Release Notes
RSoft Photonic 2023.12

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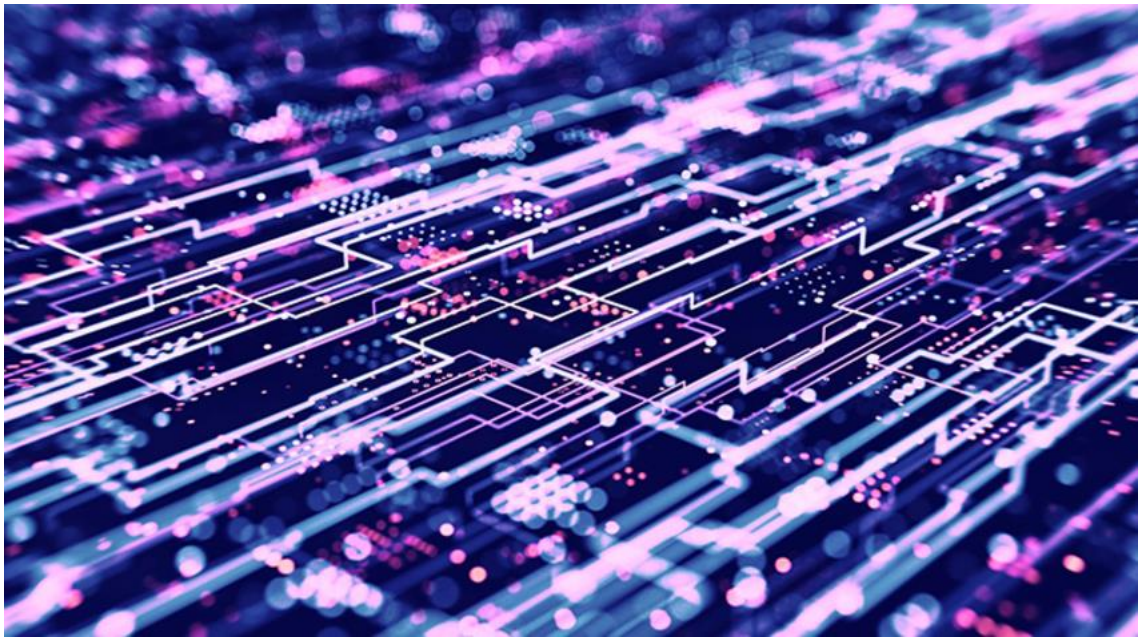

Changes to RSoft CAD

- Several improvements to the RSoft CAD Component Tree, including recognition of mouse wheel on Windows and preserving the highlighted item, as well as the scroll position, after certain operations which triggered a refresh of the tree, such as updating component properties.
- Corrected an issue with 3D Structure Type Polygon whereby index calculation at the edge of the polygon did not smoothly change with component size. Now Polygon behaves more like other types such as Channel. IMPORTANT: This change may result in a change of simulation results; however, the new results should be more accurate and well-behaved.
- Corrected an issue whereby Grating Tapers were not properly recognized for Extended Segments.
- Updated the disperse utility as follows: Added the previously existing but undocumented -fp option to the help. Also removed the -f option from the help, which is obsolete with -fp.
- Exposed the mode dispersion fit order in the Modal Options Calculation dialog for dispersion calculation. This passes the value to the disperse -fp option mentioned above to control the fitting.

Changes to RSoft OptSim

- Access in OptSim Base to the Waveguide and Multiport Optical Device Bidirectional models.
- New Python co-simulation block for custom user models.
- Enhanced support for foundry PDKs in OptoCompiler EO co-simulation.
- New support for electrical heater and input-power dependence in the Electroabsorption Modulator (EAM) model.
- Enhancements to Black-Box SOA and EAM models to eliminate unnecessary data reloading.
- New jitterSeed parameter in the Electrical and Optical Signal Generator blocks.
- New 2x1 Boolean Operator block.
- Improved support for models installed outside of the main installation, enabling inclusion of custom models in PDKs and models released separately from official tool releases.
- New TDECQ analysis block.
- Speed-up improvements for EO co-simulation.

- Enhanced multi-channel support in EO co-simulation.
- Enhanced support for MATLAB co-simulation.
- New support for parameter out-of-range warnings in Black-Box SOA model.
- New support for equation-based optical S-matrix models in the Multiport Optical Device (Bidirectional) model.
- New support for equation-based and parametric-file-based voltage transfer equations in the Electroabsorption Modulator (EAM) model.
- New Photodetector Responsivity, Photodetector Noise, and Photodetector Frequency Response models.
- New 1x1 and 2x1 Optical Expression Signal Operator models.
- New support for mixed-domain EO-co-simulation-based PDK models.
- New support for current-out-of-range warnings for Lookup Laser model.

Changes to BeamPROP BPM

- Corrected an issue with the AWG Utility on Linux whereby scans might not complete depending on their size.

Changes to FullWAVE FDTD

- Updates to FullWAVE cluster to minimize overhead.
- Improved accuracy for the FullWAVE Single-Value Absorption monitor. Note this may cause a change in simulation results in some cases, but the new results should be more accurate.
- IMPORTANT changes to FullWAVE monitor behavior. Previously, depending on the monitor domain and grid, the actual size of the monitor could be changed from the requested size. Now the size of the monitor is unchanged, and the sampling grid is adjusted accordingly. This change was made for consistency with BeamPROP/DiffractMOD/ModePROP. Note this change will result in small differences in simulation results for any impacted monitors, but the new results should be more representative of the actual requested measurement.
- Fixed issue with running Q-Finder in batch mode from a command line.
- Fixed issue with dipole sources and specific cut directions.

Changes to DiffractMOD RCWA

- IMPORTANT changes to DiffractMOD monitor behavior. Previously field values were sampled at the center of cells defined by the monitor domain and grid, so that Spatial monitors would not include values at the actual edges of the domain. Now field values are sampled at the edges of cells. This change was made for consistency

with FullWAVE/BeamPROP monitors. Note this change will result in a change in the output files for all Spatial monitors, but Single-Value monitors should not be significantly affected if at all.

Changes to ModePROP EME

- IMPORTANT changes to ModePROP monitor behavior. Previously field values were sampled at the center of cells defined by the monitor domain and grid, so that Spatial monitors would not include values at the actual edges of the domain. Now field values are sampled at the edges of cells. This change was made for consistency with FullWAVE/BeamPROP monitors. Note this change will result in a change in the output files for all Spatial monitors, but Single-Value monitors should not be significantly affected if at all.

Changes to Custom PDK Utility

- A new capability to control how the parametric scan is clustered has been added to Custom PDK Utility. The option can be set via the “Scan to Cluster” dropdown under Cluster Options.
- Improved stability of MOST during large scans. This also improves robustness of BSDF and Custom PDK Generation.

Changes to BSDF Utilities

- A new capability to control how the parametric scan is clustered has been added to BSDF generation Utility. The option can be set via the “Scan to Cluster” dropdown under Cluster Options.
- A new option for BSDF generation to use DiffractMOD internal scanning rather than MOST scanning. Can provide significant speedup for short individual simulations (e.g. low total harmonics). It can be set through an "Internal Scan" dropdown under the Advanced Options dialog.
- Improved stability of MOST during large scans. This also improves robustness of BSDF and Custom PDK Generation.
- Corrected an issue with the BSDF Generation Utility on Linux whereby opening the Parameters... dialog would crash.
- Fixed issue where the parametric BSDF generation would incorrectly append to the master file.

Changes to MOST

- Improved stability of MOST during large scans. This also improves robustness of BSDF and Custom PDK Generation.
- Fixed issue where the MOST dialog would crash on Linux in certain cases.

Changes to the Sentaurus TCAD Interface

- Added an ability to directly use Sentaurus TCAD parameter (.PAR) files for optical material parameters in the RSoft tools. It includes the dynamic capability of reading PAR files and creating relevant RSoft materials and n/k data files, when RSoft tools are called from Sentaurus Workbench.
- Updates to the RSoft TCAD wizard:
  - An additional optional input to read custom materials, through PAR files, when creating a starter design file and simulation script for use in Sentaurus Workbench.
  - If the CIS application type is chosen, the wizard would now automatically add both DFT and time, reflection, and transmission monitors. If Simulation tool is set to DiffractMOD then since only the DFT results are relevant the time monitors are disabled automatically through the monitor_disable tag that is set in the time monitors.
  - If the CIS application type is chosen, the wizard would now automatically add two positional offsets, OffsetDomain and OffsetLaunch, to ensure adequate offsets between the structure and the simulation domain as well as the launch field. These symbols are set to a typical value, and can be changed by the user as needed.
- Updated the default material file used for PolySilicon by the TDR import features used in conjunction with Sentaurus TCAD. Previously the default was the RSoft file Si_amorphous_nk.dat. Now the default is the file TCAD_PolySi.dat. This change was made because the latter is now considered more representative of typical fabricated materials, however it is important to note as with all materials supplied, it is the user's responsibility to determine their suitability. IMPORTANT: This change may result in a change of simulation results.

Changes to MetaOptic Designer

- Addition of Material Editor dialog in the MetaOptic Designer CAD.
- New features to output the MTF and Far-Field. These have been exposed in the MetaCAD GUI.
- Added MTF as a new optimization target type and exposed as a new item under the Option tab. The "Target Type" field can be used to indicate that the input is a target in another space, such as MTF, which is in k-space. When this option is used, it is important to note that Eout will be calculated and displayed in the same space.
- Exposed couple new metric types, namely Overlap (Relative) and Overlap (Absolute) under the Option tab. Note that unlike the original "Intensity Difference" metric type, both overlap types are sensitive to the phase of the field, and when using these types it is usually important to use Edes rather than Ides when defining the test case. Also

note that “Overlap (Relative)” is analogous to “Intensity Difference” in that is a dimensionless quantity and is not proportional to output power, so power_weight is important for the total metric. On the other hand, “Overlap (Absolute)” is proportional to output power, so for this type power_weight is ignored and effectively set to 0 when determining the total metric.

- An additional Output tab was added to the tabs in MetaCAD and several options were moved to that tab as well as new ones added including the MTF and far-field outputs.
- Significantly improved speed and multithreading performance in most situations, averaging 10x and sometimes 25x or higher, depending on the problem and computer hardware.
- Improved accuracy for modeling of CODEV lenses. Note this can result in significant changes in results from the previous release in some cases.
- Improved memory handling and performance when generating GDS.
- IMPORTANT change regarding reporting of several convergence metrics in both the log and the convergence plot. Previously the reported "Power" metric included the "power_weight", so it and the "Total" metric appeared unnormalized. Now the raw "Power" metric is reported without the weight and can be directly interpreted as the dimensionless power loss. Similarly, the "Total" metric is now the normalized weighted sum. Note that this change will change all convergence plots and logs, so corresponding numbers can't be compared with previous releases, including examples in the documentation which have not been updated. However, it should not affect the optimized design except in rare cases. For example, if power_weight was high the optimization might not converge, but now it should. Note also that there should be no change to important performance metrics such as Focusing Efficiency, etc.
- IMPORTANT change regarding the timing of file output. Results for Eout and the design are no longer updated at each iteration, therefore the dynamic update of these plots is effectively disabled. This change was made for performance reasons.