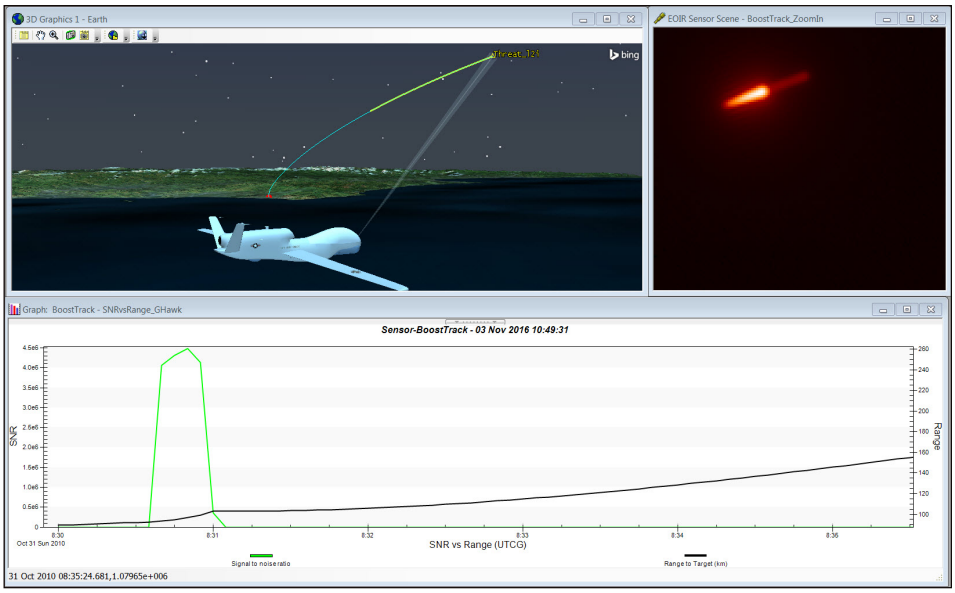
STK EOIR

EOIR models detection, tracking, and imaging performance of electro-optical and infrared sensors.

EOIR provides the following benefits:

- Radiometric sensor model that goes beyond simple geometry. EOIR considers the physics-based interactions of sensor, target, and environment providing accuracy and fidelity that have been anchored against operational sensor measurements.
- Faster and more accessible than complex stand-alone sensor models. The low complexity of the model speeds analysis and provides usability for both general systems engineers and sensor designers.
- Comprehensive mission analysis. STK's broad mission modeling environment considers EOIR performance in conjunction with sensor platform dynamics, communications, and other mission architecture elements to assess integrated performance across a variety of mission scenarios.



EOIR sensors

EOIR supports up to 36 bands per sensor. Bands share a common location and line of sight, but otherwise can have different parameters. Bands can be used to simulate a multiband sensor or different settings of a zoom lens. Spatial, spectral, optical, and radiometric properties can be defined on a per-band basis, including:

- Angular field of view extents
- Focal plane height and width in pixels
- Number of detection bands
- Lower and upper band edges
- Band integration time, sensitivity (NEI, NER) and dynamic range (SEI, SER)
- Effective focal length
- Entrance pupil diameter
- Diffraction wavelength
- Longitudinal defocus
- Image quality (zero, negligible, mild or moderate aberrations)
- Line of sight jitter

Sensor performance

Report radiometric performance for point sources and extended objects through STK reports, graphs and dynamic displays. Metrics include target radiance/irradiance, background radiance/irradiance, scene photon signal-to-noise ratio (SNR), noise equivalent irradiance (NEI) and noise equivalent radiance (NER).

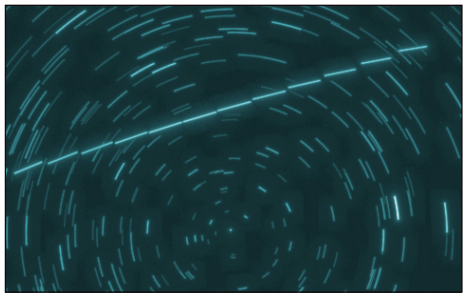
Multi-sensor architecture analysis

Model mission architectures with up to six independently specified and steered sensors distributed across satellite, aircraft, or ground platforms.

Synthetic sensor scene

The scene represents the analog world by digitally sampling the "modeled universe" at four times the sensor's detectors spatial frequency (16 spatial samples per sensor pixel) and over the passband at the wavelengths defined by the sensor model.

The scene models 27 optical materials, central bodies, stars, satellites, aircraft, missiles, and thermal models of planets, stars, solar radiance, and missile plumes.



STK EOIR

Atmosphere models

Simple atmosphere model. Calculates transmission, scatter in, and path radiance at the wavelengths corresponding to the Spectral Band Edges, and at a spectral resolution specified by the user-defined number of intervals.

MODTRAN-based atmospheric model. One of the highest fidelity, community standard atmospheric models available for EOIR simulation. This model approximates MODTRAN results for the same surface conditions that are modeled by the Simple atmosphere model.

Target modeling

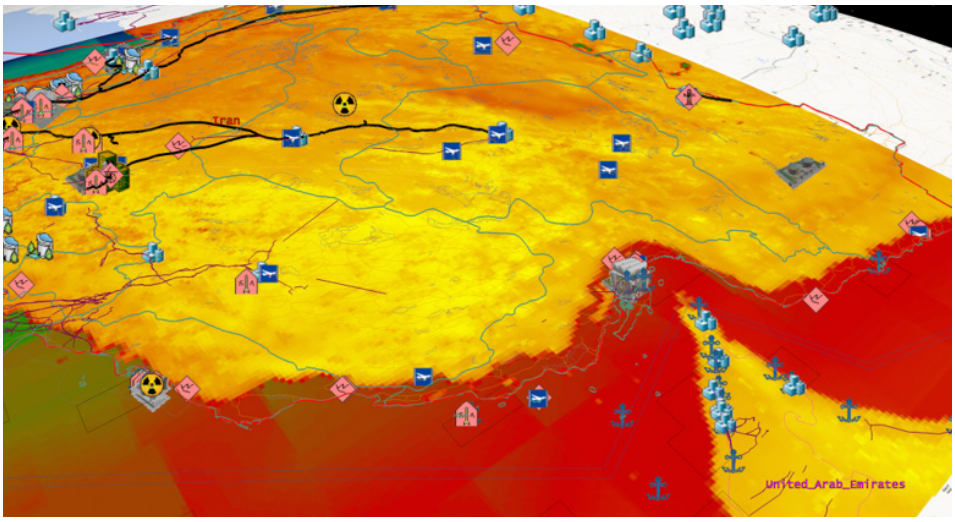
Model optical and thermal properties of aircraft, satellites, and missiles by specifying shape, dimensions, surface material, and surface temperature. Missile targets can be multi-staged with independent stage properties and a solid black body plume model (temperature and emissivity). Furthermore, custom 3D geometry and spectral materials can be loaded to simulate various other target types applicable for your EOIR mission, and hundreds of low polygon count 3D models are included.

SURFACE MATERIALS

- Aluminum MLI
- Black thermal control paint
- Burnished aluminum
- Gold MLI
- Gray body
- Silver MLI
- Solar panel
- White thermal control paint
- Load your own custom material reflectance or emissivity spectra

EARTH SURFACE MATERIAL

EOIR has a low to moderate spatial resolution global spectral material map of the earth broken into the 17 International Geosphere Biosphere Program (IGBP) Global Land Cover types plus Tundra. You can also override a portion or all of the map with your own custom reflectance texture map with arbitrary spatial resolution.



Accurate star field

Leverage STK's database of over two million high quality star records from the Hipparcos and Tycho II catalogs to model precise position and spectral irradiance based on apparent motion, temperature, and magnitude.

Celestial bodies

Include thermal and optical properties of the Earth, Moon, Sun and planets. Thermal models include diurnal, latitudinal, and seasonal variations. Optical surface properties maps are included for the Earth, Moon and Mars at 0.93 km, 2.5 km, and 0.47 km resolutions, respectively. The Earth includes an atmospheric model with four aerosol settings.

Use custom models, materials, target signatures, and thermal profiles

- **Custom 3D Models**. Load custom, lowpoly (around 1,000 polygon count) 3D models as EOIR targets.
- **Custom Materials**. Load custom materials for EOIR targets. Compatible with the freely available NASA maintained ASTER USGS material with over 2,400 spectral samples.
- **Point Source Target Signature**. Load your own custom Target Signature File (.tsf) that defines the EOIR properties of the target signature that can vary with time, angle, and wavelength.
- **Custom Thermal Profiles**. Create time-temperature thermal profiles with external tools, manually, or with thermal calculation tools such as STK SEET's passive thermal model to have targets exhibit time-dynamic surface temperatures.

EOIR sensor constraints

EOIR constraints set a signal-to-noise ratio (SNR) on an EOIR sensor.

Export sensor images

Export sensor output images as bitmaps for video creation or ASCII raw data files for use in external image processing algorithms or sensor modeling tools in MATLAB, MathCAD, etc.