OptiFDTD

Release Notes

Finite-Difference Time-Domain Simulation Design

for Microsoft Windows® /7 /8.1 /10

Optiwave

Release Notes

OptiFDTD 15.0.1

OptiFDTD 15.0.1 Release Notes

17 August 2020

Minor Enhancements and Bug Fixes

Use of Finite-Difference mode solver in semi-vector mode could result in simulation hanging

During a simulation, the process of saving a mode could result in the simulation hanging when using Finite-Difference mode solver set to semi-vector mode.

Initialization of heat absorption properties form

During initialization of the heat absorption properties form the central frequency and normalized values were initialized incorrectly.

Design files could get locked in use

Corrected a bug where, in some cases, when a design was closed the file could be locked and standard windows file access (delete, cut, etc.) were not available.

Update to VBScript functionality within OptiMode

Recent Microsoft updates within the VBScript engine bundled within Windows resulted in an incompatibility between the Windows scripting engine and the analyzer files generated from simulations. This incompatibility results in analyzer files from simulations with scripting or parameters sweeps not opening. While Microsoft has released another update to address the issue, it is currently our recommendation that in addition to updating Windows users should install the latest version of the product to ensure proper operation.

Updated codec availability and default setting for movie recording

Due to instabilities in the VP9 codec resulting in inconsistent simulation times, it has been removed from the list of available codecs within the movie recording settings for observation areas for this release. The VP8 codec has been set as the new default codec within the settings.

Release Notes

OptiFDTD 15.0

OptiFDTD 15.0 Release Notes

14 February 2019

Summary

OptiFDTD strives to provide optical engineers and researchers with the most accurate & easy-to-use tool for the design and analysis of photonic devices. In this release of **OptiFDTD** we have included a series of enhancements that focus on the user experience and design flow.

These new features include:

- New upgraded video codecs
- The multi-tasking of property edits
- Enhanced scripting capabilities for CAD file import
- Integration with Optiwave's new Cloud Compute option

New features and enhancements

Video codecs

With improvements in video technology, **OptiFDTD 15** has high quality video codecs available for use when recording simulation results. Videos of the time evolution of fields for arbitrary structures provides resources for research and in-class teaching materials. Available codecs are VP8, VP9, ZLIB, and Theora.

Multi-tasking property edits

OptiFDTD 15 has extended the design workflow based on the internal project browser within **OptiFDTD Designer** by enabling multiple dialogs for components, materials, or profiles to be simultaneously open. Additionally, property dialogs of linked components, waveguides and profiles have the ability to open corresponding dialogs. These capabilities streamline the overall design workflow.

Enhanced scripting capabilities for structure import

Increasingly complex designs combined with dynamic analysis requires not only the ability to import structures from known standard CAD file formats but **OptiFDTD 15** now provides the ability to automate the configuration and import of these files.

Optiwave's new cloud compute

OptiFDTD 15.0+ users will be able to export FDTD designs to Linux files (.fdu) and simulate them using our new Cloud Compute service. There is no need to sign up for an Amazon Web Services (AWS) account, example files will be provided, and full functionality & access will be provided to all interested users.

Minor Enhancements and Bug Fixes

Optimization of Project Browser Controls

The Project Browser, introduced in **OptiFDTD 14**, has acquired further controls over the design layout including component deletion and order.

Real time estimate reporting during simulations

The simulation dialog now provides tracking estimates for simulation duration, elapsed time, and time remaining.

Improved user control over accuracy GDS II export

The ability to export structures as GDS II layouts has been upgraded to now provide better accuracy in polygon generation for curved structures.

Optimization of OptiMode Finite-Element Method (FEM) mode solver interface

The interface between the **OptiMode** FEM mode solver and **OptiFDTD** has been optimized to improve accuracy with mode injection.

Enhancements to Lorentz-Drude Dispersive material

The Lorentz-Drude material now provides users with a plot of the refractive index dispersion based on the model coefficients. The coefficients can be user-generated or automatically generated from experimental data files. Some minor issues with importing unknown characters or use in non-English operating systems were also corrected.

Improved accuracy of the calculation of frequency domain results for observation points

There was an opportunity to improve the accuracy of the reported frequency spectrum calculated from the time domain information reported from observation points during continuous wave simulations.

Updated XML support for nonlinear materials

Issues within the XML definitions for nonlinear materials have been updated, facilitating saving of properties and export to XML.

UI glitches with Sellmeier tabs for dielectric material

The extraneous tabs that could appear while setting anisotropic settings for a Sellmeier defined constant dielectric material have been removed.

Removed deprecated tabs within input plane modal selection

The Wafer and Waveguide tabs within the modal input have been removed as they have been deprecated.

S-Parameters

The input field button within the S-Parameters dialog was incorrectly linked to the waveguide dialog, it has now been corrected to point to the input plane dialog. There was also an error in switching from amplitude to power causing error messages, this has been corrected. Accuracy of calculated S-Parameters has also been increased through improved field exports.

Consistency of selected field tabs in Analyzer

When switching observers Analyzer would reset the selected field component to Ex. The UI has been update such that the selected field component is retained when switching between observers.

Renaming of materials

Materials and profiles that are in use can now be renamed with the name change propagating through the design.

Correction to Is2DTEHzCollected

The VB script command Is2DTEHzCollected now returns the corresponding value for the Hz field component, correcting a previous error.

Export of mesh for observation line along x axis

The z-directed observation line now returns the correct positions when exporting the mesh.

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.

Release Notes

OptiFDTD 14.0

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

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Release Notes

OptiFDTD 13.0

OptiFDTD 13.0 Release Notes

1 Jul 2016

Summary

In this major release of OptiFDTD we have introduced new graphical user interface improvements for the Designer, Simulator and Analyzer. The new interface simplifies the design process, simulation and analysis of complex devices. This release also includes the latest version of the Optiwave mode solver application, OptiMode version 4.0, which delivers the 64-bit Anisotropic Mode Solver and new Mode Measure calculations. For more details on OptiMode ver. 4.0 see "OptiMode Release Notes" document.

New features and enhancements

New Detector Analysis

The Detector Analysis tools have been redesigned to simplify and make access to the important information more convenient. The Detector Analysis functionality has been brought to the front of the Analyzer application. You can easily browse the Detectors within the project browser tree, view the graph or optical field for the selected detector in the application main window and have an overview of the related key data in the information pane, in which the user may observe parameter values (if any) associated with the project, e. g. parameter sweep. We have added a number of toolbars which provide fast access to the menu options, to control the displayed information.

Note: To help with the transition from the old UI to the new one, we still keep available the old "Detector Analysis" interface under Tool menu.

Import of 3D shapes into the Designer

With introduction of this feature, the users are no longer confined to the built-in 3D Editor and limited choice of 3D shape primitives. The users can use third party 3D CAD software of their choice, export the designed shapes into the generic (IGES) 3D file format, import it into the Designer and then configure for simulations. One can develop a number of independent, stand-alone objects, even a full layout, and import it into the Designer for simulations.

Dynamic optical field visualization during simulations

Typically, the FDTD simulations are like a "black box", once started the user has to wait until the simulation complete to observe the simulation progress (eg. movie) or the simulation results. With this release we have enabled the user to actually observe the optical field formation during the simulations. One can choose to visualize optical field forming within the Observation Areas and/or dynamically selected cuts across the simulation domain.

Shape cross-section outline over the optical field view.

In the Observation Area optical field view of OptiFDTD Analyzer, the user may choose to display outline overlay of the 3-dimensional shapes intersecting the Observation Area. This great visualization tool allows to observe the relation between the Layout shapes and formation of the optical field.

Simplified Waveguide Profile and Material management

We have removed the strong dependency on the old master.plb file, the former database of Waveguide Profiles and Materials. We have provided import/export functionality supported by XML defined file format. The user may import into a project (or export from it) a Profile and/or Material definition into an independent (XML) file. This allows materials and waveguide cross-sections to be easily defined, shared. Now, one can run OptiMode, OptiBPM, and OptiFDTD designers at the same time, as these applications are no longer locked out of the master.plb use.

Note: Access to master.plb is still available, so that users may export their Profiles and Materials. The support for master.plb will be phased out, eventually.

OptiMode XS Designer and Profile Designer Tutor pages

To make it easier for the users to find required information as to the OptiMode XS Designer and Profile Designer usage, we have added the "Design Tutor" menu. The Design Tutor shortly describes basic constructs and operational concepts for these applications.

Important Usage Notes

Input Field mode calculations in the Designer

The following applies when performing Input Field mode calculations for simulations:

- The whole wafer cross-section at the Input Plane location is sent to the selected Mode Solver (Finite Difference or ADI). It includes cross-sections of all objects (waveguides and/or 3D objects) intersecting with the Input Plane.
- The mode solvers interpret each of the cross-sections as representing a straight waveguide, perpendicular to the Input Plane.

> **Note**
>
> **There is no tilt angle** applied on the solved modal field in simulators during the field injection, even if there is only a single waveguide intersecting with the Input Plane

Legacy projects using VB Script to define Gaussian beam size (Half Width)

With the changes to the Gaussian beam size and Gaussian pulse parameter definitions (see the "***Minor Enhancements and Bug Fixes***" section below), the VB Script projects which define the Gaussian beam Half Width in the script code have to be modified to use the new interface functions. Running the simulations with the old VB Script code will abort on VB Script unsupported function call error.

The required VB Script changes

- The old (phased out) interface function **SetHalfWidth(***String* value)
- Has to be replaced with the function **SetWidth(***String value***)**

> **Important**
>
> In order to get the same result, set the pulse width to be *2 * Sqr(2)* times larger than the former Half Width value.For example, if the half-width had been previously defined as 0.55 um, set the new value as follows:
>
> **InputPlane1.SetWidth *"0.55 * 2 * sqr(2)"***

See the "***Visual Basic Scripting Reference***" manual, chapter "VBScript Commands", under the "Input Plane Manager", page "Input Plane Object".

Minor Enhancements and Bug Fixes

Changes to the Gaussian pulse parameter and Gaussian beam size definitions

1. We have renamed the "Gaussian Modulated Continuous Wave" (GMCW) as "Sine-Modulated Gaussian Pulse" to bring it up to date with the commonly used terms in the FDTD simulation domain.

We have modified the "Sine-Modulated Gaussian Pulse" time domain parameter definitions as follow:

- The old "Time Offset" has been replaced with "Time Delay"
- The old "Half Width" definition (which was T - "standard deviation" of the Gaussian function) has been replaced with "FWHM" (Full Width at Half Maximum).

2. We changed the way the Gaussian Beam size is defined. The old Gaussian Transverse "Half Width" definition has been replaced with

The relation between the old "Half Width" and the current Beam Size definitions is:

See the ***Technical Background***, the "Light Sources" chapter for details.

Re-introduce ADI mode solver to input field properties

On the popular demand we have re-introduced ADI Mode Solver to Input Field's Mode Solver choice options.

Corrected sporadic crashes when observing Refractive Index distribution in Designer

Fixed. On some project, switching between the 3D Refractive Index tab and 2D Refractive Index tab while changing observed (XY/XZ) direction used to crash the application.

Corrected the option to “run until user stops execution, ..." when a point detector is present

Fixed. Whenever a point detector is present in the layout, when using the "run until user stops..." in the simulator options, the simulator stops right at the start..

Reconfigured the update of the default values of time offset and half width after editing the wavelength

Fixed. The Point Source property settings. The default "Time Offset" and "Half Width" values on "Gaussian Modulated Continuous Wave" setting page were not being updated when the user changed wavelength on "General" settings page.

Special characters in object names may result in unexpected behavior

Fixed. When special characters (such as '=') are used in observation lines or other scriptable object names, the script interpreter will misinterpret the characters, resulting in unexpected behavior. Please refrain from using special characters in object names. For example, use '_' instead of '='.

Installation notes

Intel Redistributables installation

As part of the installation process, Intel redistributables 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.

OptiFDTD 13.0.1

OptiFDTD 13.0.1 Release Notes

15 Aug 2016

Minor Enhancements and Bug Fixes

Relocated "Import 3D Shape..." menu option

The "Import 3D Shape..." menu option has been moved from "Draw" menu under "Draw->3D Shapes" sub-menu. This menu option can also be accessed from the Design Tutor menu set, under the "3D Shapes".

Corrected the saving of simulation 3D settings for time step size when non-uniform mesh is used

Fixed. Changes to time step size are not remembered in the "Simulation 3D Settings" window. Uncheck the "Auto" for time step size, and set a desired value. The value is properly propagated to the simulator, however, the value will be reset to the default value when the settings window is opened next time.

Input Field Properties updated to correct issues with selection of Power/Amplitude on 3D Gaussian transverse tab

Fixed. Open the "3D Gaussian Transverse" tab in the "Input Field Properties" window. In the "Input Amplitude or Power" section select Amplitude, then Power radio button. Both options become active (checked) and there is no way of checking only one of them, until the window gets closed and opened again.

Fixed OptiMode Designer crash when a project contains diffused waveguide profile or material

Fixed. OptiMode Designer may crash when opening a file project containing Diffused Waveguide Profile or Diffused Material.

Corrected field component labels for simulation results in Analyzer

Fixed. On the tabs displaying field components, Analyzer has wrong names: Hx, Ey, Hx for both TE and TM simulations, instead of Ex, Hy, Ez for TM and Hx, Ey, Hz for TE.

OptiFDTD 13.0.2

OptiFDTD 13.0.2 Release Notes

05 Jan 2017

Minor Enhancements and Bug Fixes

Display overlay objects contours to field graphs for 2D layout simulation result

Enhancement. The Object Overlay Contour display have been implemented for 3D simulation results. With this release update we have this feature for 2D Simulation results.. Now the "pure" 2D projects, where waveguide profiles have no 3D representation, can be visualized the same way as 3D simulation results.

Corrected power spectrum graph for 2D pulse simulations

Fixed. The power spectrum values and the resulting graph for 2D pulse simulations are wrong in the following cases:

- Vertical Observation Lines - the Sx component(s) of Poynting Vector are checked.
- Horizontal Observation Lines - the Sx component(s) of Pointing Vector are un-checked.

Updated discretization issue when non-uniform mesh is lower resolution than standard mesh

Fixed. The material distribution for discretized shapes located in non-uniform mesh areas with lower mesh density than the regular mesh is incorrect.

Note: Only the projects with non-uniform mesh of lower density than the regular mesh were affected by this issue.

Correct Analyzer crash when displaying Observation Area for projects without Input Plane

Fixed. Analyzer crashes when displaying simulation result for project designs which have no Input Plane, just Point Source, and Observation Area(s).

Addressed inconsistency between Height Plot and Image Map

Fixed. The waveguide overlay contours displayed on the Image Map is correct, however, when the display is switched to Height Plot the contour overlays are wrong.

Added PBG Cell Edit context menu

Fixed. The context menu (pop-up menu) for "turning on/off" PBG cell doesn't open.

Corrected disabling of toolbar buttons Re, Im, Amp for H field component for 3D simulation results

Fixed. The Analyzer toolbar buttons used to change the displayed aspect of the (complex) optical field, the Re, Im, Amp, Pha, etc. are disabled for 3D simulation results, when H field component is displayed.

Installation notes

Intel Redistributables installation

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OptiFDTD 13.0.3

OptiFDTD 13.0.3 Release Notes

16 Mar 2017

Minor Enhancements and Bug Fixes

Add copy/paste functions to the material coefficient definition control.

Improvement. Implemented copy/paste functionality to fill the grid of material definition coefficients (eg. Drude-Lorentz) in the Profile Designer.

Corrected error which caused launching field exported from observation area propagates to be in wrong direction.

Fixed. Launching as custom field a field obtained from Observation Area in prior simulations, results in field propagation in a different direction than the propagation direction expected from the field reaching the Observation Area.

A channel profile with slanted wall and offset layers now properly rendered in viewers.

Fixed. In some cases of waveguides using Channel Profile with slanted walls and offset layers, the waveguide is not properly rendered in the 3D Editor - parts of the waveguide walls are missing.

Set the initial position of the temporary observer plane to the middle of the cut axis.

Improvement. When defining a temporary observer for the runtime field view in Simulator, the initial observer plane position used to be set to the start position of the cut axis. It has been modified to set to the position at the middle of the cut axis. For example, a YZ observer plane will be set at X=0, an XZ observer plane will be set at Y=0.

Corrected script behaviour for when /SCRIPT option is selected.

Fixed. For the 3D simulator, the "Simulate Using Script" has to be selected in order to run a script that is loaded from a file specified by using the '/SCRIPT' in the command line. If the '/SCRIPT' option is provided in the command line, the simulator should run the script even the "Simulator Using Script" was not selected (in the Designer).

The modified flag is now set when achange is done only to the nonuniform mesh parameters.

Fixed. Editing the non-uniform mesh parameters does not change the project status to "modified" and does not prompt the user to save data before the simulations. When the user changes the non-uniform mesh parameters and proceeds to run simulations, he would run simulations on the old data set.

Corrected displays of columns with dispersive materials form for double-click behaviour.

Fixed. Add a new dispersive material in the Profile Designer. By default the data grid for **isotropic** "Lorentz Dispersive" material with 3 columns for "Sellmeier Equation" coefficients. Proceed to change the column size by double-clicking on the vertical column separator between columns. This action causes display of two more columns: "Ay(F/m)" and "Az(F/m)" which do not belong to **isotropic** settings

Updates to DFT phase calculation for line and area detectors

The calculation of the imaginary part (affecting phase) of the discrete Fourier transform (DFT) calculation in OptiFDTD has been updated. The amplitude and power calculations/analysis remain unaffected.

Removed redundant prompt to select a row for deleting a variable even if the row is already selected and highlighted.

Fixed. In the dialog "Variables and Functions", select a variable by clicking the row number. This row gets highlighted. Click any space below the last row. The selected row still remains highlighted. Click "Delete" button. A message "Please click a row number which you want to delete" will pop-up, even if the row is still highlighted (presumably selected).

OptiFDTD 12.0

OptiFDTD 12.0

16 January 2014

Summary

In this major release of OptiFDTD we have introduced a new graphical user interface for OptiFDTD Designer and OptiFDTD Analyzer. The new interface simplifies the design, simulation and analysis of complex devices.

New features and enhancements

Full 64-bit software

OptiFDTD has been thoroughly re-engineered to take into account the evolution of processors and memory. It is now presented as a **100% 64-bit software** for increased performances and virtually no memory limits. Users of 32-bits operating systems have not been forgotten and are offered our 32-bit OptiFDTD software package **OptiFDTD 32-bit, for free**.

3D editor

A new **3D Editor** has been introduced in OptiFDTD Designer and OptiFDTD Analyzer. Components can now be positioned, selected and edited directly in 3D. Simple mouse operations enable zooming, panning and tumbling around the simulation domain. For more precise positioning and better visualization of hidden geometry, the 3D editor can be replaced by a 4-quadrants window showing 3 orthographic views (XY,XZ, YZ) and a 3D representation of the layout. The Wireframe mode can be activated to show intersecting objects more precisely.

Project Browser

Along with the 3D editor, the project browser window can dramatically enhance productivity when designing a FDTD simulation. All components (geometry, input sources, and detectors) of the project are categorized in a single window and can be rapidly accessed for edition.

Design Tutor

For first-time users, designing a FDTD simulation can sometimes become overwhelming. The Design Tutor is a menu in OptiFDTD Designer that presents a step-by-step workflow for preparing, designing and simulating photonic components. Each step is shortly explained in the form of an online help. This menu can also be used by more seasoned users as a shortcut for common functions of the software.

Advanced Refractive Index Viewer

The refractive index viewer, as well as many graphical windows, have been improved. The view can be adjusted in 3D and the impact of a change in FDTD mesh size can be visualized directly.

Improved OptiFDTD Analyzer

OptiFDTD Analyzer graphical user interface has been modified to provide a better user experience. It now features the Project Browser and 3D Editor as well as an improved detector analysis window. Observation areas graphs are now clearer and mouse operations are now possible such as zooming, panning resizing of the window.

Smaller movie files

We have added a new, more efficient, movie compression algorithm for the observation areas detectors. When large areas are recorded in time domain, the generated movie file was rapidly becoming too large for most movie players to handle. Now, movie files are significantly smaller while keeping the same quality and resolution.

Increased accuracy in OptiMode

OptiMode has seen significant improvements. Transparent Boundary Conditions (TBC) can now be used in the Finite Difference (FD) mode solver. The accuracy of the mode solver solutions is dramatically increased for leaky waveguides and high index contrast structures. OptiMode solver graphical user interface has been re-engineered to include better visualization graphs and mouse operations.

Matrix and Mesh Converter Tools

Two new tools appeared in OptiFDTD Toolbox: **Matrix Converter** and **Mesh Converter**. The matrix converter creates output data files compatible with software such as Matlab™ or Origin™ from Optiwave's fields data file format. The mesh converter on the other hand can convert an output field data file generated by OptiBPM and generate an input field for OptiFDTD.

Minor Enhancements and Bug Fixes

GDSII CAD import limited to version 5

The GDSII file format importer used to abort its operations when a newer file format was detected. Currently, the importer will proceed with importing the selected GDSII file, however, unsupported constructs will be omitted.

Installation notes

Intel Redistributables installation

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Location of the Materials database file

In this version of OptiFDTD, the master Material Database file, *master.plb,* is installed in a location shared by all users. In Windows 7/8, this location is by default:

```
C:\Users\Public\Documents\OptiFDTD materials\Master.plb
```

If you require restricted access to the database, you can specify another location for master.plb from Profile Designer's "Options..." menu. You might have to manually copy the existing master.plb, if you want to transfer the existing materials to the new location.

the materials defined in an OptiFDTD project are stored within the project file and are not shared. If you would like to have them always available for use in other projects, you can copy them to the "Master" tree-node in Profile Designer. The materials available in the "Master" tree-node are stored in the master.plb database.

OptiFDTD 12.1

All updates for this release

Improvements

Support for Observation Points export in scripts

Observation point time series data can now be exported using scripts (see **GetTimeSeries** method in *OptiFDTD VB Scripting reference* p. 70).

Support for observation areas export in Linux simulator

Observation area data can now be exported using the Linux simulator. It uses the script functions described in OP-46 below and automatically exports f3d files.

Change color coding of axes in 3D editor

The axes in the 3D editor are now color coded according to their orientation.

Add intensity plots to Opti 2D viewer

Intensities (as defined by the square of magnitude) can now be displayed in Opti 2D viewer.

Plot intensity in observation area / line / point detector window

Intensities (as defined by the square of magnitude) can now be displayed in observation point / line / area detectors in OptiFDTD Analyzer.

Provide the user with the possibility to export files for OptiBPM

OptiBPM-compatible files (f3d files with Ex and Ey or Hx and Hy components) can now be created by OptiFDTD. This option can be set in OptiFDTD Designer by selecting *Edit->Options->Generate OptiBPM compatible field data files* and exporting fields of type "*ExEy*" in OptiFDTD Analyzer DFT data export window.

XML anisotropic materials import

Materials definitions can now be imported in the profiles and materials designer, using XML file format. The documentation under *[Samples folder]\materials\graded_lens_XML_import* (where *[Samples folder]* represent the folder where the FDTD samples are installed, in *Documents* by default) provides an example of this functionality.

VB script function for exporting total field intensities

Total field intensities, in the form |Ex|^2 +|Ey|^2 + |Ez|^2 , can now be exported after simulation using scripting functions (see **GetEIntensity** and **GetHIntensity** methods in *OptiFDTD VB Scripting reference* p. 73).

Support for movies and observation areas export in scripts now available

Movies and field data from observation area can now be exported using VB script functions (see **SelectComponentForMovie**, **UnselectComponentForMovie** and **ExportGUISelectedFieldData** methods in *OptiFDTD VB Scripting reference* p. 72-73).

> The export function for fields take a wavelength as an argument. This wavelength must be present in the list of wavelengths generated by the DFT transform. This means that one cannot use an arbitrary wavelength here. To ensure a correct wavelength is given, first do a test-run of the simulation without the scripting checked, pick a wavelength of interest in the list displayed on the observation area window in OptiFDTD Analyzer, and finally use that wavelength in the script. A clever system will be devised in a latter release of OptiFDTD.

Xeon Phi cards support in the Linux simulator

Intel Xeon Phi copressor cards are now supported by the Linux simulator as an experimental feature.Please contact us for more details.

Bug fixes

Saving of dielectric Sellmeier parameters corrected

The Sellmeier parameters for dielectric materials where not saved when the "store" function was used. This issue is now corrected.

Changed displayed folder during "Save as..." to current folder

When opening a project file using Windows explorer and when using the function "Save as..." in OptiFDTD Designer, the folder displayed in the "save as" dialog box is now the current folder.

Unlimited number of field movies now available

An unlimited (dependent on the amount of memory available) number of movie files can now be recorded.

Profiles and materials designer updated to improve stability and performance

The profiles and materials designer stability and performances have improved.

OptiTool Mesh converter updated

In OptiTools, the mesh converter had various issues such as calculation problems for non-square matrices. This update fixes this bug and improves the overall usability of the tool.

Corrected display of nonuniform mesh in analyzer for displaying the fields

When simulating using the non-uniform mesh options in the simulation dialog box, the analyzer observation area window wouldn't be updated to reflect the non-uniform grid. This update fixes this issue. The observation area displays a pixel's size according to the density of the grid. The export function now exports the correct number of data points.

It is possible to save the mesh points as a text file:

1. In OptiFDTD Analyzer, go to Simulation-> Simulation parameters...
2. Click Parameters... in the Nonuniform mesh section
3. For each dimension of interest, click Export mesh... to save the data as a text file

The f3d data file doesn't contain any reference to non-uniform mesh points. If the file is opened in OptiWave 3D viewer, a uniform mesh will be applied an structures will appear distorted. Data file formats will be modified to account for non-uniform data in a latter release of OptiFDTD

Corrected display issues when changing the display ratio in 2D layout in relation to 3D editor

The 2D layout options now provide the expected behavior in the 3D editor window.

OptiFDTD 12.2

Improvements

Add Sx+Sz tab in observation line analysis window

A new tab (Sx+Sz) has been added to the observation line analysis window. The values displayed represent the total Poynting vector crossing the observation line and is calculated as Sx+Sz = sqrt(Sx^2 + Sz^2).

Add Sx+Sz tab in 2D XZ observation area analysis window

A new tab (Sx+Sz) has been added to the observation area analysis window for 2D simulations. The values displayed represent the total Poynting vector crossing the observation area and is calculated as Sx+Sz = sqrt (Sx^2 + Sz^2).

Bug fixes

Corrected initialization of 2D mode solver with multiple waveguides present

When multiple waveguides are present at the input plane, the 2D mode solver would display all waveguides' refractive indices even if one only was selected.

Point Source GMCW settings are now saved

The values entered in the point source GMCW settings were not being saved.

Non-uniform mesh improved handling along domain edge

In some cases, the non-uniform mesh would display the wrong refractive index at the edge of the simulation domain.

Corrected the default DFT calculation and waveguide selection

When simulating a GMCW pulse and keeping the default DFT parameters, the resulting calculated DFT wavelength were all equal to the central wavelength.

Updated VB scripting function SimCtrlParams3D.SetBoundaryX (or Y or Z) to include Periodic Boundary Condition (PBC)

In scripting, the function SimCtrlParams3D.SetBoundaryX (or Y or Z) was missing a the PBC case.

Linked source wavelength to default time step size calculation

The default time step size in the simulation parameters were not related to the actual wavelength being used.

Properly linked OptiViewers to the input plane

In the previous release, the internal field viewers OptiViewers were not linked properly to the input plane "user" field "view" button.

Corrected bug in Profiles and Materials Designer and handling of materials with user defined parameters

In some cases where materials were being used in conjunction with user parameters and/or scripting, saving or modifying materials and profiles in the "Profiles and Materials Designer" would move and resize objects in OptiFDTD Designer.

Improved performance of refractive index view

In some situations, observing the refractive index (2D or 3D) in OptiFDTD Designer would slow down the graphical interface. This fix improves performances of the refractive index view.

Fixed incorrect error dialog regarding non-uniform mesh

The non-uniform mesh parameters window would show an error dialog about the layout dimensions even without modifying the mesh in some cases. This release fixes this issue.

Corrected calculation of Lorentz-Drude material coefficients when switching between wavelength and frequency

In the "Profiles and Materials Designer" Lorentz-Drude material parameters, switching from frequency to wavelength would sometimes result in the damping values resetting to default.

Removed erroneous error message triggered when viewing refractive index of a design that included a point source

When a point source is used and the refractive index was observed using the 2D or 3D refractive index viewer of OptiFDTD Designer, changing the observed component (real, imaginary or X, Y, Z components) would trigger an error message.

Properly linked the input plane source wavelength to the default DFT spectrum

The DFT options would always use 1.55 um wavelength as a reference even if a different wavelength was entered in the input plane CW window.

Corrected displayed information for non-uniform mesh in observation area snapshots

When simulating using a non-uniform mesh and creating a snapshot of an observation area, the snapshot boundaries would not correspond to the dimensions set in the observation area or the simulation domain.

Fixed window positioning for observation areas in OptiFDTD Analyzer

In some cases, when selecting observation areas in OptiFDTD Analyzer, the graph displayed in the observation area analysis window would move.

OptiFDTD 12.2.1

Improvements

Add initial phase in the point source dialog

The *Initial phase* field has been added to the Point Source properties dialog. Values in degrees can be entered to describe the initial phase of the input field. Multiple input sources can have different phase values and model interference effects for example. A new scripting function named *SetInitialPhase* has been added to the Point Source object properties. See the Visual Basic Reference manual for more details.

Export mesh coordinates

The F3D file format used by Optiwave products does not include information about non-uniform meshes used in the simulation. This feature enables the export of the mesh information in OptiFDTD Analyzer. To export the mesh, from OptiFDTD Analyzer, go to *Tools > Detector Analysis,* then select the observation area or line you want to export. Click on the *Export Data...* button. If you expand the observation area or line (using the plus sign), you will be able to export the DFT values of the fields and / or the meshes associated by checking the box next to *DFT* and *Mesh. The mesh points coordinates are exported in a single column in a separated file for each dimension.*

Bug fixes

Matrix converter outputs transposed matrices

The Matrix Converter tool (in OptiTools toolbox) was outputting matrices in the wrong direction. Using the matrices in Matlab or Excel for example would involve transposing the values. This bug is now fixed and the results are now in the proper orientation.

Observation line graph now properly updated when DFT wavelength is changed

In OptiFDTD 12.2 we simplified the observation line detector analysis window by removing the *Update graph* button. A bug was introduced and updates for the observation lines were not done when the user changed the wavelength in the DFT values list. This bug fix corrects the problem.

Corrected mesh converter labels

The Mesh Converter (In OptiTools toolbox) conversion fields values were not labelled properly. This issue is now fixed.

Corrected instability in OptiFDTD Designer related to scripting

In some cases, clicking the *test script* button or clicking *Simulation > Test script* would crash OptiFDTD Designer. Stability of the OptiFDTD Designer application has been greatly improved and this type of issue should disappear with this new release.

Refractive index viewer has been updated to remove flickering while scripting

While running the script (using the **Test Script** function), the refractive index display would show update problems (such as flickering). This issue is now fixed.

Corrected a default setting in clipping length for lens designs which caused an error

Some objects (such as E**lliptic lens** and **Circular lens**) contain a property named **Clipping Length**. Due to some issues in the values validation, entering "0" in the field would result in an error. This bug is now fixed.

OptiFDTD 12.2.2

OptiFDTD 12.2.2

Bug fixes

Corrected Observation Areas for nonuniform mesh layout if they don't extend to lowest coordinate boundaries

The issue affects Analyzer calculating power for non-uniform mesh simulations. The power calculations were incorrect for the Observation Areas whose boundaries do not extend to the minimum coordinate values of the plane where the Observation Area was placed. For example, an Observation Area placed at some Z distance in XY plane (XY-cut), with rectangle boundary not extending to the (Xmin, Ymin) edges, would result in incorrect power value calculations.

Fixed 3D data viewer crashes when data grid is too large

The issue affects Viewer 3D when using "data viewer". In the Viewer 3D, open a data file which has over 500 columns, select one of the field components and then open "data viewer". The application freezes due to the "data viewer" grid crash. The crash is related to limitation of the .NET v. 3.5 grid component. The issue has been fixed with grid component from .NET v. 4.5.