



## OptiFDTD 14.0 Release Notes

18 January 2018

### Summary

In this major release of OptiFDTD we have introduced a new material management interface built into the OptiFDTD Designer, including automated fitting of user provided refractive index data to a Lorentz-Drude model. This release also introduces the debut of 2 new features: The ability to calculate S-parameters for passive optical components and access to the OptiMode full vector finite-element (FEM) mode solver for modal input. We have focused on user experience in both creation of designs as well as extracting data through post-processing.

### New features and enhancements

#### Integrated material and profile management

OptiFDTD 14 has integrated the management of both materials and waveguide profiles within the Project Browser of OptiFDTD Designer. The Profile Designer application has now been deprecated and will be removed in the future. Materials and profiles can be created through simple context menus or even imported from previous designs through drag and drop functionality by storing material models in XML files. Common material definitions come pre-installed as XML files in the material library and can easily be added to by exporting materials defined within OptiFDTD.

Further improving the user experience, OptiFDTD 14.0 introduces the ability to upload refractive index files and have that data fit to a Lorentz-Drude model to create materials for use within simulations. The data files can be from references, user generated calculations, or experiments allowing customers access to a broad range of materials.



**Note:** As a deprecated application, Profile Designer **does not include** new features and improvements, such as the new Lorentz-Drude material fit functionality.

#### All new S-parameter ports

The new S-parameter port introduces a powerful integrated source / detector configuration that can be used with OptiFDTD's scripting capability to complete the required simulations. The S-parameters can be generated within OptiFDTD Analyzer and plotted for user analysis or even exported for use in OptiSystem or OptiSpice in integrated or discrete optical circuit simulations.

#### Upgraded field movie creator

The generation of movies of the time varying fields within OptiFDTD simulations has been upgraded, providing users with improved customization. Additionally a number of bug fixes have been introduced, increasing stability of the tool.

## Full vector far field calculator

Complimenting OptiFDTD's current suite of post processing tools is a new full vector far field calculation that is capable of providing accurate results for fields over a wide angle range within the far field regime by loading vector fields from OptiFDTD simulations through a streamlined user experience.

## Integrated access to OptiMode finite-element mode solver

This release comes with the integration of the latest OptiMode, providing access to the new finite-element method (FEM) mode solver. This mode solving utility is a fast and extremely accurate method that provides solutions for the full 6 components of the electromagnetic field and is capable of working with a wide array of waveguides.

## Additional scripting capabilities

New VB script functions have been included within the OptiFDTD environment, providing users the ability to script changes to the settings for the discrete Fourier transforms (DFT) performed during scripted simulations

## Minor Enhancements and Bug Fixes

### Upgraded viewer settings

A viewer upgrades have been introduced, including improved overlays of waveguide outlines and Brillouin zones in the Analyzer and PWE Bandsolver. Within the X-Cut and Z-Cut views of either refractive index profiles or field data there is an easy to use utility that provides users with automated calculations of widths at full width at half max (FWHM),  $1/e$ ,  $1/e^2$  and user defined ratios. These calculations include linear interpolation between data points to provide improved accuracy in the width measurements.

### Point source algorithms updated

The algorithms for implementing the point source in OptiFDTD have been updated to provide results with improved accuracy relative to user specifications.

### Reconfigured finalization steps for CW simulations

Finalization steps within continuous wave (CW) simulations in OptiFDTD are used to ensure that enough time (number of steps) have elapse to allow the system to have reached steady state. The calculation for the number of steps required has been reconfigured as previous settings resulted in unnecessarily long finalization steps.

### Improved interfacing with OptiMode

Configuration files and settings are now passed between OptiFDTD and OptiMode through XML files, improving the communications between the products when calculating modal inputs.

### Waveguide selection for modal input

The selection of waveguides for modal input through input planes has been reconfigured to provide users with the ability to send the cross section along the input plane to the built in mode solvers in addition to the option to select of waveguides. Tilted waveguides will not be permitted as selections for modal input.

## Streamlined user access to variables and functions

Management of the Ok and Cancel functionality as well as dialog warnings have been streamlined and corrected to improve user experience.

## Corrected error handling of data

Error handling within the data viewers have been updated to handle data from failed simulations or corrupted data to prevent unexpected shutdowns of the software.

## Selection issue in 3D viewer solved

When rotating 3D objects objects would become un-selected, this has been corrected and objects will remain selected.

## Finite-difference mode solver set as the default option for input plane modal input

When setting the input plane for modal input there are three mode solvers available to the user: ADI, FD, and FEM. As a broadly applicable method with the least amount of computational overhead the FD mode solver has been set as the default method when launching the dialog for configuring the modal input.

## OpenGL issue within virtual machine environment

Backtracked the versioning on updated graphics rendering engine to manage incompatibilities with the virtual machine (VM) environment which affected the display of refractive index views when used on VMs.

## Corrected file prefix usage

Minor bug fixes addressing proper use of prefixes when exporting data and in the filter within the File Open dialog.

## OWA Converter tool ported to 64-bit

The OWA converter within the OptiTools suite available to OptiFDTD has been update to the 64-bit software environment.

## Design tutor moved to help menu

The Design tutor for helping new users with the OptiFDTD product has been moved to the help menu to better position it for users looking for assistance.

## Re-labeling of options within the nonlinear material creation menu

When the labels for the types of nonlinear material available have been renamed to 2nd order, 3rd order (Kerr), 3rd order (Kerr - Response time), and Raman. This clarifies some of the ambiguity that existed in the previous naming scheme regarding the 3rd order nonlinearity models. There are 2 Kerr models in OptiFDTD: (Kerr) is a standard implementation of the Kerr nonlinearity; (Kerr - Response time) is an implementation of the Kerr nonlinearity which includes the response time of the material.

## **Installation notes**

### Intel Redistributable Libraries installation

As part of the installation process, Intel redistributable libraries are installed alongside with OptiFDTD and (optionally) OptiFDTD samples. Please note that a reboot of the computer is required after installation for OptiFDTD to function properly.