerPower



This shows the same Jamming power metric as before, but does it throughout an entire volume at multiple altitude levels as opposed to the single altitude slice.

## Summary:

This scenario shows how STK supports Electronic Warfare (EW) mission planning and operations. This scenario focused on GPS jamming from an emitter in a mountainous region to an aircraft flying overhead along with the regional navigation accuracy and the GPS jamming power over the region, however there are countless other EW scenarios that can be modeled using STK.