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NORTHROP GRUMMAN

EGA: Environment Generation and Analysis

Description

The Environment Generation and Analysis (EGA) suite of software models is used to create and analyze complex, multi-emitter signal environments. EGA generates a software pulse-by-pulse description of an environment, such as a dynamic, coordinated air defense network, that includes a dense and diverse assortment of emitters. This software pulse environment, generated from the perspective of an ownship System Under Test (SUT), may then be used either to stimulate customer-supplied EW receiver algorithms or to perform a variety of environmental analyses. Often used in concert with a CEESIM RF simulator, the EGA has proven itself as a tool for enhancing scenario development and characterizing environments.

Key EGA Features

- EGA suite of software tools is used to create and analyze complex multi-emitter signal environments
- Generates a pulse-by-pulse software description of an environment
- Often used in concert with a CEESIM RF simulator, as a tool for scenario development and environmental analysis
- Software pulse model and post-processing analysis toolkit

Scenario Generation

Scenario generation allows for programming of all of today's emerging threats. Programmable emitter modulations include: RF (Stable, Random Agile, Discrete Agile, Sequential Agile, Channelized, Associated, etc.); PRI (Stagger, Constant, Dwell/Switch, Discrete Jitter, Continuous Jitter, Sinusoidal, Sliding, etc.); PW (Constant Duty Cycle, Jitter, Pulse Group Modulation, DFMOP, LFMOP, PMOP, AMOP, etc.); ERP, Scan (Circular, Sector, Raster, Phased Array, Conical, Spiral, Helical, etc.); and Antenna Characteristics (Azimuth and Elevation antenna patterns, Transmit Polarization, Reflector Model Type, etc.).

All types of platforms and their associated motions can be programmed and simulated in round-earth or flat-earth format. Scenarios can be run with a variety of additional simulation variables such as terrain, LOS effects, ducting, atmospheric effects, range and frequency attenuation, and Doppler algorithms, to name a few.

Scenarios created on the EGA are fully compatible with a CEESIM simulator (and vice versa).

Pulse Generation

The pulse generation component generates a non-real-time software simulation of the Electronic Combat environment specified in the scenario. Users can advance to a particular time in the scenario, and generate and store as much of the environment as they desire. The user can choose to capture all pulses in the environment or invoke a level of filtering.

ASCII Viewer

ASCII Viewer lists all filtered PDWs captured that would be seen at RF during a scenario run. The user may toggle the display status (either on or off) for 80 unique PDW fields using the parameters dialog from a pull-down menu. PDW fields include: Scenario Time, Elapsed Time, Frequency, Received Power, Received AOA (AZ), Received AOA (EL), PW, and Slant Range, to name a few.

Statistics

Statistical post-processors provided with EGA include:

- Aggregate Counts - Minimum, maximum, average, and standard deviation data are displayed for emitter attributes over the selected time base
- Emitter Beam Counts - Statistical data are presented for every emitter/emitter beam (generator) present in the pulse file. The following items are listed: frequency range, maximum received power at the SUT, average PW, and total pulse counts in the pulse file
- Numerical Counts - Scenario time, pulse counts, pulse density and emitter counts are displayed based on either scenario time or filter types that have been set (e.g., pulse density vs. AOA)
- Graphical Counts - Graphically plots the data identified in the Numerical Counts. Pulse Counts, Average Pulse Counts, Pulse Density, and Emitter Counts can be displayed

Plot Utility

The Plot tool graphically displays data from pulse file in a 2-D or 3-D format. Plot parameters for both vertical and horizontal axes can be changed by manipulating vertical and horizontal axes. 13 available plot parameters include: Elapsed Time, Emitter, Generator, Channel Number, Range, Azimuth AOA, Elevation AOA, Power, Pulse Width, Frequency, FMOP Excursion, AMOP Excursion, and Pulse Repetition Interval (PRI). A Pulse Viewer is also available to verify programming at the pulse level.

Pulse Dropout Model

For a given emitter scenario and RF simulator hardware configuration, the Pulse Dropout Model (PDM) accurately calculates the pulse dropout that would occur if an actual hardware RF simulator were being used. The PDM calculates digital and RF dropout on an emitter basis, an RF-channel basis, or an overall scenario basis. System saturation can also be monitored.

EGA Specifications

- Motif-based graphical user interface
- Intuitive user interface
- 24-hour scenario timeline
- Earth Type: Round (WGS-84) and Flat (X,Y,Z)
- Six degrees of freedom (DOF) platform motion
- Euler platform body motion
- Typical control computer uses a LINUX operating system or equivalent; AIT Tape; DVD-RW
- Programmable filtering criteria
- Fully compatible with a CEESIM

General Capabilities

- Fully programmable emitter simulation
- Single or multiple emitters can reside on a platform
- Emitters can be spatially offset from platform location
- Emitters can have multiple beams
- Multibeam emitters can be synchronized in RF, PRI, and Scan

Frequency Characteristics

- Frequency Range: Definable from 0.05 to 40 GHz
- Modulation Types: CW, Stable Frequency, Frequency Sequence, Periodic Frequency Modulation, Frequency Switching, Discrete Frequency Agility

Periodic Frequency Modulation Types

- Sinusoidal, Sawtooth, Triangular, Trapezoidal, Exponential, User-Defined
- Intra-Pulse Modulation: Linear FMOP (Chirp), Discrete FMOP, Phase MOP, Amplitude MOP

Transmit Scan Types

- Circular
- AZ/EL Sector (Unidirectional, Bidirectional)
- Steady
- 3-D Scanning
- Conical
- Raster (AZ/EL, Interleaved or Non-Interleaved)
- Track-While-Scan
- Electronic Scan (Phased Array)
- Time-Multiplexed Interrupts
- Helical, Spiral
- Palmer Superimposed
- Scan Effects
- Updated on a pulse-to-pulse basis

Transmit Antenna Characteristics

- User can create unique antenna patterns
- Linear, circular, or elliptical transmit polarization
- Rectangular or elliptical reflector models

Emitter Script Events

- Script events include activate, deactivate, change mode based on scenario time, and change mode based on range

Environmental Effects

- Terrain
- LOS (User-selectable Earth radius factor)
- Multipath
- Ducting
- Atmospheric Absorption
- Selectable rain-fall rate
- Sea-state selection
- Range and Frequency Attenuation
- Doppler effects

For more information, please contact:

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