

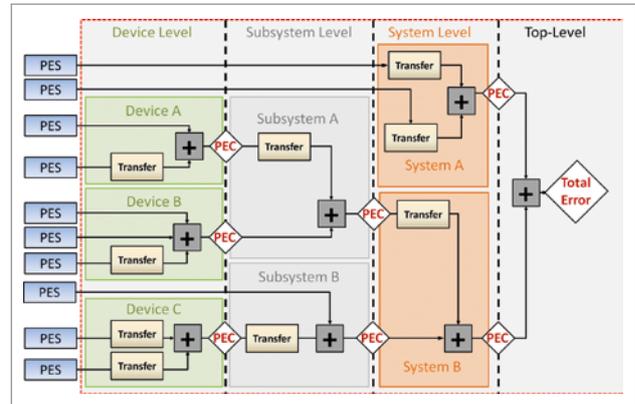
# PEET

## Pointing Error Engineering Tool



PEET is software tool that supports engineers in the setup and calculation of error budgets to estimate the impact of error sources on the total system performance and a figure of merit. It is suitable for performance budgets in all engineering domains – there is no restriction to pointing applications.

PEET is designed as a toolbox for MATLAB and provides a dedicated graphical user interface to quickly create and modify the error signal flow via drag & drop. This allows an increased transparency on models and assumptions compared to purely tabular (spreadsheet) budgets.



Generic budgeting problem: From error sources to system error

### Key Features

#### General

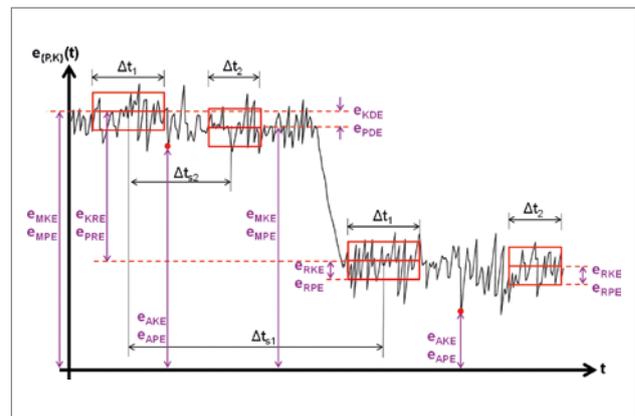
- 1-axis and 3-axis budgets based on standardized rules from ECCS (ECSS-ST-60-10C) and the methodology described in the ESA Pointing Error Engineering Handbook (ESSB-HB-E-003)
- Unitary interface format to exchange, share and combine budgets
- Frequency domain approach for error signal transfer and sample-based approach for statistical error source properties allow fast evaluation compared to time-domain based Monte-Carlo approach, thus the tool is well-suited for trade-off studies
- Free-of-charge for space organizations within ESA member states

#### Performance Requirement Definition

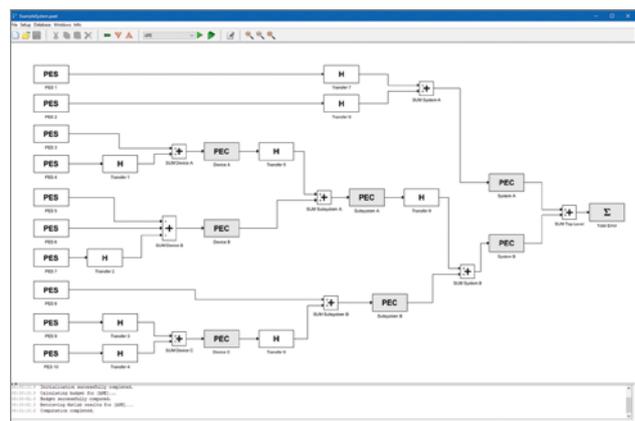
- Statistical requirements with given level of confidence
- Spectral budgets based on power spectral densities
- Explicit consideration of absolute errors and errors defined within and between certain time windows based on standardized metrics
- Requirements on time-constant, time-random and total error contributions traceable via user-defined ID

#### “Error System” Definition

- Error sources based on typical (or user-defined) probability distributions or power spectral density functions
- Customizable correlation between temporal and ensemble properties of error sources
- Static or dynamic (LTI) system transfer models



Absolute and time-windowed errors in ECSS standard

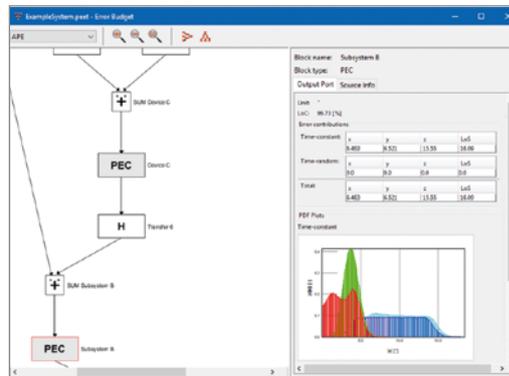


The System Editor: Creating the error signal routing

- Unit package with automatic unit conversion and consistency checks

### Error Evaluation

- “Simplified” and “advanced” level of confidence evaluation based on mean and standard deviation or probability density functions
- Automatic consideration of correlation and impact of time-windowed error in the summation
- Standardized summation rules avoid typical discussions on how to sum error contributions



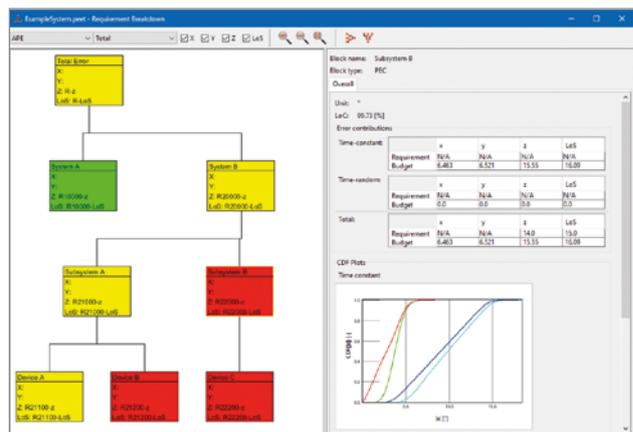
The Budget Tree View: Analysing error signal properties (exemplary for a statistical “3-Sigma” budget)

### Interfaces

- Data import from MS Excel or MATLAB workspace
- Customizable MS Excel reports
- Figure export in MATLAB compatible format (.fig)
- Script-based execution using MATLAB scripts simplifies integration into tool chains

### Visualization

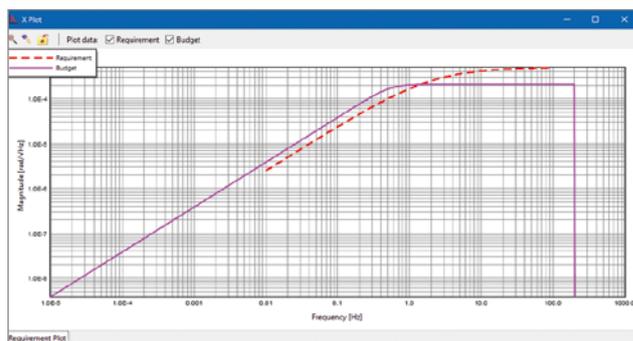
- Error signal analysis and requirement compliance in dedicated tree view that represent the system/requirement structure
- Various plot types for probability densities, probability function, correlation and power spectra



The Breakdown Tree View: Checking compliance with requirements

### Software Requirements

- Windows 7/ Linux CentOS or higher
- MATLAB 2011b or higher (64 bit versions only)
- MATLAB Control System Toolbox
- Any C-language compiler configured for MATLAB mex (freely available)



Exemplary: Spectral budget versus requirement function

- MATLAB is a registered trademark of The MathWorks, Inc.
- Control System Toolbox is a trademark of The MathWorks, Inc.