Chimaera

JRM Technologies

Real Physics • Real Sensors • Real-time

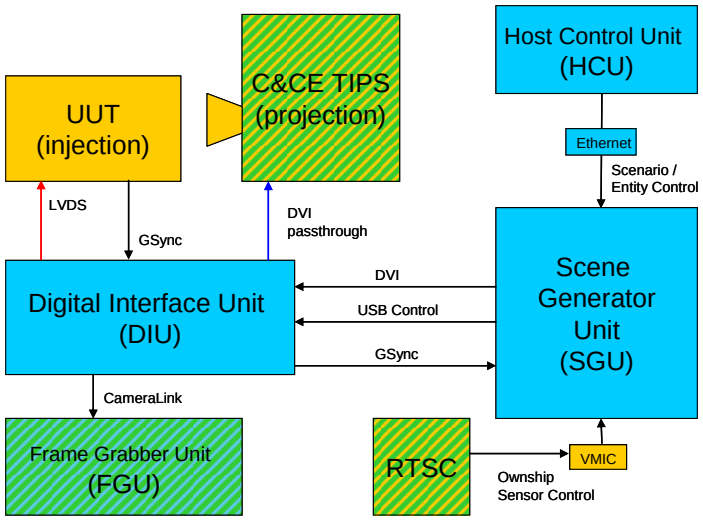
Configurable Hardware-in-the-Loop Image Generator for Advanced EO-IR Applications

CHIMAERA is a real-time, Multi-Spectral Imaging Sensor Scene Generator System for stimulating high-frame-rate sensor and projector systems in the 0.2-25.0 μm spectrum. It is designed to fully meet the scene generation requirements of a real-time hardware-in-the-loop (HWIL) laboratory environment.

CHIMAERA consists of an integrated combination of unique subsystems, each with dedicated hardware and software components.

1. **Chimaera Host Control Unit (HCU)**
   - GUI-based scenario and trajectory definition
   - Scenario & sensor parameters to SGU via CIGI
   - Position/orientation updates to SGU via CIGI.
   - Automated configuration of SGU, DIU, and FGU
   - Tools to generate matclassed terrains & 3D models
   - Signature modeling tools

2. **Chimaera Scene Generator Unit (SGU)**
   - Reads scenario, sensor, and entity updates from host via CIGI.
   - Reads ownship sensor position/orientation updates from customer's Real-Time Simulation Computer (RTSC) via VMIC shared memory.
   - Processes phenomenology and sensor physics to produce 16-24 bit DVI or DisplayPort imagery.
   - Combined rack-mount **KMM** unit (Keyboard/Mouse/Monitor) available.



Key Features

- Multi-Spectral EO/IR Scene Stimulation
- Optical projection & digital injection modes
- Controllable target super-sampling
- Digital Injection Unit (LVDS, MIPI, CameraLink)
- Genlock-sync capability
- Render-from-source & database paging
- Special Effects: Flare, Smoke, Dust, Plume, Fire
- IR window aerodynamic heating
- Dynamic target thermal signatures
- At-Aperture 32-bit radiance capture
- GUI-based Scenario Creation
- Custom Sensor Optics, Detector, & Electronics
- 16-24 bit video @ 60-200Hz @ <3 frame latency
- Physics-based, spectral signature synthesis
- VMIC & CIGI real-time network interfaces
- On-the-fly Modtran-based atmospherics.
- Synchronized multi-channel capability
- Remote operation

3. **Chimaera Digital Interface Unit (DIU)**
   - Produces TTL GSync signal to SGU graphics card
   - Inputs genlocked video stream from scene generator and converts to LVDS or MIPI output for driving direct digital injection of customer's unit under test (UUT).
   - Passes video stream to customer's IR scene projector.
   - USB control from SGU or HCU specifies arbitrary gsync/frame rate, resolution, and windowing.
   - CameraLink output
   - Genlock source or passthrough

4. **Chimaera Frame Grabber Unit (FGU)**
   - Captures high frame rate 16-24 bit video stream from scene generator for later playback.

5. **Real-time Simulation Computer Emulator (RTSC)**
   - Emulates the Unit-under-test (UUT) flight motion feeds into VMIC (reading track file).

Multiple Chimaera systems may be genlock-synchronized for driving more than one channel simultaneously.

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CHIMAERA is a HWIL Image Generator for advanced EO-IR Applications, based upon JRM's *SigSim* and *SenSim* physics-based signature & sensor modeling libraries and the latest in real-time graphics hardware.

Complex Scenes

Easily load a complex 3D terrain database, completely specify any number of arbitrary sensors, atmospheric and weather conditions, and place 3D vehicle or human models in the scene, then display in real-time. Optional *Render-from-Source* technology allows on-the-fly database construction directly from raw satellite/aerial source data.

High Fidelity Simulation

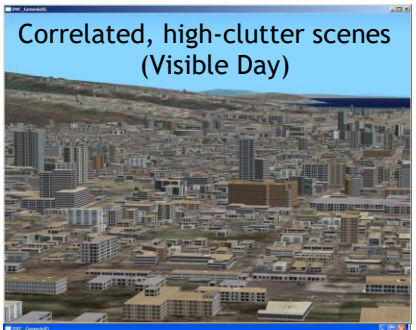
CHIMAERA provides high-fidelity simulation of arbitrary imaging sensors in the UV through far IR (0.20-25.0 um) spectrum with highly-optimized, physics-based models for:

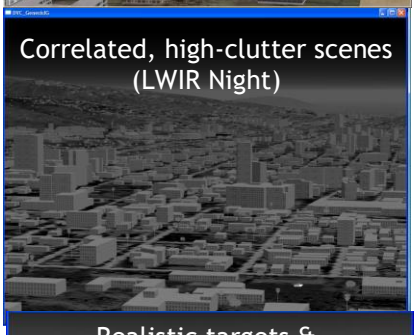
- Ephemeris
- Natural and man-made Irradiances
- Full transient, angle-dependent thermal modeling based on material properties & user-defined boundary conditions
- Spectral BRDF reflection
- Signature synthesis and Modtran-based atmospheric propagation modeling
- Special effects & countermeasures
- Physics-based sensor modeling, including all major optical, detector, and electronics effects such as:
  - Diffraction and design blur
  - 3rd order Optical Aberrations
  - Motion & Platform Jitter Blur
  - Gaussian, Poissan, 1/f noise
  - NVG Haloing
  - Scanning effects
  - Gain, level, AGC

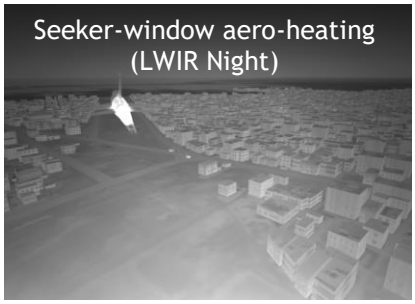
Conversion/Import tools also available for U.S. GFE simulators such as **Muses** & **Spirits**.

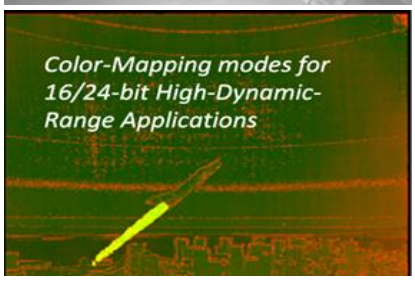
System Performance (16-bit DVI-D Single-link)

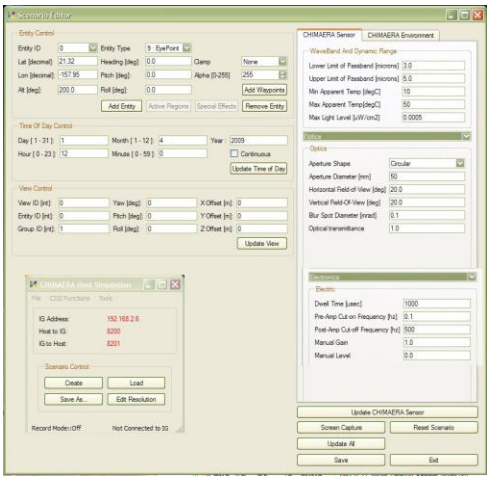
Frame Rate (Hz)	Resolution (Typical)	Resolution (Max)
100	1024x1024	1024x1024
200	512x512	800x600
400	256x256	480x360











The Host Scenario Definition GUI and Xbox Trajectory Controller offer easy user interaction for all elements of CHIMAERA.

CHIMAERA HCU/SGU/DIU Rack

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