

**Release Notes**  
**RSoft Photonic Component Design Suite**  
**Version 2016.09**

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**Optical Solutions Group**

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**SYNOPSYS<sup>®</sup>**

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## Changes to All Products

- Integrated the RSoft tools into Synopsys' Sentaurus Workbench, allowing for co-simulation of electronic and optical aspects of a problem:
  - Any RSoft simulator, including FullWAVE, BeamPROP, DiffractMOD, FemSIM, and ModePROP, can now easily be used in Sentaurus Workbench as a part of a Sentaurus TCAD project.
  - Provided simulation tool definitions for the RSoft tools that can be added to Sentaurus TCAD user's 'site' directory. Simulation scripts can be in bash or TCL.
  - Device geometry created in SDE or SProcess can be automatically and dynamically loaded by the RSoft CAD. Complex index perturbations can also be loaded into an RSoft design file from a TDR file.
  - TDR files generated by Sentaurus TCAD can be used as input files in the RSoft software, and RSoft software outputs can be generated in TDR format for further use in Sentaurus TCAD.
  - New TDR Utility (tdrutil) performs common tasks with TDR files including the bootstrap process of creating an RSoft .ind design file from a boundary TDR file. This can be done in several ways, including from the SWB interface after creating a project, from the RSoft CAD, or from the command line.
  - Two new tutorials (located in the Multi-Physics Utility and Sentaurus TCAD Interface manual) illustrate the use of these new features. Examples include a 3D SOI modulator with interleaved P-N junctions and a 3D SiGe waveguide photodetector.
- Multiple improvements to grid/mesh generation:
  - All grid properties can now be set locally. This can be done for specific components using component tags, or for groups of components based on materials or component names using the new Default Tags option in the RSoft CAD. The resulting mesh is the union of global mesh settings and any local mesh settings defined. This provides extra flexibility and control when constructing a non-uniform mesh.
  - New Grid Edge Factor setting that sets the grid size at material interfaces as a fraction of the bulk grid. This is designed to be used in place of the previous Grid Edge setting and is more convenient. This is the new default if previous settings have not been applied.
  - Grid Grading has been enabled by default. In addition, the default Grading Ratio has been changed to  $\sqrt{2}$ . Note this is a change of behavior and may affect results.

- Made changes to the mesh generation process to match the mesh in the PML with the mesh at the edge of the simulation domain proper. Note that this is a change of behavior and may affect results.
- Streamlined Linux installation process:
  - New installation scripts (setup\_rsoft\*). These scripts automatically set the necessary environment variables and start the necessary licensing daemons on the license server.
  - The rslmd daemon is now started on demand on client machines and does not need to be started in rc.local except on the license server.
- Updated minimum SCL version to 11.10. Windows users will be prompted when installing v2016.09 to update SCL if needed, Linux users will need to manually install an updated SCL version.
- Added official support for Windows 10.

## **Changes to The RSoft CAD Environment**

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

- Added new TDR import option to the CAD menu.
- Device geometry can now be defined from a boundary TDR file created by Sentaurus TCAD.
- Added an option to open the BSDF Viewer from the CAD menu.
- New Default Tags option that can be used to assign Component Tags to components by component name or material. This will streamline the structure import from a boundary TDR file.
- Update of Graphene model to include proper temperature dependence, support two time constants, and support anisotropy. Note that there is a syntax change to the underlying symbol table functions, which will require editing old files.
- Changed 3D views to transparent by default (this includes the 3D pane in the CAD and all visualization tools). As in previous releases, double-clicking the 3D view will cycle through the views (transparent, wire-frame, solid).
- The mouse wheel can now be used to scroll in the symbol table.
- When opening a file name that does not exist, the software offers to create a new file with that name.

## Changes to FullWAVE

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

- New option for setting the grid size based on points-per-wavelength (PPW). The grid size along each coordinate can be directly set to a specific grid size as before, or set indirectly based on a specific number of PPW based on the refractive index (local in the case of Nonuniform grid, worst case in the case of Uniform grid).
- Improved PML boundary options:
  - Moved PML Width setting to the Advanced Options dialog.
  - Added new PML Cells option that sets the number of cells to use in place of the PML Width. This is the default for new design files. Old files may benefit in efficiency from using this option.
- Improved logic for determining the optimum number cluster processes to be consistent with licensing changes made in the previous release.
- Improved logic for splitting processes across multiple computers resulting in faster simulations in certain cases.
- Added a new <prefix>.txt output containing a summary of Monitor Results. This is analogous to the DiffractMOD output.
- Significant changes to program behavior include:
  - Enabled output of both wavelength and frequency spectra by default for Pulse/Impulse excitation (previously only for wavelength). In addition, the Source Normalization options is enabled by default for both (previously only for wavelength). Note this is a change of behavior and may affect results.
  - Enabled output of the time monitor data for Pulsed excitations.
  - Monitor files output in TDR format now uses .tdr as the extension rather than .dat.

## Changes to BeamPROP

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

- Added a new monitor to record the effective modal area.
- Added an option to unwrap the output of phase monitors (monitor\_unwrap\_phase=1). This is useful on conjunction with the previously existing option monitor\_abs\_phase=1 to get the cumulative absolute phase over the length.

## Changes to DiffractMOD

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

- Several improvements to layering process. Note this is a change of behavior and may affect results, which should be more accurate.
- Added Monitor Results to the <prefix>.txt output file. Previously it only contains the standard DiffractMOD results.
- Significant changes to program behavior:
  - Enabled +Theta and +s conventions introduced in the previous release by default. The new convention is consistent with other RSoft tools and is recommended, but users can still use the old convention if needed. Note this is a change of behavior and may affect results.
  - Changed behavior for phase in field output. Previously phase was output between -180 to 180. Now phase is output from 0 to 360 consistent with other tools. Note this is a change of behavior and may affect results.
  - Monitor files output in TDR format now uses .tdr as the extension rather than .dat.
  - Changed behavior of internal plane wave launch to respect the Unit Power launch normalization option set in FullWAVE. This was done to allow consistent interpretation of spatial field outputs between DiffractMOD and FullWAVE. Note this is a change of behavior and may affect results if this option is set.

## Changes to ModePROP

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

- Several improvements to layering process. Note this is a change of behavior and may affect results, which should be more accurate.
- Significant changes to program behavior:
  - Changed behavior for phase in field output. Previously phase was output between -180 to 180. Now phase is output from 0 to 360 consistent with other tools. Note this is a change of behavior and may affect results.
  - Monitor files output in TDR format now uses .tdr as the extension rather than .dat.
  - Changed behavior of launch to respect the 'Unit Power' launch normalization option. This was done to allow consistent interpretation of spatial field outputs between ModePROP and FullWAVE. Note this is a change of behavior and may affect results if this option is set.

## Changes to FemSIM

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

- New option to output VCSEL cavity modes in 3D (output\_as\_3d=1).

## Changes to BSDF Utilities

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

- Updates to BSDF Viewer:
  - Added link to BSDF Viewer in the RSoft CAD menu.
  - Added an option for producing R/T vs wavelength plot.
  - Added Source Properties option to Advanced options dialog.
  - Fixed error in BSDF Viewer where the R/T power for polarized cases was displayed incorrectly. Note this is a change of behavior and may affect results.
- Improvements to BSDF calculations with FullWAVE, including reduced memory in some cases.
- Enabled the simulations of anisotropic materials within a BSDF calculation.
- Removed 32-bit RSoft BSDF UDOP DLL.

## Changes to Multi-Physics Utility

In addition to the changes listed in the All Products and RSoft CAD sections, the following changes apply to the Multi-Physics Utility:

- The Multi-Physics Utility manual has been expanded and renamed to the Multi-Physics and Sentaurus TCAD Interface manual. It now contains information about both the Multi-Physics Utility proper and the Sentaurus TCAD interface including two new tutorials.

## Changes to MOST

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

- Improved logic for how processes/threads are set for clustered simulation.