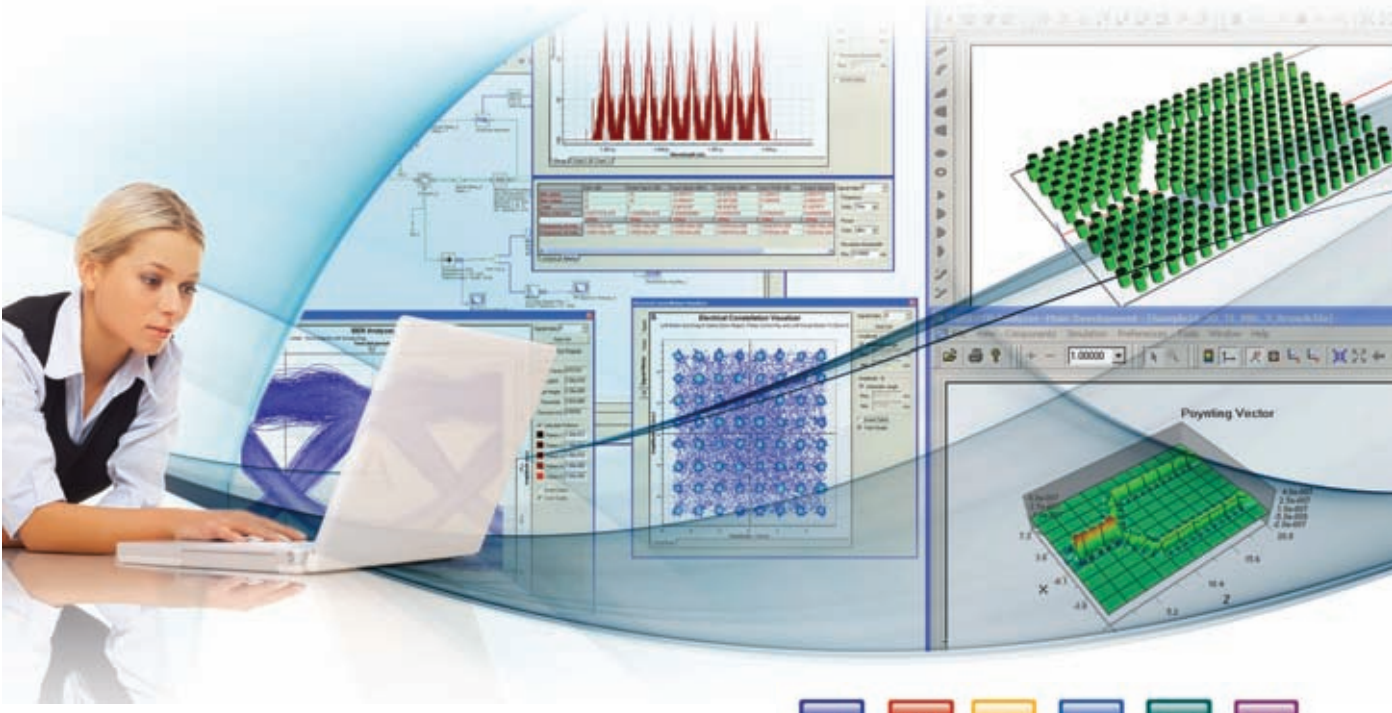
Optiwave



DESIGN SOFTWARE FOR PHOTONICS

With an unparalleled suite of design and simulation software tools, Optiwave is the leading provider of innovative design tools for photonics. The acceptance of Optiwave software as the industry standard is validated through its implementation at Fortune 500 companies, universities and government research labs worldwide. Optiwave is headquartered in Ottawa, Canada with an established distribution network throughout the Americas, Europe, and Asia.

“Accurate and timely modeling is critical to optimizing PLC design and to avoiding costly design mistakes. Optiwave has provided my group with an excellent tool for modeling PLC structures.

Optiwave software is easy to use, flexible, powerful and fast. Additionally, the support we have received has been uniformly excellent. I can wholeheartedly recommend Optiwave for waveguide and fiber-optic modeling.”

Carl Tuttle,
PhD Physicist, Optical Designer
Advanced Technology Center,

Lockheed Martin Corporation

YOUR DESIGN INTERESTS MAY INCLUDE

OptiSystem
PAGE 04

Fiber optic telecommunication networks, FTTH applications, CATV design, PON, SONET/SDH ring design and optical amplifier design.

OptiSPICE
PAGE 14

Design and simulation of opto-electronic circuits at the transistor level, from laser drivers to transimpedance amplifiers, optical interconnects and electronic equalizers.

OptiFDTD
PAGE 20

Metallic nanostructures, photonic band gap materials and devices, optical micro-ring filters and resonators, grating based waveguide structures.

OptiBPM
PAGE 26

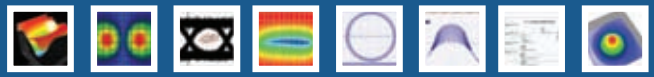
Channel waveguides, rib or ridge waveguides, buried waveguides or waveguides from a diffused process. Facilitates the design of splitters, combiners, couplers, modulators and multiplexers.

OptiFiber
PAGE 31

Single and Multimode fiber design, characterization of attenuation, bend loss, dispersion, mode measures, birefringence and PMD.

OptiGrating
PAGE 32

Fiber gratings, planar waveguide gratings for optical signal conditioning, sensors. Chirped and apodized gratings. Multigrating resonators.



Optiwave Systems Inc. is the most renowned and consistently innovative developer of innovative design tools for photonics.

Optiwave provides a robust variety of photonic design tools to hundreds of leading high-technology businesses. An established community of over one thousand scientific users in over forty countries worldwide support Optiwave's hallmark of achievements in Canadian business for over a decade.

Optiwave's roots as a research and development company have always been its greatest strength. Its team of specialists in developing engineering software solutions has created a wide range of industry-leading software programs and applications for the numeric simulation of physical processes that are both highly advanced and remarkably user friendly.

Opti*System*

Optical Communication System and Amplifier Design Software

OVERVIEW

In an industry where cost effectiveness and productivity are imperative for success, the award winning OptiSystem can minimize time requirements and decrease cost related to the design of optical systems, links, and components. OptiSystem is an innovative, rapidly evolving, and powerful software design tool that enables users to plan, test, and simulate almost every type of optical link in the transmission layer of a broad spectrum of optical networks from LAN, SAN, MAN to ultra-long-haul. It offers transmission layer optical communication system design and planning from component to system level, and visually presents analysis and scenarios. Its integration with other Optiwave products and design tools of industry leading electronic design automation software all contribute to OptiSystem speeding your product to market and reducing the payback period.

SPECIFIC BENEFITS

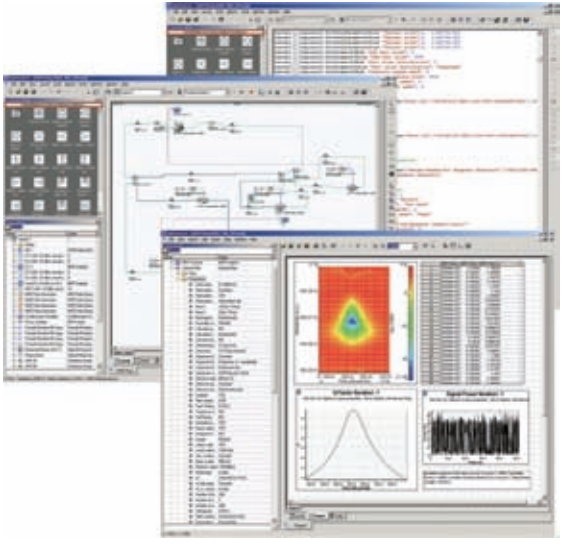
- Provides global insight into system performance
- Assesses parameter sensitivities aiding design tolerance specifications
- Visually presents design options and scenarios to prospective customers
- Delivers straightforward access to extensive sets of system characterization data
- Provides automatic parameter sweep and optimization
- Integrates with the family of Optiwave products

APPLICATIONS

Created to address the needs of research scientists, optical telecom engineers, system integrators, students and a wide variety of other users, OptiSystem satisfies the demand of the evolving photonics market for a powerful yet easy to use optical system design tool.

OptiSystem enables users to plan, test, and simulate:

- WDM/TDM or CATV network design
- SONET/SDH ring design
- Transmitter, channel, amplifier, and receiver design
- Dispersion map design
- Estimation of BER and system penalties with different receiver models
- Amplified System BER and link budget calculations



" As optical systems become more and more complex, scientists and engineers must increasingly adopt advanced software simulation techniques for vital assistance with design issues. OptiSystem's power & f exibility facilitates efficient & effective photonic designs."

Dr. Govind P. Agrawal,
Professor,
Institute of Optics, University of Rochester and author of Fiber-Optics Communications Systems

KEY FEATURES AND FUNCTIONALITY

Component Library

The OptiSystem Component Library includes hundreds of components that enable you to enter parameters that can be measured from real devices. It integrates with test & measurement equipment from different vendors. Users can incorporate new components based on subsystems and user-defined libraries, or utilize co-simulation with a third party tool such as MATLAB or SPICE.

Integration with Optiwave Software Tools

OptiSystem allows you to employ specific Optiwave software tools for integrated and fiber optics at the component and circuit level: OptiSPICE, OptiBPM, OptiGrating, and OptiFiber.

Mixed signal representation

OptiSystem handles mixed signal formats for optical and electrical signals in the Component Library. OptiSystem calculates the signals using the appropriate algorithms related to the required simulation accuracy and efficiency.

Quality and performance algorithms

In order to predict the system performance, OptiSystem calculates parameters such as BER and Q-Factor using numerical analysis or semi-analytical techniques for systems limited by inter symbol interference and noise.

Advanced visualization tools

Advanced visualization tools produce OSA Spectra, signal chirp, eye diagrams, polarization state, constellation diagrams and much more. Also included are WDM analysis tools listing signal power, gain, noise figure, and OSNR per channel.

Data monitors

You can select component ports to save the data and attach monitors after the simulation ends. This allows you to process data after the simulation without recalculating. You can attach an arbitrary number of visualizers to the monitor at the same port.

Hierarchical simulation with subsystems

To make a simulation tool f exible and efficient, it is

essential to provide models at different abstraction levels, including the system, subsystem, and component levels. OptiSystem features a truly hierarchical definition of components and systems, enabling you to employ specific software tools for integrated and fiber optics at the component level, and allowing the simulation to be as detailed as the desired accuracy dictates.

Powerful Script language

You can enter arithmetical expressions for parameters and create global parameters that can be shared between components and subsystems using standard VB Script language. The script language can also manipulate and control OptiSystem, including calculations, layout creation and post-processing when using the script page.

State-of-the-art calculation data-flow

The Calculation Scheduler controls the simulation by determining the order of execution of component modules according to the selected data f ow model. The main data f ow model that addresses the simulation of the transmission layer is the Component Iteration Data Flow (CIDF). The CIDF domain uses run-time scheduling, supporting conditions, data-dependent iteration, and true recursion.

Report page

A fully customizable report page allows you to display any set of parameters and results available in the design. The produced reports are organized into resizable and moveable spreadsheets, text, 2D and 3D graphs. It also includes HTML export and templates with pre-formatted report layouts.

Bill of materials

OptiSystem provides a cost analysis table of the system being designed, arranged by system, layout or component. Cost data can be exported to other applications or spreadsheets.

Multiple layouts

You can create many designs using the same project file, which allows you to create and modify your designs quickly and efficiently. Each OptiSystem project file can contain many design versions. Design versions are calculated and modified independently, but calculation results can be combined across different versions, allowing for comparison of the designs.

NEW FEATURES IN OPTISYSTEM

The most comprehensive optical communication design suite for optical system design engineers is now even better with the release of OptiSystem version 8.0 also available in 32-bit and TRUE 64-bit editions.

The latest version of OptiSystem features a number of new features and enhancements to address the design of passive optical network (PON) architectures using orthogonal frequency division multiplexed (OFDM) signals, optical coherent detection systems and injection-locked Fabry-Perot laser diodes (F-P LD).

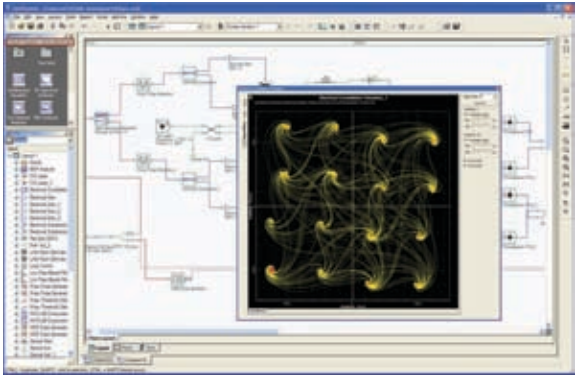
The OptiSystem API has been extended to support OptiSPICE, the first circuit design software for analysis of integrated circuits including interactions of optical and electronic components. OptiSystem is the default waveform viewer and signal integrity analyzer of OptiSPICE.

Fabry-Perot Laser

A new model of a wavelength-locked Fabry-Perot laser diode (F-P LD) based on the rate equations for the semiconductor laser diode. Fabry-Perot laser is a cost-effective source for the wavelength-division multiplexed passive optical networks.

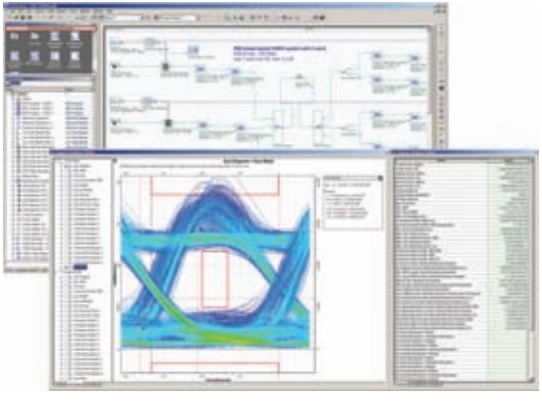
Duobinary, CSRZ and DPSK Transmitters

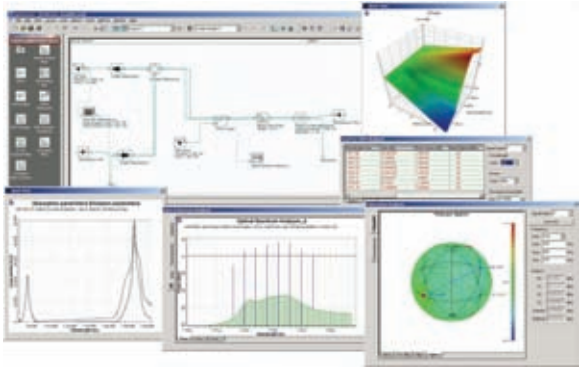
New transmitters encapsulate the complexity of advanced modulation formats such as duobinary, CSRZ and DPSK facilitating the design of fiber-optic communication networks.



OFDM Modulator/Demodulator

OFDM can be applied in optical long haul transmission systems and have many advantages over conventional single-carrier modulation format. The new components allow for the simulation of OFDM transmitters and receivers, supporting different types of modulation schemes such as BPSK, QPSK, QAM, etc.





Yb Doped Fiber Dynamic

A new time domain Stimulated Brillouin Scattering (SBS) model for high-power Ytterbium doped fiber amplifiers. The new model describes the interplay between the first and second-order Stokes, pump, and signal in double-clad fiber amplifiers.

MORE FEATURES IN OPTISYSTEM

Bi-Directional AWG

New feature empowers the unique bi-directional capabilities of OptiSystem, facilitating the design of AWG based PONs.

Microwave Components

New sophisticated library of components including 180 and 90 degree hybrid couplers, DC blockers, power splitters and combiners. An ideal solution for ROF simulation applications.

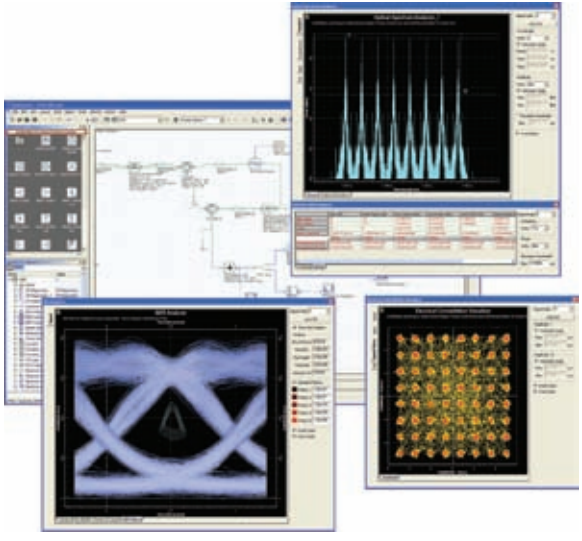
MLSE (Maximum Likelihood Sequence Estimate)

An advanced component feature using the Viterbi algorithm to equalize the input signal through a dispersive channel.

Optical Fibers and Amplifiers

A new discretization parameter for broadband sampled signals offers improved performance, accuracy, and convergence for doped amplifier gain and Brillouin calculations.

Four-Wave Mixing, Stimulated Brillouin Scattering, Self-Phase Modulation, Cross-Phase Modulation, and Stimulated Raman Scattering are all included with the optical fiber models of OptiSystem.



Free Space Optics (FSO)
New feature enabling the simulation of complex inter-satellite communication links.

Constellation and Polar Diagrams
A new calculation engine in OptiSystem used to estimate symbol error in user defined regions and targets.

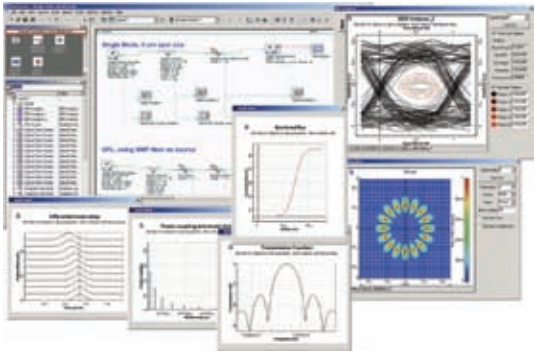
Advanced Analysis Toolsets
The photonic all-parameter analyzer measures polarization mode dispersion (PMD) and records multiple traces simultaneously. This robust new feature can measure insertion loss (IL), differential group delay (DGD), polarization chromatic dispersion (PDC), depolarization rate, dispersion, dispersion slope, and group delay (GD).

S-Parameter Extractor
The signal characteristics from an optical transmitter input and receiver output can be extracted and exported into an industry standard touchstone format for s-parameters, benefiting EDA tools that offer integrated S-Parameter support which effectively reduces the design cycle time.

BTI utilizes OptiSystem simulation software for research in optical transmission link designs, ROADM capabilities and advanced research in optical signal regeneration and amplification.

"OptiSystem's capabilities enhance our design process allowing us to provide a rapid delivery of enhanced capabilities on our microWDM platform. The technical support from the Optiwave team meets our expectations in achieving the desired simulation requirements."

Dr. Ahmed Atieh,
Technical Lead Engineer
BTI SYSTEMS INC

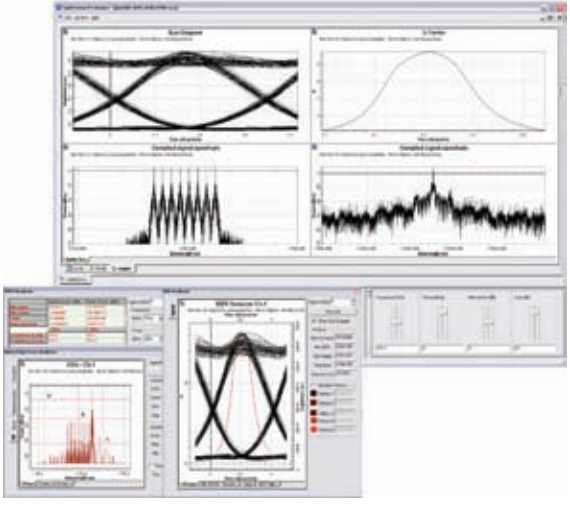


OptiPerformer

Optiwave introduces OptiPerformer, a free optical communication system visualization tool which harnesses the full power of OptiSystem.

Use OptiPerformer to create specific dynamic design scenarios which can be used by non-R&D colleagues to enhance their understanding of photonic component & system design trade-offs.

OptiPerformer users need not possess OptiSystem software, nor the requisite technical skill-set to operate it in a way which leverages its full range of capabilities.



Opti*SPICE*

Opto-Electronic Circuit Design Software

OVERVIEW

OptiSPICE is the first circuit design software for analysis of integrated circuits including interactions of optical and electronic components. It allows for the design and simulation of opto-electronic circuits at the transistor level, from laser drivers to transimpedance amplifiers, optical interconnects and electronic equalizers. With the imminent coexistence of electrical and optical components at the chip and board level, it is important to provide designers with a reliable simulation framework that can accurately and efficiently predict signal behaviour in opto-electronic integrated circuits and boards. OptiSPICE produces self-consistent solutions of opto-electronic circuits that contain feedback spanning both optical and electrical parts. OptiSPICE is a fully-integrated solution for parameter extraction, schematic capture, circuit simulation and waveform analysis.

BENEFITS

- Significantly reduce product development costs and boost productivity through OptiSPICE comprehensive design environment to simulate optical and electrical circuits in one simulation engine.
- Run state-of-the-art transient time domain, small-signal frequency, and noise analysis to accurately predict behaviour of advanced opto-electronic circuits.
- OptiSPICE Schematics offers direct schematic entry in an intuitive graphical user interface. It allows for greater ease of schematic capture, parameter specification, waveform probing and usage.
- Waveform analysis using OptiSystem for complex post-processing functionality. Advanced visualization tools produce OSA Spectra, signal chirp, eye diagrams, polarization state, constellation diagrams and much more.
- Includes parameter extraction tools for OptiSPICE model creation. From measurement data, parameter extractors are used to find the best set of OptiSPICE model parameters to fit the measurement.

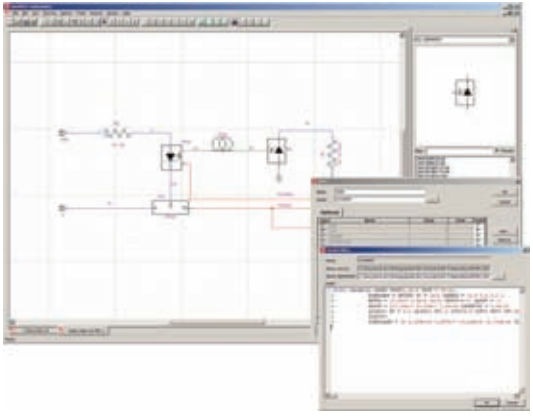
APPLICATIONS

- Design and simulation of opto-electronic circuits at the transistor level, from laser drivers to transimpedance amplifiers, optical interconnects and electronic equalizers.

- Signal integrity analysis of opto-electronic circuits, including eye diagram analysis with BER patterns.

Schematic Editor

- Integrated Device Symbol Editor allows you to create custom symbols for devices or hierarchical blocks using standard drawing tools.
- Hierarchical Design with unlimited levels is fully supported. Any symbol on a schematic can contain another schematic of arbitrary size. Blocks can be nested to any desired depth. Any number of hierarchical blocks can be open for editing at any time.
- OptiSPICE Schematics includes a powerful Custom Report Generator tool for netlist and text report generation. The report format is driven by a “form file” which contains formatting commands and constant text. Form file features allow you to control: Overall report structure, e.g. netlist formats by signal or by device, listings by device for bills of materials, etc.
- OptiSPICE includes several powerful technologies for scripting and customization that allows full access to all design data and virtually every program function.



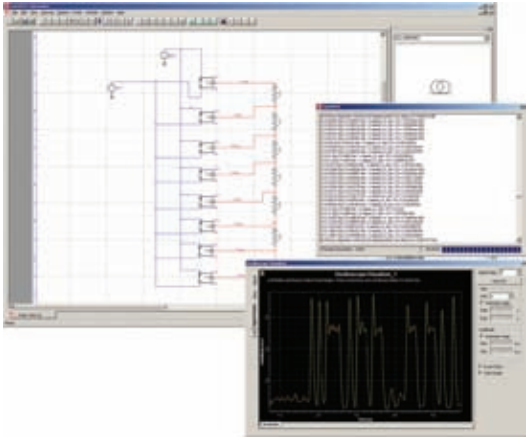
- The schematic editor can save diagrams in the standard PDF (Acrobat), WMF (Windows Metafile) and DXF (AutoCAD) graphics formats.

This capability allows you to pass graphics to other programs for plotting, enhancement, or incorporation into other documentation.

- Generate OptiSPICE or HSPICE compatible netlists.

Simulator

- OptiSPICE simulator incorporates equations governing optical components directly into an electrical simulation framework, thus forming a single-engine opto-electronic simulation software.
- Includes thermal macro models that model the thermal behaviour of the devices. Users can incorporate them into the opto-electronic simulation to provide reliable simulation results.
- Supports a wide variety of electrical circuit elements such as diodes, transistors, BJTs and MOSFETS along with optical components such as laser diodes, optical fibers and photodiodes.

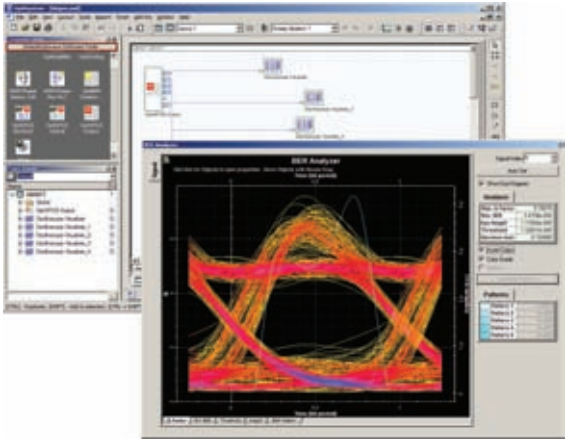


- Able to handle integrated optics, multiple optical channels (WDM), and multimode signals.
- Advanced numerical techniques for superior convergence. Advanced solver automatically selects the best convergence algorithm for reliable transient simulation convergence.

- Active and passive device model compatibility with industry HSPICE standard. Users can easily import external models and netlists written in HSPICE format to OptiSPICE.
- Enables accurate simulations by supporting BSIM3 models.
- Provides accurate implementation of different frequency dependent models including S-parameters, pole/residue expressions and transmission line models.

Waveform Analysis

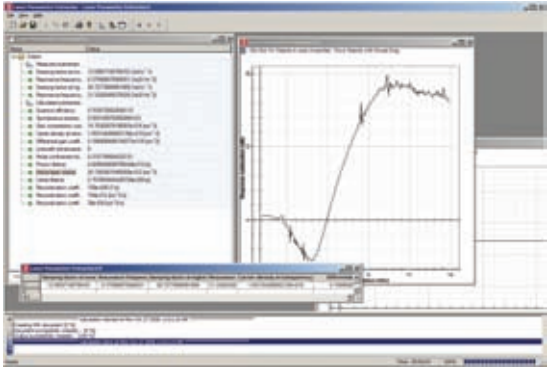
- OptiSPICE includes the award winning software OptiSystem for complex post-processing, signal integrity and waveform analysis.
- In order to predict the system performance, OptiSystem calculates parameters such as BER and Q-Factor using numerical analysis or semi-analytical techniques for systems limited by inter symbol interference and noise.
- The OptiSystem signal processing library includes many components for post-processing of OptiSPICE results. Users can also create new types of analysis or incorporate new components using MATLAB.

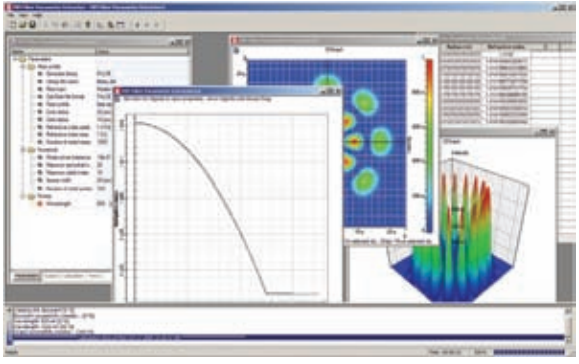


- Advanced visualization tools produce OSA Spectra, signal chirp, eye diagrams, polarization state, constellation diagrams and much more. Also included are WDM analysis tools listing signal power, gain, noise figure, and OSNR per channel.

Parameter Extraction

- Laser parameter extractor allows users to generate models by extracting and fitting parameters from static and dynamic measurements of lasers.





- Filter parameter extractor allows users to translate S-parameters into compact and efficient pole/residue representations.
- Multimode fiber parameter extractor includes an optical fiber mode solver that allows users to generate libraries of fibers from a user defined refractive index profile.

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.

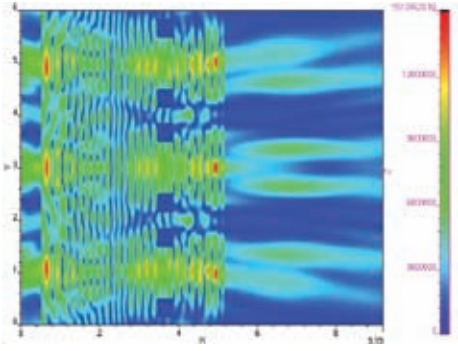
Next Generation Simulation Engine

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.

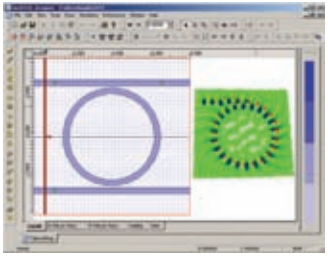
KEY FEATURES AND FUNCTIONALITY

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.

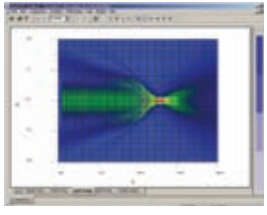
Robust Photonic Crystal Editor

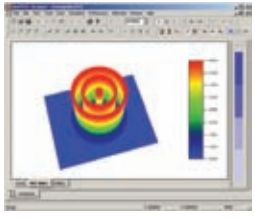
Included with OptiFDTD is a robust photonic crystal editor allowing users to edit any lattice structure and periodic layout with a number of template shapes (i.e. Atom Waveguides). Editing features have also been improved, including user-defined shape creation and structure rotation.

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.

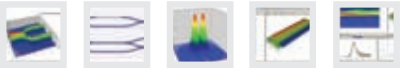
Lorentz-Drude model
A Lorentz-Drude model for metallic integrated photonic circuits. This advanced materials model will allow users to perform more accurate, truly full-wave simulations for metallic structures – another "industry first" captured by OptiFDTD.

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."
Dr. Peter Catrysse
Dept. of Electrical Engineering, Stanford University

Opti*BPM*

Waveguide Optics Design Software



OVERVIEW

OptiBPM is the computer-aided design software tool enabling design of complex optical waveguides, which perform guiding, coupling, switching, splitting, multiplexing, and demultiplexing of optical signals in photonic devices.

Based on the Beam Propagation Method (BPM) of simulating light passage through any waveguide medium, OptiBPM allows designers to observe computer-simulated light field distribution and examine the radiation and the guided field, simultaneously.

Reliably characterizing the beam facilitates computer-aided design of a variety of integrated and fiber optic guided wave problems. OptiBPM delivers significant new features, such as the ability to define and use anisotropic materials in layout designs and waveguide simulations.

OptiBPM can improve design engineers' productivity, reduce risk, and lower overall costs related to design of waveguide solutions. OptiBPM's high-value functionality includes powerful integration capabilities with our award-winning optical communication system software, OptiSystem, and with Design Workshop's dw-2000, a mask layout physical design and verification software.

APPLICATIONS

- Accommodates waveguides integrated on a substrate, including channel waveguides, rib or ridge waveguides, buried waveguides, or waveguides from a diffused process
- Facilitates design of Splitters, Combiners, Couplers, Modulators, Multiplexers, and AWGs
- Models on both the device scale and (in conjunction with OptiSystem) on the photonic circuit scale
- Facilitates the design of optical fiber based devices

KEY FEATURES AND FUNCTIONALITY

Integrated Environment

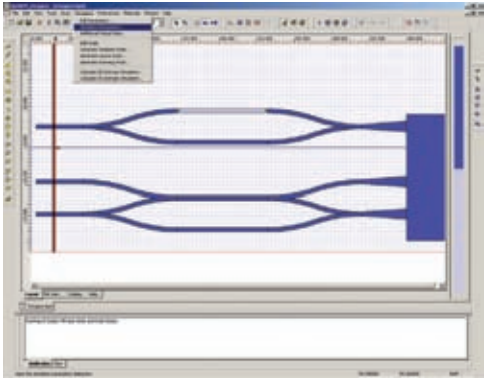
OptiBPM's integrated environment allows channel, fiber, and diffused waveguides to be combined on a single layout. A simple menu selection allows a layout to be simulated with either the 2D or 3D simulation engines, and simulations can be started at any propagation position using the new input plane component. Integration of OptiBPM with Design Workshop's dw-2000 allows users of both applications to better implement design and manufacture workf ows. Integration with OptiSystem delivers continuity in simulation from the waveguide to the system or sub-system level.

Powerful Optimization and Tolerance Analysis

OptiBPM includes exclusive optimization and tolerance analysis features. Users can now optimize their designs through the information collected by the simulation engine, enhanced by coding tools, which can be modified to meet critical design needs. Monte-Carlo simulations are now possible with OptiBPM, where it can perform statistical analysis to aid users in predicting the yield of their process with a candidate design.

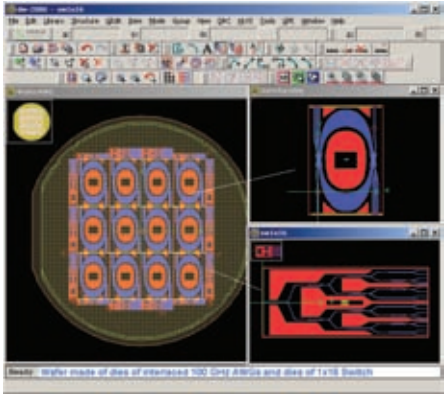
Improved Handling of Waveguide Geometry

A number of waveguide shapes have been added, including: Elliptic, Parabolic Taper, Ring and S-Bend Cosine Taper. Now, OptiBPM waveguides are fully parameterized so waveguide position and all other



waveguide properties can be controlled using simple expressions. Limitation on the orientation angle of a waveguide no longer exists.

User-defined waveguides allow arbitrary shapes to be created and used in a layout. These custom waveguide shapes can be defined in terms of their path, or by specifying the upper and lower arms of the waveguide. This permits creation of many more waveguide shapes - any whose basic parameters can be described by standard functions of a single variable.



Three-dimensional profiles define the width and length of the 2D waveguide in the x-z plane and the height in the y plane. Waveguides can now be tapered in thickness, channel waveguides can be tapered linearly, and fibers can be tapered linearly and proportionately. The 3D channel waveguide profiles also support lateral offset of profile layers or non-symmetrical structures.

NEW FEATURES IN OPTIBPM

Import of DXF and GDSII Mask File Formats

Export of OptiBPM layout designs to the standard mask layout formats has always been possible in OptiBPM, now you can import AutoCAD .DXF and Calma .GDS files into the OptiBPM layout as well.

Fiber Vector and LP Mode Solver

Mode solvers based on finite difference mesh can have limitations unacceptable for optical fiber calculations. The magnitude of the fields far from the fiber core can be orders of magnitude smaller than the error made in

calculating finite differences. Over long propagation distances, those small fields can still be significant. The latest release of OptiBPM includes an integrated multi-layer fiber mode solver that uses a meshless technique. The modes can be found in the popular LP approximation, as well as the exact, full vector, modes.

Advanced Optimization Algorithms

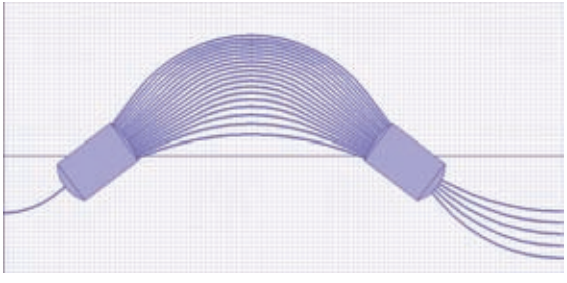
A good design can be obtained with physical insight and knowledge of basic design principles. However, finding the best design usually involves a tedious phase of optimization.

OptiBPM's new Optimization Algorithms can fully automate this important step. OptiBPM uses well established optimization algorithms, like Golden Search for one dimension, and Simplex method or Direction Set methods for multidimensional searches.

Analysis of Large Scale Optical Circuits

BPM techniques work on a microscopic level (typically the smallest distance is about 0.1 microns), but photonic circuits, on the other hand, can occupy an entire wafer (scale: 10 cm). The analysis must span 5 or more orders of magnitude in the change in scale. The successful analysis needs to combine the basic microscopic techniques with an approach at a more abstract, or system, level. OptiBPM has the Scattering Data feature, in which the Transfer matrix of any device can be obtained. Once characterized this way, the device (a subsection of the entire layout of the optical circuit) can be uploaded to OptiSystem. The analysis of the optical circuit as an optical system is very efficient, enabling design of advanced photonic circuits like Lattice Filters, Interleavers, Ring-Coupled Resonators, and AWGs.

Reference: "Advanced Photonic Circuit Simulation", Proc. of SPIE Vol. 5956 59560K, Warsaw, September, 2005.

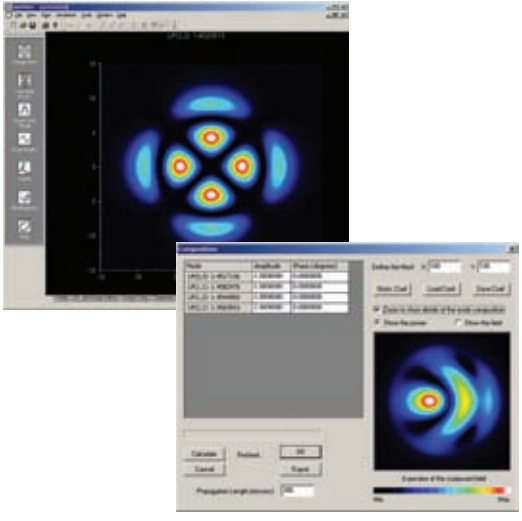


OVERVIEW

The optimal design of a given optical communication system depends directly on the choice of fiber parameters. Dimensions of the fiber cross-section, material composition, and refractive index profile all inf uence important linear and non-linear phenomena. OptiFiber uses numerical mode solvers and other models specialized to fibers for calculating dispersion, losses, birefringence, and PMD.

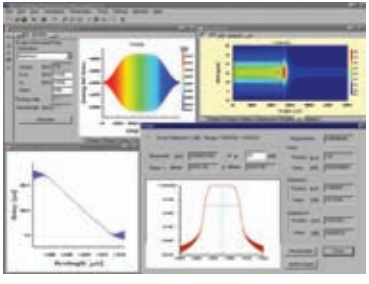
KEY FEATURES AND APPLICATIONS

- Assess parameters, sensitivities, and tolerances
- Fiber mode solving of LP or Vector modes by Finite Difference or by Transfer Matrix Methods
- Analysis of measured fiber profiles from instruments such as the EXFO NR-9200
- Single mode fiber designs such as Corning SMF-28, dispersion f attened or shifted fibers.
- Multimode fiber design, such as 50/125 m and 62.5/125 m silica fibers.
- Visualization of multimode interference patterns with propagation
- Automatic parameter scanning
- Fiber Sensor design
- Calculation of birefringence and PMD from intrinsic or extrinsic perturbations.



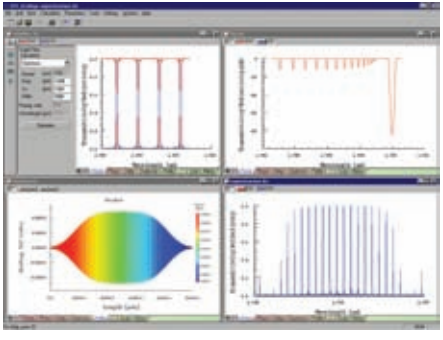
OVERVIEW

Emerging as a de-facto standard over the last decade, OptiGrating has delivered powerful and user-friendly design software for modeling integrated and fiber optical devices that incorporate optical gratings. OptiGrating uses the Coupled Mode Theory to model the light and enable analysis and synthesis of gratings. A complex grating is approximated by a sequence of uniform segments, and analyzed by connecting the segments with the well-known Transfer Matrix Method. This gives the designer the information needed to test and optimize grating designs.



APPLICATIONS

- WDM add/drop, narrow and broadband fiber and waveguide filters
- Fiber Bragg reflectors
- EDFA gain flattening elements
- Dispersion compensators for fiber communications
- Sideband suppression using grating apodization
- Fiber and waveguide sensors
- Long Period Gratings with coupling to cladding modes



Optiwave Foundations

As one of the first companies to realize the full potential of photonic design automation software, Optiwave is the most renowned and consistently innovative in the business, from its extended suite of software products and applications to its in-house engineering design capabilities and unsurpassed technical support.

Optiwave's roots as a research and development company have always been its greatest strength. Its team of specialists in developing engineering software solutions has created a wide range of industry-leading software programs and applications for the numeric simulation of physical processes that are both highly advanced and remarkably user friendly.

www.optiwave.com