Photon ENGINEERING
Illuminating Ideas

FRED™ New Features

Version 21.42

Summary of New Features

The following new items are included in this official release version of FRED 21.42:

Multi-threading, Ray Buffers and RAM Usage

- FRED Optimum now performs multi-threaded raytracing and analyses on up to 127 threads when available.
- The total number of rays allowed to be stored in RAM is now only limited by the total amount of RAM available on the computer. Users should configure their RAM usage settings on the Ray Buffer tab of the FRED Preferences dialog to ensure that FRED is taking full advantage of their computer hardware.
- The Advanced Raytrace and Ray Manipulation Utilities dialogs allow a new option for compressing deleted rays out of the ray buffer to free-up RAM. When a ray is "deleted", the slot in memory where the ray information resides is marked as a deleted ray but otherwise the structure of the ray buffer and its memory usage remains unaffected. As an example of its usage, consider a raytrace containing a large number of total rays where only a relatively small fraction of those rays are of interest for analysis. If the Advanced Raytrace is configured such that the raytrace automatically applies a ray selection filter at the end of the trace that deletes any rays not of interest, the "compress ray buffer" option can also be toggled so that the ray buffer is additionally compressed to preserve only the ray data that remains and free up the memory of the deleted rays. Some applications require analyses that perform multiple passes over the ray buffer to extract quantities of interest and compressing the ray buffer to its minimum size can result in significant time savings during the ray processing loops.

FRED^{MPC} (GPU raytracing and analyses)

- A major architectural rewrite of the GPU code-base has been performed in order to use the newest NVIDIA libraries and GPU hardware. Not only is the new architecture faster than the previous version, the updated NVIDIA libraries allow the MPC capability to be more rapidly and expansively developed in ways that were not possible before this update. No future rewrites to the GPU code-base of this magnitude are anticipated, given the NVIDIA technology roadmap.
- All ideal lens types are now supported in MPC.
- All diffraction grating and diffraction efficiency types are now supported in MPC.
- Detector Entities now support ray selection filtering with an MPC raytrace. This applies whether the Detector Entity CalcTiming parameter is "At Trace End" or "During Trace".

- Child rays generated during a split-mode raytrace can now be accessed by Detector Entities when the CalcTiming parameter is either “At Trace End” or “During Trace”.
- Ray counts are now reported following an MPC raytrace (ex. Analyses > Surface Incident/Absorbed Power). Additionally, Analysis Results Nodes (ARNs) generated as part of an MPC raytrace also include ray count information and can be accessed by right mouse clicking on the ARN and choosing the Detailed Report option.
- MPC raytracing and analyses can now be run in both single (32-bit) and double (64-bit) float precision. A toggle for selecting the precision mode is available on the new MPC menu and toolbar and the state of the toggle is saved with the document. The MPC Advanced Raytrace dialog also contains a new option for performing MPC raytracing with double float precision. Although not all applications require the use of 64-bit precision raytracing, which typically comes at the expense of raytrace speed, this is also an important diagnostic and testing capability that allows an evaluation of the impact of single precision on the results for a given calculation.