OptiFDTD

What's New in 9.0

Created to address the needs of research scientists, professors, and students, OptiFDTD satisfies the demand of users who are searching for a powerful and flexible Finite-Difference Time-Domain simulation design suite.

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What's new in OptiFDTD 9.0

Non-uniform mesh simulation

OptiFDTD 9.0 introduces support for non-uniform mesh simulation in the 64-bit 3D simulator. The non-uniform mesh simulation engine is especially useful when simulating designs containing high-value dielectric constant materials, including metal structures.

The key benefits of this feature are lower memory consumption, and consequently lower CPU usage.

The non-uniform mesh that meets the requirement of FDTD algorithms can be automatically generated based on the layout material properties. The engine generates fine meshes for high refractive index regions, while coarse meshes are applied in the low index regions.

Users now have flexibility to adjust a graded mesh in-between the fine and coarse meshes. The generated mesh can be visualized in each direction. The most visible benefits of non-uniform mesh usage can be observed when simulating surface plasmon resonance and metallic structure projects.

Waveguide Cross-Section Designer for modal analysis

OptiFDTD 9.0 introduces a new application enabling users to create complete projects out of mode solving.

In most cases, the first stage of optical design is the design of the optical waveguide itself. At this stage, mode solvers are the natural simulators to use. In OptiFDTD 9.0, one can specify materials and profiles, and then create a project using **OptiMODE XS Designer**.

The OptiMODE design application is dedicated to the cross section of the waveguide only. The associated Simulator accesses all 3D mode solvers available from Optiwave, and is supported by a post processor Analyzer application, in the same style as OptiBPM and OptiFDTD. The designer also supports VB Scripts which facilitate batch simulation automation to scan or optimize design parameters.

Once the design is finished, the optimized profile can be added to the Master profile list in the Profile Designer, for use in subsequent OptiFDTD (or OptiBPM) simulations.

- **Additional feature in OptiMODE**: The solving of modes from user-defined refractive index distributions. Import a file with any kind of refractive index distribution into the OptiMODE XS Designer.

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2D Cauchy Integral mode solver

The 2D mode solver in OptiFDTD 9.0 is now enhanced to find lossy and leaky modes, as well as **surface plasmon modes**. This mode solver exploits the Cauchy Integral rule – where the number of poles inside a closed path in the complex plane is given from the path integral over the contour.

VB Scripting support extended to 64-bit simulation engines

Responding to demands of our users, VB Script support is now supported in 64-bit simulators. This feature is currently available in 32-bit simulators and utilized by many users in simulations of complex, parameterized structures, and their optimizations.

Calculation of modal group delay and dispersion

OptiFDTD 9.0 includes a special feature to plot modal index vs. wavelength.

This data is displayed in the OptiMODE Results Analyzer. From this data it can also calculate and plot group delay and dispersion spectra. The feature is based on a wavelength scan controlled by VB Script. However, if the user does not want to write the script, there is an option to use the dispersion scan script auto-generation feature. This dialog box controlled feature will write the appropriate script automatically.

System requirements

OptiFDTD requires the following system configuration:

- Microsoft Windows XP/Vista and Windows 7 (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 amount of RAM is always recommended for large simulations:

  - 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.

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