OptiBPM 12.2 Release Notes

OptiBPM 12.2.0.569, December 16, 2014

1. Overview

OptiBPM 12.2 is an update to OptiBPM 12.1. The main feature of this release is to add new options for export of files containing optical data. This feature will provide more flexibility when using OptiBPM with OptiFDTD.

2. Feature – New Export Option

When exporting optical data to file from vector calculations, OptiBPM will usually put both field components, E_x and E_y, in one file. The format used is called BCF3DCXV (See OptiBPM User Reference, Appendix B, File Formats). However, OptiFDTD often requires vector data to be in two separate files, one for E_x, and the other for E_y. OptiBPM 12.2 can be set to export in either format. The selection is made in the OptiBPM Layout Designer Options dialog box (Preferences >> Options). The Options dialog box has a new panel: Export Options. In the panel is a checkbox. When enabled, OptiBPM will separate the field components into separate files for E_x and E_y. The names of the files are chosen to make it clear if the component in the file is the X or Y component. If the checkbox is not selected, OptiBPM will put the two field components in the same file, as in previous versions.

3. Enhancements, Fixes, Corrections

3.1. Issue BPM-2 Relative Power Vs Distance could be more accurate

The power doesn't increase with propagation, of course. However, the E^2 number sometimes does. This is a little-noticed approximation made in previous versions of OptiBPM. Waveguide index contrasts are usually low, so the estimation of the Poynting flux, (P = E x H) is usually estimated by integrating E^2 over the transverse plane. On the other hand, the relation between magnetic and electric field in a propagating wave depends on the index of refraction. To compare optical powers in two places having different index of refraction, it is more accurate to compare n x E^2 in one place and another. OptiBPM 12.2 calculates the Relative Power Vs Distance by multiplying the integrand by the local value of refractive index. This has proven to be more accurate.

3.2. Issue Mode-5 Fibre Vector Mode Solver finds spurious modes

In a fibre with outer layers having larger refractive index than the core layer, the mode solver sometimes found spurious modes. The mode solver tests the coefficient for the Bessel **I** functions at the beginning of the cladding. It identifies a mode by finding a modal index where the coefficients of the Bessel **I** functions at the beginning of the outermost layer go to zero. This is a possible modal index because the modal field in the outermost layer has no Bessel **I** functions, only Bessel **K** which are bounded at infinity. However, there is a pathological case in which the Bessel **I** functions are zero, but the **K**

functions are also zero. In this case, the optical field in all layers is zero too. This modal index does solve the necessary condition, but the corresponding field is zero, carries no power, and so this index is not a mode. The problem was fixed by calculating the coefficients of the Bessel **K** functions in the outermost layer. If neither of those coefficients is greater than mTolReal, then the root of the dispersion equation is identified as an artifact. Instead of returning, the method FindNextMode will go back to interval search with the upper bound now set to the modal index of the artifact. If it finds another root, it will test again. FindNextMode only returns if the root is not an artifact or the interval search is exhausted.

3.3. Issue BPM-9 3D simulator crash when using polygon waveguides

We were presented with an OptiBPM project that would crash the 3D simulator repeatedly at the same moment. This problem occurred because the propagation step in question intersected close to a polygon line. There were two code errors involved: 1) Intersection points that were nearly equal (double comparison failed). 2) When extra points that should be removed were subsequently removed from a list, it was not done properly and an array bounds error occurred which caused the crash. These problems have been fixed.

3.4. Enhancement OV-1 - Plot Intensity

Both the Opti 2D Viewer and Opti 3D Viewer can plot complex data as the dependent variable. In the plot of the dependent variable, the user can choose real, imaginary, amplitude, or phase. This feature is to add Intensity to this list. Intensity is simply the square of the amplitude.

OptiBPM 12.1 Release Notes

OptiBPM 12.1.0.556, August 28, 2013

1. Overview

OptiBPM 12.1 is an update of OptiBPM 12.0. Since most of the features of this release are from OptiBPM 12.0, the details of OptiBPM 12.0 are also included in this release note. This release corrects some issues with the Transparent Boundary Condition option in the Finite Difference mode solver. The relevant Settings dialog box has been changed to include the simplified TBC parameter list. The documentation has been modified accordingly. The documented sample Finite Difference Mode Solver has been changed with an example offered which shows how the TBC can recover some accuracy even in a problem where the window boundaries have been placed much too close to the waveguide.

2. Enhancements, Fixes, and Corrections

2.1. Enhancement 4269 - Test of refractive index values inappropriate

In the OptiBPM 12.0 Profile Designer, Dielectric materials>> 3D Isotropic refractive index, a test was performed on the refractive index entered. If the test fails, the values can't be entered. When the Anisotropic tab is in the Use Default state, the main diagonal of the permittivity tensor is filled with the square of the isotropic refractive index. The software was checking the real part of the permittivity calculated, and would not let the data past if the real part of the permittivity was less than zero. In fact there is no need for this test. Yes, the real part of the permittivity will be less than zero in this case. This is normal and should be allowed. In mode solving, it is becoming more common to include materials of this kind (e.g. metals). These tests were from the days when the mode solver was used mostly for calculating the starting fields of OptiBPM projects. Now the mode solver sees wider use and may include materials such as metals, and the propagation analysis might be done by OptiFDTD instead. The restrictions that may have been appropriate in OptiBPM projects are no longer relevant, so they have been removed.

2.2. Enhancement 4270 - OptiBPM Input Plane mode solver doesn't save vector field

The Input Plane in OptiBPM 64 bit or 32 bit can open a mode solver. Suppose the mode solving is full vector and the solver is Finite Difference. This will result in modal fields with 4 components: Hx, Hy, Ex, Ey. If this mode is then saved, only the Hx component was being saved. Now all four components can be saved.

2.3. Issue 4271 - Crash when there is no refractive index contrast

The Full Vector Finite Difference mode solver used to crash if it was asked to solve a project with no refractive index contrast. That data can’t be expected to have a sensible simulation result, but the software has been improved so at least the simulator does not crash.

OptiBPM 12.0 Release Notes

OptiBPM 12.0.0.554 March 8, 2013

1. Overview

This release introduces a new mode solver into both OptiMode and OptiBPM. This mode solver can be used on any structure consisting of isotropic materials. It is a full vector solver, so it will be appropriate for waveguides with high refractive index contrast. (Waveguides with low refractive index contrast can be simulated accurately with the semi-vector mode solvers.) The creation of this mode solver was motivated by troubles that the ADI mode solver seems to have when generating higher order modes. The ADI mode solver is still the fastest mode solver, and it is probably still the best choice when it is the fundamental mode to be found. Although the new Finite Difference mode solver runs more slowly, it takes longer to find the modes, the results (including all higher order modes) are more accurate and the modes are found more reliably. The new Finite Difference mode solver is based on a magnetic-field-only formulation of the Maxwell equations. The modes are therefore magnetic fields. The electric fields are calculated from the curl equation by finite differences after the magnetic fields of the modes are found. Note that this calculation is only possible in the full vector form, as both magnetic field components are necessary to calculate electric fields. The Finite Difference mode solver does come with semi-vector TE and TM options, but in these cases the single field component calculated is a magnetic one (H_x for TM or H_y for TE).

For more details, see the technical description of the Finite Difference Mode Solver. This has been added to the Technical Background sections of OptiMode_User_Reference.pdf and to the OptiBPM 12.0 Tech Background and Tutorials.pdf. For examples of the new mode solver and test results, see the new folder in the OptiMode samples folder, Finite Difference Mode Solver.

OptiBPM 12 also introduces 64 bit applications. 3D Isotropic BPM simulations can now be performed and are supported by 64 bit versions of the OptiBPM Designer, Analyzer, and 3D Isotropic BPM simulator. In addition, the Input Plane of the 64 bit OptiBPM Designer can call the 64 bit version of the Mode Solver. The 64-bit versions of Layout Designer, Simulators, and Analyzer feature a new redesigned data visualizer used to display the refractive index, optical field, etc. The interaction with the visualizer differs from the previous 32-bit version visualizer and is summarized in the OptiBPM User Reference >> OptiBPM Simulator 3D functions >> Data Visualizer for 64-bit Applications.

2. Enhancements, fixes, and corrections

2.1. Enhancement 4209, VB Script should be able to set Reference Index value

The Reference Index is set in the Global Data tab of the Simulation Parameters dialog box. For the case of Modal input, the VB Script has commands to select which waveguide in the Input Plane will be used to set Reference Index. It is also desirable to allow the setting of the Reference Index numerically, as in the User option of Input Plane. The enhancement: Add a VB Script command that sets the numerical value of the Reference Index that can be used in the User Reference Index option.

The SimParamsGlobalMgr has new methods .SetUserReferenceIndex(double real, double imaginary) and .GetUserReferenceIndex(double real, double imaginary) . Example:

```
SimParamsGlobalMgr.SetUserReferenceIndex 1.2, .7
SimParamsGlobalMgr.GetUserReferenceIndex real_value, imaginary_value
MsgBox real_value
```

(see Set/Get2DRefractiveIndex for example syntax)

2.2. Issue 4214, Memo (preview of Notes) in Open dialog box does not work

OptiMode projects have a notes page, in which a page of notes may be written about this project. To aid the user in selecting the correct project when opening an existing file, the first part of this notes page is displayed in a panel called Memo in the Open dialog box. This feature stopped working in Windows 7. The Windows 7 problem has been fixed.

2.3. Issue 4215, Mode solver hides error report

The output window in the mode solver has two tabs, Notification and Error. By default, the Error tab is covered by the Notification tab. If an error occured in the mode solving, the error was reported in the Error tab, but was not seen by the user. Second, the Notification tab reported that the iteration was finished successfully, even though it wasn't. The behaviour for when the out-of-memory error occurs now is: “Mode # not found” message displayed in “Notification” window, “ERROR” message displayed in “Notification” window. “Iteration # aborted.” Displayed in “Notification” window. The solving stops (does not show message “Iteration # finished successfully”), and the error message from engine is displayed in the “Error” window.

2.4. Issue 3842, Wrong numbers displayed in 3D ADI mode solver Gauss Field Parameters box

When running the 3D ADI mode solver, the starting Gauss Field in the Gauss Field Parameters box can have either User or Auto settings. In the case of Auto settings, the fields are read only.

However, in the case of Fiber Profile, the wrong numbers were displayed there. The issue has been fixed in this release.

2.5. Issue 4212, Profile From File User DLL Profile too slow

The Profile From File User DLL Profile is an Optiwave-written DLL that reads RI data from a user supplied file and enters it into a User DLL Profile in OptiBPM Profile Designer. This DLL will work fine if the FileRI3D.cfg file contains a single data file on the list. However, there was a problem if there were other (large) files that were not used in the simulation, because the DLL would read the entire list every time it was called. This made the execution slow. This has been fixed in this release. The DLL only reads the list once, at the beginning of execution.

3. Notes on software usage

OptiFDTD and OptiBPM should not be run simultaneously. This can cause problems related to the Waveguide Profile Designer accessing the shared material library database file (master.plb). Whenever switching between OptiFDTD and OptiBPM, please ensure that the current application is completely shut down before starting the other. For Japanese users, please note that some customers have reported trouble when trying to use Optiwave software with certain Japanese domestic brands of computer, such as EPSON.

Uninstalling OptiBPM from a machine on which OptiFDTD is installed can cause problems with OptiFDTD or the Waveguide Profile Designer. Uninstalling OptiFDTD from a machine on which OptiBPM is installed can cause problems with OptiBPM or the Waveguide Profile Designer. A reactivation script is provided with both OptiFDTD and OptiBPM to correct this issue. This script can be accessed from the Start menu under the Optiwave product folder in the Reactivate submenu. To successfully execute the reactivate script, you need administrative privileges. The 'How To' descriptions below describe the reactivation process for the affected products.

3.1. HOW TO: Reactivate OptiFDTD when OptiBPM is uninstalled

PLEASE NOTE that these batch files access protected areas of the system registry. You must have ADMINISTRATOR privileges to for these batch files to have any effect.

Reactivation steps for Windows XP:

1. Login on the system as a user with administrative privileges
2. Reactivate OptiFDTD:
    a. Click on the "***Reactivate***", from the Start menu "***Optiwave Software->OptiFDTD NN->Recovery***"
    (where NN is the OptiFDTD version number)

3. To verify successful reactivation Open any sample file in OptiFDTD Waveguide Layout Designer

Reactivation steps for Windows 7, Windows 8:

1. Open a console window as administrator:
    a. From the Start menu, type "***cmd***" in the "*Search programs and files*" field
    b. The ***cmd*** console window shortcut will appear on the top of the Start menu
    c. Right-mouse button click on the ***cmd*** shortcut and from the drop-down menu select "***Run as administrator***"
    d. When you get User Account Control prompt asking whether you allow the program to make changes to your computer - accept.
2. The console window opens in the system folder. You need to change directory to the OptiFDTD installation directory - in the console window type "**cd** " followed by the path to OptiFDTD installation folder e.g.:

    cd C:\Program Files(x86)\Optiwave Software\OptiFDTD NN\bin

    (where NN is the OptiFDTD version number)

3. In the console window type "Reactivate OptiFDTD.bat" and press Enter key.
4. To verify successful reactivation Open any sample file in OptiFDTD Waveguide Layout Designer

3.2. HOW TO: Reactivate OptiBPM when OptiFDTD is uninstalled

PLEASE NOTE that these batch files access protected areas of the system registry. You must have ADMINISTRATOR privileges to for these batch files to have any effect. Reactivation steps:

Reactivation steps for Windows XP:

1. Login on the system as a user with administrative privileges
2. Reactivate OptiBPM:
    a. Click on the "***Reactivate***", from the Start menu "***Optiwave Software->OptiBPM NN->Recovery***"
    (where NN is the OptiBPM version number)

3. To verify successful reactivation Open any sample file in OptiBPM Waveguide Layout Designer

Reactivation steps for Windows 7, Windows 8:

1. Open a console window as administrator:
    a. From the Start menu, type "***cmd***" in the "*Search programs and files*" field
    b. The ***cmd*** console window shortcut will appear on the top of the Start menu
    c. Right-mouse button click on the ***cmd*** shortcut and from the drop-down menu select "***Run as administrator***"
    d. When you get User Account Control prompt asking whether you allow the program to make changes to your computer - accept.
2. The console window opens in the system folder. You need to change directory to the OptiBPM installation directory - in the console window type "**cd** " followed by the path to OptiBPM installation folder e.g.:

    cd C:\Program Files(x86)\Optiwave Software\OptiBPM NN\bin

(where NN is the OptiBPM version number)

3. In the console window type “Reactivate OptiBPM.bat” and press Enter key.
4. To verify successful reactivation Open any sample file in OptiBPM Waveguide Layout Designer

4. Known Issues with OptiBPM

4.1. VB Script number formatting on non-US-English operating systems

When converting the float type numbers into their string representation, VB Script follows the local settings of the operating systems. In some countries, the customary decimal separator is comma instead of the decimal point. In such cases passing a double number as string is impossible i.e. it will fail due to invalid format. It is especially visible when setting expressions on waveguides or other objects, which expect a string representing a float-point number according to IEEE standard.

Workaround – A simple workaround for this behaviour is to include the following code, near the beginning of the script. We would suggest copying the comments as well, so one can remember why this code has been added to the script in the first place:

```
' This option ensures that all variables are declared before being used
' It helps with accidental errors in script programming and debugging
Option Explicit

' Set the VB Script engine to conform with English-US standard.
' It makes sure that the number-to-text conversion conforms with the IEEE float-point
' number representation standards.
'   In some countries a comma is used instead of the decimal point, which renders passing
'   a double number as a string impossible i.e. invalid format. It is especially important
'   when setting expressions on waveguides or other objects, which expect that strings
'   representing floating point precision numbers have the standard format
Dim nOriginalLocale
nOriginalLocale = SetLocale("en-us")


'Use the SetLocale( nOriginalLocale ) to switch back to (restore) your country specific
'settings
'It affects format of displayed (retrieved) items like date, time, currency etc.
```

4.2. Issue 1361 - Protection key not found after application goes into hibernation

Description - Some computers provide a power saving feature, Hibernation. If available, this feature is controlled by opening Power Options in Control Panel. Clicking the Hibernate tab, and then selecting the Enable hibernate turns it on. After the computer goes into hibernation, it won't find the Optiwave protection key, and the simulation will stop with a message that the protection key can't be found.

Workaround - Disable the hibernation feature of the computer.

4.3. Issue 3332 - Unexpected end of statement in VB Script because of compound label name

Description - Waveguides in the layout all have unique names. When the Generate Layout Script feature is used to make a script version of the layout, it uses the waveguide name as the variable name in the new VB script. This makes the text readable, but can lead to trouble if the waveguide was named something that is not a legal name in Visual Basic. The most common trouble is the use

of two or more words in the name - e.g. "Wave Guide 1" instead of "WaveGuide1". White spaces are allowed in the waveguide name, but they cannot be translated to a single variable in Visual Basic. The auto-generated script cannot be executed because there are illegal names in it.

Workaround - If you name the waveguides in the layout yourself, use a single word name (don't use white spaces in the names). This issue doesn't appear if you use the application's auto generated name.

4.4. Issue 1625 - Dragging the vertical scrollbar during a simulation will abort the simulation

Description - During 2D BPM simulations, the simulator sometimes becomes unstable when moving the vertical scroll bar. Improvements have been made to make it more stable, but there is still a chance that some combination of window resizing and scrolling will cause trouble.

Workaround - The resizing and scrolling should not be necessary. Pause the simulator before doing these operations if they must be done.

4.5. Issue 3442 - Batch mode unexpectedly terminates when attempting printing

Description - We have opted to make the simulator visible while it runs in batch mode. We think that users would like to see what is happening while the simulation is under way. The simulator can still respond to simple GUI interactive events, like clicking a tab to view a different data set graphics. However, it has been designed for fast switching from one simulation to the next one. If the user GUI actions are too slow, some of the requests may cause problems (like a printout, for example).

Workaround – In the batch mode, the software might not support every feature available in the interactive mode, subject of synchronization timing between completing a simulation and servicing the user request through GUI. If you want a fully interactive session, use OptiBPM in the non-batch mode, which is designed to support such operations, or pause the simulations.

4.6. Issue 2524 - Some old DLLs used with BPM_CAD 4.0 don't work in OptiBPM 5 and higher

Description - The example User DLLs shipped with the old version of Optiwave BPM, BPM_CAD, were made using the Watcom FORTRAN compiler and wrap FORTRAN functions. The Watcom FORTRAN compiler is now obsolete, so these DLLs are no longer supported.

Workaround - Optiwave will support DLLs made with the Microsoft C++ compiler, version 6 or later. See Appendix F of the OptiBPM User Reference for more information.

4.7. Issue 3458 - Mode function causes Profile Designer application to terminate

Description - It is possible to call the mode solver from the Profile Designer. When the active window is a User Function Profile or User DLL Profile dialog box, the Mode function causes the Profile Designer application to terminate.

Workaround - While it is possible to call the mode solver from the Profile Designer, it is better to call it from the Input Plane, or better still from the OptiMode Cross Section Designer. In OptiMode and in the Input Plane, the cladding, substrate, and calculation window size are all explicitly defined.

4.8. Issue 3353 - Export User Defined WG to Mask generates application termination

Description - In a User Defined waveguide where the upper and lower paths are being specified, it is possible to have the upper and lower boundaries cross. In this unusual case, it can cause trouble with the mask generation feature.

Workaround - Only the resulting shape is significant in the application, it doesn't matter if the boundary is defined from the upper or lower curve. Therefore, if you must make a waveguide with this shape, we suggest specifying the shape using functions that don't cross. This should always be possible.