FRED™ New Features Version 19.40.2

Photon ENGINEERING

Illuminating Ideas

Introduction

Photon Engineering makes every possible effort to have regular releases which provide significant feature and usability enhancements to FRED. The purpose of this document is to convey the most recent features added to FRED in the last release and describe both their utility and implementation with reference to any examples which demonstrate their use.

New Features

Licensing

FRED now supports the use of the Sentinel license technology platform from Thales/Gemalto in addition to the existing SuperPro license implementation. Comparatively, the Sentinel licensing implementation provides additional licensing options, streamlines license setup, offers more flexible license search strategies, and has significantly better license monitoring and management tools available to license administrators. Switching from SuperPro to Sentinel is completely voluntary and customers with existing SuperPro keys can continue to run FRED in the same manner they are accustomed to. Customers interested in switching to the Sentinel license implementation should contact Photon Engineering at fredsales@photonengr.com for more information.

FRED^{MPC} Coherent Field Summation

A new GPU capability has been added that allows FREDmpc licenses to perform coherent field summation calculations using the GPUs in either single or double precision modes. When performing coherent field calculations with large raysets or high-resolution analysis grids, the GPUs can deliver order of magnitude faster calculation times compared to the CPU calculation.

Analysis Results Nodes (ARNs)

- ARNs can be created from file by dragging and dropping FGD files from a Windows file-explorer folder into the FRED GUI.
- A "Fit to view" option has been added to the ARN right mouse click context menu to fit the 3D view to the selected ARNs.
- When using the GUI "ARN Create From File" option, multiple FGD files can be selected in the file browser and the corresponding ARNs will be created.

- Multiple ARNs of the same type can be selected and displayed in the 3D visualization view together on a common scale.
- The Linear Combination utility for ARNs has been extended to support the combination of more than two ARNs.
- ARNs now support OPD map and Wavefront data, with accompanying GUI and script capabilities for routing those datasets into an ARN.
- New script commands for ARN data grid integration, summation, standard deviation, linear combination, and Zernike decomposition have been added.
- FFT operations are now automatically zero-padded, removing the need for analysis grids to be defined explicitly with a power of two number of pixels.

Multi-slice ARNs

ARNs can now be combined together in a single "multi-slice" ARN, with accompanying utilities for managing the layers of a multi-slice ARN. The multi-slice ARN concept has utility in cases where an analysis calculation results in many ARNs on the object tree (ex. analysis as a function of source angle). The resulting individual ARNs may be combined into a single multi-slice ARN and the multi-slice ARN can be written out to a single file on disk. Later, the output file can be read back into FRED as a multi-slice ARN and "exploded" back into individual ARNs if desired.

ARN Data Exports

A new right mouse click context menu option, "Export Data", allows ARN data to be exported to FITS files, .mp4 or .wmv video output files, or image files (.bmp, .jpeg, .gif, .tiff). These data export options help to facilitate the communication of analysis results when generating reports and presentations outside of FRED.

Component Extraction

ARNs whose intrinsic cell data is multi-valued (ex. scalar field has 2 values per cell, real and complex) now allow their derived quantities (ex. energy, amplitude, phase, from a scalar field distribution) to be easily extracted into their own ARNs using a simple right mouse click context menu option. This is useful in an analysis flow where a derived quantity of an ARN's basic cell data is desired to be analyzed, post-processed, or reported.

Glass Catalogs

Glass catalogs from the following vendors have been updated with the most recent data available: CDGM (April, 2019), Heraeus (August, 2019), Hikari (September, 2018), Schott RadHard (July, 2016), Hoya (December, 2019), NHG (August, 2018), Ohara (March, 2020), Schott (January, 2019), Sumita (version 11.01.0). Updated the SUPRAX material in the Custom catalog file with new information from Auer Lighting. Added the i-line glasses to the Ohara catalog.

OPD Maps

The OPD Map analysis GUI allows the resulting calculation to be stored in a multi-slice Analysis Result Node (ARN), with one slice in the ARN corresponding to each unique wavelength found in the OPD Map calculation. Additionally, new scripting commands have been added that

implement the OPD Map analysis function with three different options for specifying the reference sphere to be used in the analysis.

Volume HOE Diffraction Efficiency

A new option for determining the diffracted signal ray direction leaving a volume hologram has been added that uses the surface-based grating equation.

Miscellaneous Updates and Bug Fixes

This release contains many other minor feature additions and bug fixes not listed above. Please refer to the Release Notes found on the Help menu inside of FRED for a complete listing of all enhancements and defect resolutions.