

OptiFDTD 8.0 Release Notes

OptiFDTD 8.0.0.428, June, 2008

1 Overview

The key features of this release are:

- **64-bit 2D Simulator**
- **Heating Absorption**
- **Total Field/Scattering Field 2D simulations and analysis**

Beside the listed features we also introduced a number of minor enhancements and fixes. More detailed description of the features can be found under the “Feature Overview” section.

See also our *Optiwave Community Forum* portal (<http://forum.optiwave.us/>) for new additions. You can find there miscellaneous examples of software and VB Script usage.

1.1 Important notes

1.1.1 Windows Vista users

Please see the **6.5 Issue KB917607** section on the bottom of this document

1.1.2 Notes on usage of 64-bit Simulators

In order to execute 64-bit Simulations, the software must be installed on a 64-bit Windows operating system. The menu options related to 64-bit simulations are disabled when the software is installed on a computer with a 32-bit operating system.

For the details, see the “System Requirements” in the “Installation Instructions” section below.

Important:

Due to the huge volume of data, which can be calculated during 64-bit simulations there are no volume DFT calculations performed. The DFT data (simulation results) are stored through Observation Objects only. In order to observe any simulation results one must set Observation Objects (Observation Points or Observation Areas) Otherwise there will be no result data available for analysis, after the simulations are completed

1.1.3 Notes on performance of 64-bit 3D Simulator on multi-processor (multi-core) systems

The performance of the 64-bit 3D Simulator has been dramatically improved due to its support for parallel processing on multi-processor (multi-core) systems. The performance is almost linearly proportional to the number of processors (processor cores) installed on the computer.

In order to achieve the highest performance (speed) of the simulations, it is recommended that the computer is not used while the simulations are in progress:

The calculations are performed on all available processors in so called true-parallel algorithm (the only applicable parallel processing method for FDTD algorithm). In result the overall performance (speed) of the simulations depends on the processing speed of the slowest processor, since all other processors have to wait until the last processor completes its simulation sequence.

If the computer is used for other tasks during the simulations, the operating system will take some CPU time to support the user running his application (e.g. email, internet browser, word editors, etc.). It will decrease the CPU time spend by one (or more) of the processors on simulations.

2 Feature Overview

2.1 64-bit 2D Simulator

The introduced 64-bit 2D Simulator, will allow the users to simulate much larger designs that were possible under 32-bit simulators, due to memory limitations imposed on 32-bit applications.

The 32-bit applications may use up to 2-4GB of memory, which restrict the dimensions of the simulated problems. This limitation doesn't exist for 64-bit applications. Under 64-bit Windows operating system a 64-bit application may operate on up to 8 Tera Bytes of memory.

Note:

In order to use the 64-bit Simulators, the software must be installed on a computer with Windows 64-bit operating system.

2.2 Heating Absorption

In metallic and lossy materials in semiconductor devices or solar cells absorb part of the wave energy and convert it to heat. The Heating Absorption feature supports calculations of the heating field distribution and heating absorption rate estimation.

See the Tutorial Lessons describing usage of this feature for details.

2.3 Total Field Scattering Field 2D simulations and analysis

This feature supports simulations of TF/SF phenomenon and full-angle Radar Cross-Section (RCS) analysis in 2D space.

The 2D TF/SF simulations are based on a special method of Input Wave generation, where a planar wave front is generated within the enclosed rectangular area, and propagated in an arbitrary direction. The generated field (Total Field) exists only within the designated rectangular area. Any field detected outside this area is Scattered Field, resulting from the reflections on objects located within the Input Wave area. We have added Radar Cross-Section (RCS) calculation tools to our analyzer, to process the TF/SF simulation results.

Complex grating structures and plane wave simulation problems will benefit from this technique.

2.4 Enhancements, Resolved Issues

Enhancement: The user may use negative coefficients in Drude-Lorentz materials

The interface has been extended to allow for specification of negative coefficients.

Fix: The DFT image is incorrectly displayed in Analyzer, when Observation Area extends beyond the wafer

The data contained in the Observation Area is properly recorded and calculations properly performed. However, the DFT field image was shifted and fragmented, so it was not aligned with the layout structures.

This issue has been fixed.

Note: The user should avoid positioning the Observation Areas outside the wafer, since no data is available for recording there.

Fix: Incorrect VB layout script generated from Observation Area

The layout script related to positioning of Observation Areas was incorrect.

This issue has been fixed.

Fix: Positioning of Observation Areas from VB script is incorrect

This issue has been fixed.

Fix: Unable to set width and height expressions in Observation Areas from VB script

This issue has been fixed.

Issue 3991 Long expressions are not accepted in the data entry of Observation Area dialog box

The space of the data entry fields has been enlarged to accommodate longer text.

This issue has been fixed.

Issue 3957 Generating layout script for a point source does not record the depth

No script related to the Point Source depth was generated.

This issue has been fixed.

3 Installation Instructions

3.1 System requirements

OptiFDTD requires the following system configuration:

- Microsoft Windows 2000/XP/Vista 32-bit or 64-bit

Note:

In order to utilize 64-bit simulators a 64-bit Windows operating system is required. The menu options related to 64-bit simulations are disabled when the software is installed under a 32-bit operating system.

A 64-bit operating system is required as well when planning to use of the multi-processor (or multi-core) supported calculations, since this support has been implemented in 64-bit simulators.

- Personal computer with a minimum Pentium Processor 1GHz.

A higher clock and/or multi-core processor are recommended, since FDTD algorithms are highly CPU intensive and simulations take long time to complete.

For 64-bit operating systems, Intel or AMD processors supporting EM64T architecture are required (processors providing hardware support for 32-bit and 64-bit applications). For example Intel's Core 2 based processors.

- Minimum 1 GB of RAM

The FDTD algorithms require high volumes of RAM. A higher RAM amounts are recommended:

- 3-4GB of RAM under 32-bit operating systems
- Over 4GB of RAM for 64-bit operating system. The practical determination of how much RAM would be required depends on the dimensions of the simulated problems and computer's

CPU power. For larger problems, the 8-16GB (or more) of RAM is suitable, especially when accompanied by fast multi-core CPU's.

- Minimum 5-10 GB of free hard disk space

This requirement depends on the simulated problems. However, in most of the cases simulations generate high volumes of the simulation results. Much higher amounts of hard disk space is recommended to accommodate for the storage space needs. Availability of a fast-access hard disk will speed up the simulations as well.

- A graphics card supporting 1024 x 768 graphic resolution, minimum 256 colors
Make sure that the computer has the most recent video drivers installed.
- Internet Explorer 6.0
- DirectX8.1

Note:

For machines running Windows XP, the "Windows Classic" theme must be used.

3.2 Software installation

It is recommended that any earlier versions of the software be uninstalled prior to the full installation of the OptiFDTD 8.0.

Note:

The result files (*.fda) for the lessons described in the Technical Background and Tutorials manual are included on the setup CD. These files are not copied to your computer when OptiFDTD is installed. These files are available on the setup CD for your convenience.

Vista Users - IMPORTANT

Due to strong restrictions related to security and system access, the *setup.exe* has to be executed as an administrator, to successfully complete the software installation. This can be achieved in the following ways:

- Logon to the system from the built-in Administrator account and execute *setup.exe*.
- Login an account with administrative privileges and run the *setup.exe* as administrator. For example click with right-mouse button on the *setup.exe* and from the drop-down menu select "Run as Administrator" option.

Note:

It might happen that even in this case not all the components are properly registered with the system. In this case the Layout Designer might not be able to open any of the sample files.

To resolve this issue follow these steps:

- Close the OptiFDTD applications
- Go to the Start menu
- In the "Program Files->Optiwave Software->OptiFDTD 8->Recovery" click with the right-mouse button on "Recovery" shortcut.
- From the drop-down menu, select "Run as Administrator".

This should re-register the required components and allow the applications to work properly.

3.2.1 Backup your data

Current users of OptiFDTD should backup their data before installing OptiFDTD 8.0. The software installation program supplies a set of samples. Some of these samples have the same names as samples already on your computer. Therefore, it is possible for the samples that are installed with this software to overwrite the existing samples. Since this program is installed into its own folder structure, the possibility of this happening is small. However, backing up your data is still recommended.

3.2.2 Note location of your Master.plb file

If you currently use OptiFDTD (or OptiBPM), please make a note of the location of your Master.plb file in the Waveguide Profile Designer. The current location of the Master.plb file can be determined by opening the Waveguide Profile Designer and selecting 'Tools -> Options...' from the main menu. Note the value displayed in the 'Master library path' edit box.

After completing the installation of OptiFDTD, start the Waveguide Profile Designer and select 'Tools -> Options...' from the main menu again. If the value of the 'Master Library Path' has changed, you may want to reset this to the value displayed before installing the software. The Master.plb file is the master database of profiles and materials. The contents of this file are displayed under the 'Master' node in the Waveguide Profile Designer browser docked at the left hand side of the screen.

Depending on the installation options, the location of the Master.plb could be changed during installation of OptiFDTD.

3.2.3 Installing OptiFDTD 8.0

To install OptiFDTD 8.0, run the program named **setup.exe** on the distribution CD. This setup program will provide you with the instructions required to install the software.

4 Notes on software usage

If you own both OptiBPM and OptiFDTD, please note that OptiFDTD and OptiBPM should not be run simultaneously. This can cause problems in the Waveguide Profile Designer. 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.

5 Issues with Uninstall

If OptiFDTD 8.0 is installed onto a machine that already has OptiFDTD or OptiBPM installed, please note that uninstalling this version can cause problems with existing OptiFDTD, 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 under the OptiFDTD and OptiBPM products in the **Recovery** submenu. You must be logged in as a user with Administrative privileges to run this script.

The **'How To'** descriptions below describe the reactivation process for the affected products.

5.1 HOW TO: Reactivate OptiFDTD when OptiBPM is uninstalled

PLEASE NOTE that these batch files access protected areas of the system registry. You must be logged in as a user that has ADMINISTRATOR access to for these batch files to have any effect. To Reactivate OptiFDTD, please perform the following steps:

1. Optiwave Software -> OptiFDTD 8 -> Recovery -> Reactivate OptiFDTD

2. Open any sample file in OptiFDTD Waveguide Layout Designer

5.2 HOW TO: Reactivate OptiBPM when OptiFDTD is uninstalled

PLEASE NOTE that these batch files access protected areas of the system registry. You must be logged in as a user that has ADMINISTRATOR access to for these batch files to have any effect. To Reactivate OptiBPM, please perform the following steps:

1. Optiwave Software -> OptiBPM *N* -> Recovery -> Reactivate OptiBPM
2. Open any sample file in OptiBPM Waveguide Layout Designer

6 Known Issues with OptiFDTD 8.0 release

6.1 When attempting to simulate problems requiring much larger memory than available on the computer, the 64-bit simulators will stall

Description – In case when simulations of the designed structure would require much larger amounts of memory than available (installed) on the computer, the requested 64-bit simulator will start, opening its progress window. However, it will appear as doing nothing, while attempting to use different approaches to allocate required memory. This process takes long time, since there is no direct solution to it, and the system tries to utilize/allocate the virtual memory. There will be no message displayed; even after the memory allocation attempts fail (which could be followed by the application crash).

It may take 20-40 min or more before simulations start or fail, for large-dimension problems.

6.1 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.

6.2 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.

6.3 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.

6.4 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.

6.5 Issue KB917607 – Windows Vista does not support classical Windows online help

Windows Help program (WinHlp32.exe) is not included with the Windows Vista operating system. WinHlp32.exe is required to display OptiFDTD Help files. In result the online help for OptiFDTD is unavailable under Windows Vista operating system.

Workaround – To resolve this issue, Microsoft has released a WinHlp32 download for Windows Vista computers at the Microsoft Download Center.

We have provided short summary/instructions on the workaround for this issue. You can find it on the installation CD in the \Misc\winhlp32_vista\readme.htm file

6.6 Under Windows Vista – Layout Designer cannot open sample and data files

This behaviour is related to improper registration of the software components during the installation process. In this case the Layout Designer might not be able to open any of the sample files.

To resolve this issue follow these steps:

- Close the OptiFDTD applications
- Go to the Start menu
- In the “Program Files->Optiwave Software->OptiFDTD 8->Recovery” click with the right-mouse button on “Recovery” shortcut.
- From the drop-down menu, select “Run as Administrator”.

This should re-register the required components and allow the applications to work properly.