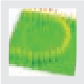
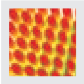
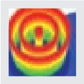
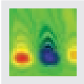
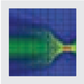
Opti*FDTD*

Finite-Difference Time-Domain Simulation Design Software

OVERVIEW

OptiFDTD is a powerful, highly integrated and user-friendly software application that enables the computer-aided design and simulation of advanced passive and non-linear photonic components. OptiFDTD enables you to design, analyze and test modern passive and nonlinear photonic components for wave propagation, scattering, ref ection, diffraction, polarization and the nonlinear phenomenon. The core program of OptiFDTD is based on the finite-difference time-domain (FDTD) algorithm with second-order numerical accuracy and the most advanced boundary condition - Uniaxial perfectly matched layer (UPML) boundary condition. The algorithm solves both electric and magnetic fields in temporal and spatial domain using the full-vector differential form of Maxwell's coupled curl equations. This allows for arbitrary model geometries and places no restriction on the material properties of the devices.

The automation of these processes dramatically improves productivity of design engineers and reduces time-to-market for the product. This, along with integration with other Optiwave photonic design automation software, all contributes to quicker return on investment and shorter pay-back period.

SPECIFIC BENEFITS

- Presents global overview of photonics problems
- Provides broad material choice
- Offers extensive excitation selection
- Delivers powerful Post-Data Processing

APPLICATIONS

OptiFDTD enables the simulation of:

- Photonic band gap materials and devices
- Optical micro-ring filters and resonators
- Grating-based waveguide structures
- Diffractive micro-optics elements
- Complex integrated optics structures
- Nonlinear materials, dispersive materials, surface plasma and anisotropic materials

- Photonic surface plasmon and surface plasma wave
- Nano-partical, cells, tissue and lens
- Electromagnetic phenomena

NEW FEATURES IN OPTIFDTD

TRUE 64BIT

The latest version of OptiFDTD delivers the power of 64-bit computing to desktops supporting Windows XP 64-bit and Windows Vista 64-bit operating systems.

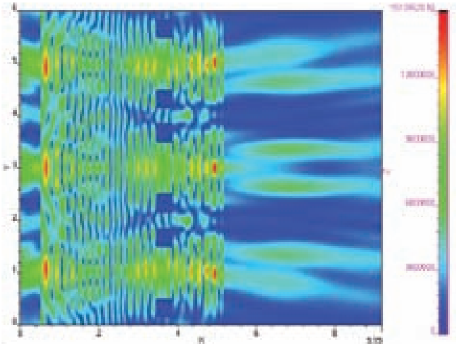
Next Generation Simulation Engine

With the 64-bit features of OptiFDTD, users can design and run a new generation of 64-bit simulations that address up to four billion times as much memory as 32-bit applications.

As engineers tackle larger, more complex real-world problems in their designs, sufficient memory becomes crucial. 64-bit operating systems can utilize 16 TB (Terabytes) of RAM. A 32-bit system can only handle a maximum of 4 GB of RAM, severely limiting the amount of accessible memory in an existing system.

Total Field Scattering Field (TF/SF)

Introducing a new arbitrary tilting plane wave excitation algorithm that separates total field and scattering field. Ideal for Radar Cross Section (RCS) analysis and grating simulations.



Heating Absorption Module

Metallic and lossy materials in semiconductor devices or solar cells absorb part of the wave energy and convert it to heat. The advanced heating absorption module in OptiFDTD 8.0 supports calculations of the heating field distribution and heating absorption rate estimation.

Initial Phase of the Plane Input Wave

A new feature enabling users to select the initial phase offset of a launched input wave. A practical application when analyzing combined signals from multiple input planes.

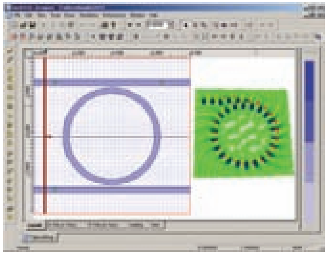
KEY FEATURES AND FUNCTIONALITY

OptiFDTD has the most extensive material choices, including

- Lossless and lossy materials
- Isotropic and anisotropic materials
- Multiple resonance dispersive materials
- Lorentz-Drude materials - Noble metals and surface plasma materials
- 2nd-Order and 3rd-Order nonlinear materials
- Kerr effect materials
- Raman effect materials
- Perfect conductor materials

OptiFDTD has the most extensive selection of excitation sources, including

- Waveguide mode excitation
- Gaussian beam excitation
- Plane wave excitation
- Point source and Dipole Source
- Single wavelength excitation
- TF/SF excitation
- Spectral excitation
- Power and amplitude
- Linear or circular polarization
- Multiple beam excitations



Advanced Boundary Condition

OptiFDTD includes an advanced boundary condition simulation feature which optimizes memory usage and provides more accurate results. Using the Uniaxial Perfectly Matched Layer (UPML) method to calculate the absorbing boundary condition in comparison with conventional PML

The periodic boundary condition, Perfect Electric Conductor (PEC) and Perfect Magnetic Conductor (PMC) boundary conditions can be used with UPML to realize more advanced simulations for periodic and symmetric layouts.

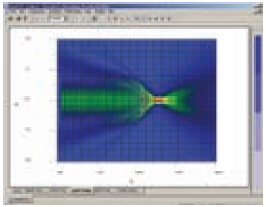
Robust Photonic Crystal Editor

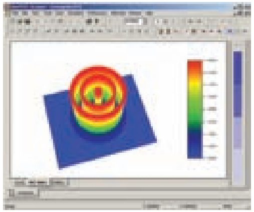
Included with OptiFDTD is a robust photonic crystal editor allowing users to edit any lattice structure and periodic layout with a number of template shapes (i.e. Atom Waveguides). Editing features have also been improved, including user-defined shape creation and structure rotation.

Simulation Automation through Scripting

A powerful feature empowers users with full simulation engine automation through Visual Basic scripting. Completely integrated with the graphical user interface, the f exible scripting tools allow for a streamlined automation process:

- Quickly and easily convert any layout design or its parts into the script.
- Create custom libraries of scripts that represent particular components, which can be added to any new layout design.
- Easily create the most complex design without manual graphical user interface operations.
- Optimize your simulation with comprehensive post-processing tools.





FDTD Band solver
A fully integrated 2D band solver is based on the FDTD method with Bloch's periodic boundary condition, and can generate the band diagram based on the reduced simulation domain of single or multiple cells from a square or hexagonal lattice.

Waveguide thickness tapering options
Waveguides can now be tapered in thickness in addition to width. Channel waveguides can be tapered linearly, and fibers can be tapered linearly and proportionately. With 3D fiber profiles, the width of the 2D waveguide in the x-z plane is also applied to the height, in order to model fiber tapering. As the dimensions change in y, the position of the center line of the fiber in 3D space is maintained.

Post Data Analysis
OptiFDTD has the strongest post-data analysis tools available. Options include, Discrete Fourier Transform Field Distribution in Domain, Poynting Vector in Domain, Polarized Power calculation, and Overlap Integral calculation.

Lorentz-Drude model
A Lorentz-Drude model for metallic integrated photonic circuits. This advanced materials model will allow users to perform more accurate, truly full-wave simulations for metallic structures – another "industry first" captured by OptiFDTD.

PWE band solver
A new band solver based on plane wave expansion (PWE) method will enable customers to analyze properties of photonic crystal materials and devices in all three dimensions.

> "We are using OptiFDTD to perform 2D and 3D simulations of CMOS image sensor pixels to evaluate their optical efficiency. OptiFDTD is a very versatile simulation tool and we have been very impressed with the technical support we have received from Optiwave."
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> **Dr. Peter Catrysse**
>
> *Dept. of Electrical Engineering, Stanford University*