

**Release Notes  
RSoft Photonic Device Tools  
Version 2020.03**

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**Photonic Solutions**

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**SYNOPSYS®**

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## Changes to All Products

- Renamed the toolset to the RSoft Photonic Device Tools, also renamed several simulators to include the underlying algorithm, including FullWAVE FDTD, BeamPROP BPM, DiffractMOD RCWA, ModePROP EME, and FemSIM FEM.
- Licensing Updates:
  - New optional licensing implementation for the RSoft Photonic Device Tools, Photonic System Tools, and OptSim Circuit that does not require installing Photonics Solutions software on the SCL license server. This is particularly useful in Linux environments where SCL may be managed by IT; the installation process is documented in the Linux chapter of the Installation Guide. For information about using on Windows, contact [photonics\\_support@synopsys.com](mailto:photonics_support@synopsys.com).
  - Updated automatic installation routine to set the SCL Vendor Port to 27021 by default.
- **Important Platform Support Notice for Windows 7 and Legacy Linux Versions:** Photonic Solutions products versioned 2020.03, as well as any 2020.03 service releases, will be the last versions to officially support both Windows 7 and RedHat/CentOS 6.5 or older. This includes the RSoft Photonics Device Tools, Photonic System Tools, and the PIC Design Suite. For Linux, there will be no support for Linux versions with a kernel older than 2.6.32-504 and glibc older than 2.12; you can find the glibc version of your system by running the command "ldd --version" in a terminal; the kernel version can be found via the command "uname -r".

## Changes to RSoft CAD

In addition to the changes listed in the All Products section, the following changes apply to the RSoft CAD:

- New graphical Waveguide Mode Utility to easily automate the calculation of modal properties such as dispersion, group index, group velocity, etc to help design waveguides, both straight and bent. This applies to both the built-in BPM mode solvers and FemSIM FEM.
- Improved support for Sentaurus TCAD TDR files, see Multi-Physics and Sentaurus TCAD Interface section.
- Added new option in Preferences to control the CAD tree width.
- Improved efficiency when loading large GDS files.
- Support for GDS datatypes when loading a GDS file via a circuit reference.
- Added support to read 2D data files with no header.
- Improved startup time on Linux.

- WinPLOT changes:
  - Datasets with a single point will now automatically use a symbol to avoid appearing empty.
  - Fixed issue where symbols were not appearing in legend.
  - Fixed issue with contour plot value display and log scales.
- Changes in Behavior:
  - Changed how extended segments taper in 3D. Previously the index would vary along the Z axis, now it varies along the segment axis. This is a significant change of behavior which may change results.
  - S-Matrix interpolation is now in the frequency domain.

## Changes to FullWAVE FDTD

In addition to the changes listed in the All Products and RSoft CAD sections, the following changes apply to FullWAVE FDTD:

- Implemented an optimized single-value absorption monitor output which uses the power flux calculation when applicable. Note that while this optimization is more efficient and gives improved results when absorption is significant, it also has accuracy limitations at coarser grid sizes for the case of small absorption. Specifically, even if there is no loss/gain in the volume of the monitor (i.e. pure real refractive index), the monitor result may show a small, unphysical absorption/gain. This noise floor can make it difficult to measure small absorption, and disabling the optimization is recommended in this case.
- Implemented an optimized total power monitor (power flux through monitor volume).
- Disabled CW-FFT monitors that require a lot of memory as they do not provide meaningful results and add to the required memory/time.
- Added several warnings to help avoid non-efficient monitor, cluster, time step, and periodic boundary configurations.
- Improved handling of processes for clustered simulations run on machines with more than 64 processes/cores.

## Changes to BeamPROP BPM

In addition to the changes listed in the All Products and RSoft CAD sections, the following changes apply to BeamPROP BPM:

- New option to set the output grid size, useful when a fine grid is needed for simulation but a coarse grid is sufficient for the output. This option can potentially reduce the output file size for large simulations.

- Implemented an optimized single-value absorption monitor output which uses the power flux calculation when applicable. Note that while this optimization is more efficient and gives improved results when absorption is significant, it also has accuracy limitations at coarser grid sizes for the case of small absorption. Specifically, even if there is no loss/gain in the volume of the monitor (i.e. pure real refractive index), the monitor result may show a small, unphysical absorption/gain. This noise floor can make it difficult to measure small absorption, and disabling the optimization is recommended in this case.
- Improved Display Mode settings to facilitate easier switching between 2D and 3D.

## **Changes to ModePROP EME**

In addition to the changes listed in the All Products and RSoft CAD sections, the following changes apply to ModePROP EME:

- Implemented an optimized single-value absorption monitor output which uses the power flux calculation when applicable. Note that while this optimization is more efficient and gives improved results when absorption is significant, it also has accuracy limitations for the case of small absorption. Specifically, even if there is no loss/gain in the volume of the monitor (i.e. pure real refractive index), the monitor result may show a small, unphysical absorption/gain. This noise floor can make it difficult to measure small absorption, and disabling the optimization is recommended in this case.
- Changes in Behavior:
  - Improved efficiency of density and absorption monitors which may significantly change results. Generally the new results should be better.

## **Changes to DiffractMOD RCWA**

In addition to the changes listed in the All Products and RSoft CAD sections, the following changes apply to DiffractMOD RCWA:

- Implemented an optimized single-value absorption monitor output which uses the power flux calculation when applicable. Note that while this optimization is more efficient and gives improved results when absorption is significant, it also has accuracy limitations for the case of small absorption. Specifically, even if there is no loss/gain in the volume of the monitor (i.e. pure real refractive index), the monitor result may show a small, unphysical absorption/gain. This noise floor can make it difficult to measure small absorption, and disabling the optimization is recommended in this case.
- Changes in Behavior:
  - Improved efficiency of density and absorption monitors which may significantly change results. The new results should generally be better.

## Changes to FemSIM FEM

In addition to the changes listed in the All Products and RSoft CAD sections, the following changes apply to FemSIM FEM:

- New graphical Waveguide Mode Utility to easily automate the calculation of modal properties such as dispersion, group index, group velocity, etc to help design waveguides, both straight and bent.

## Changes to BSDF Utilities

In addition to the changes listed in the All Products, RSoft CAD, DiffractMOD RCWA, and or FullWAVE FDTD sections, the following changes apply to BSDF Utilities:

- Extended RSoft BSDF capability to produce and use parametric RSoft BSDF files, allowing for devices to be optimized wholly within LightTools
- Data is interpolated if a parameter value not contained in the parametric BSDF model.

## Changes to Custom PDK Utility

In addition to the changes listed in other sections, the following changes apply to the Custom PDK Utility:

- Extended Custom PDK model data generation to active devices such as modulators and detectors through co-simulation between RSoft Photonic Device Tools and Sentaurus TCAD.
- Added a new example for an improved design/simulation flow for both ring and linear modulators using RSoft Device Tools and Sentaurus TCAD.
- Group index data is now automatically included in S-Matrix models produced by the Custom PDK Utility for more efficient modeling at the circuit level.
- New option in the S-Matrix Viewer to plot in dB scale.
- New option to indicate that the design file is set up to calculate both TE and TM on one run. This option is useful to avoid running the file twice unnecessarily.

## Changes to Multi-Physics Utility and Sentaurus TCAD Interface

In addition to the changes listed in the All Products section, the following changes apply to Multi-Physics Utility and Sentaurus TCAD Interface:

- Extended Custom PDK model data generation to active devices such as modulators and detectors through co-simulation between RSoft Photonic Device Tools and Sentaurus TCAD.
- Added a new example for an improved design/simulation flow for both ring and linear modulators using RSoft Device Tools and Sentaurus TCAD

- Improved support for Sentaurus TCAD TDR files:
  - New Import TDR dialog to further automate the import of Sentaurus TCAD TDR files, including options for specific applications.
  - Added support for using a 2D TDR file in the XY plane, useful for calculating transverse modes.
  - Added support for importing contacts in a TDR file.
  - Added limited support for TDR files in circuit reference blocks.
- Added Net doping plot output.
- Changes in behavior:
  - Changed wavelength behavior of the Soref model. Previously the model always used the 1.55 um data, now it uses the 1.3 or the 1.55 data based on the defined wavelength, specifically it uses the 1.55 data if a wavelength greater than or equal to 1.4 is used.
  - Defaulted to use RSoft materials instead of TCAD materials when importing a TDR file. As always, the material settings can be changed after import.
  - Improved frequency response output, this is a change of behavior, the new results should be smoother and more accurate.

## Changes to MOST

In addition to the changes listed in the All Products and RSoft CAD sections, the following changes apply to MOST:

- Python measurements can now access the current simulation prefix via the `most_current_prefix` symbol. This allows further customization during scans and optimizations, including scanning and optimization of RSoft BSDF files.

## Changes to LaserMOD

In addition to the changes listed in the All Products and RSoft CAD sections, the following changes apply to LaserMOD:

- All transient excitations in the Bias Table have been enabled for incident light. Previously, only the “Step” excitation was allowed.
- New interpolations for mobility have been added to the AlGaAs material library file. To utilize them, replace the expression for “`kpmat_MOBN0`” (“`kpmat_MOBP0`”) with “`MobN_BOWING`” (“`MobP_BOWING`”) in the file. Note, this will change the behavior of all projects utilizing this file. The old interpolations are stored in “`MobN_LINEAR`” (“`MobP_LINEAR`”).