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

Opti*System*

PAGE 04

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

Opti*SPICE*

PAGE 14

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

Opti*FDTD*

PAGE 20

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

Opti*BPM*

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.

Opti*Fiber*

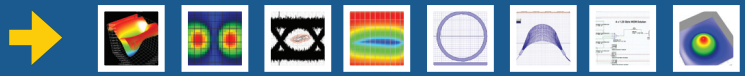
PAGE 31

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

Opti*Grating*

PAGE 32

Fiber gratings, planar waveguide gratings for optical signal conditioning, sensors, chirped and apodized gratings, and multigrating resonators.



Optiwave Systems Inc. is the most renowned and consistently innovative developer of 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 sixty 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.

OptiSystem

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 (in both the time and frequency domain):

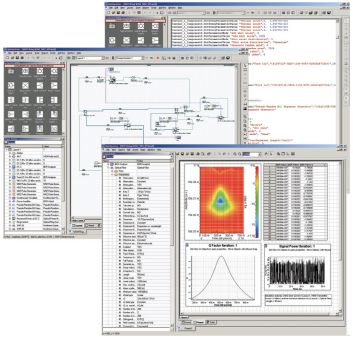
- Optical network designs including OTDM, SONET/SDH rings, CWDM, DWDM, PON, Cable, OCDMA
- Single-mode/multi-mode transmission
- Free space optics (FSO), Radio over fiber (ROF), OFDM (direct, coherent)
- Amplifiers and lasers (EDFA, SOA, Raman, Hybrid, GFF optimization, Fiber Lasers)
- Signal processing (Electrical, Digital, All-Optical)
- Transmitter and receiver (direct/coherent) sub system design
- Modulation formats (RZ, NRZ, CSRZ, DB, DPSK, QPSK, DP-QPSK, PM-QPSK, QAM-16, QAM-64)
- System performance analysis (Eye Diagram/ Q-factor/BER, Signal power/OSNR, Polarization states, Constellation diagrams, Linear and non-linear penalties)

" 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 & flexibility facilitates efficient & effective photonic designs."

Dr. Govind P. Agrawal,

Professor,

Institute of Optics, University of Rochester and author of Fiber-Optics Communications Systems



KEY 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 and 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 flexible 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, 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.

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 flow model. The main data flow 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.

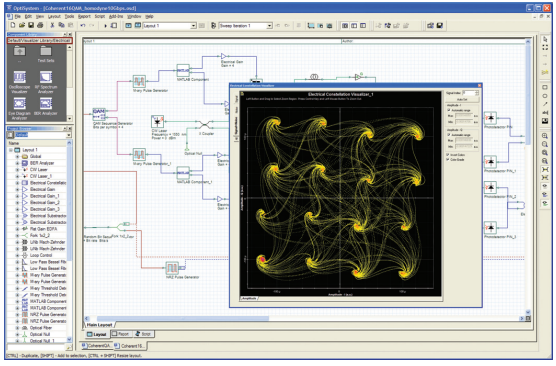
FEATURES

OptiSystem provides the most comprehensive optical communication and photonics design suite for optical design engineers. Its key features include:

Transmitters library

OptiSystem's Transmitters library contains an extensive selection of optical sources (Fabry-Perot, DFB, VCSEL), electrical and optical signal pulse generators, optical modulators (EA, MZ), electrical modulators and coders (QAM, PAM, FSK, OFDM) and multi-mode signal generators (Laguerre-Gaussian, Hermite-Gaussian).

Designers can choose between advanced physical-based or measurement-based (empirical) models for modeling the static and dynamic behavior of semiconductor lasers. Our physical-based models include 1D and 2D multi-mode laser rate equations, providing designers with the ability to switch between bulk laser rate models and the transmission line matrix method (TLMM).

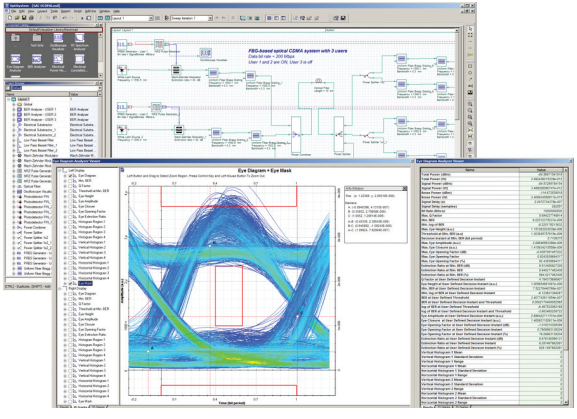


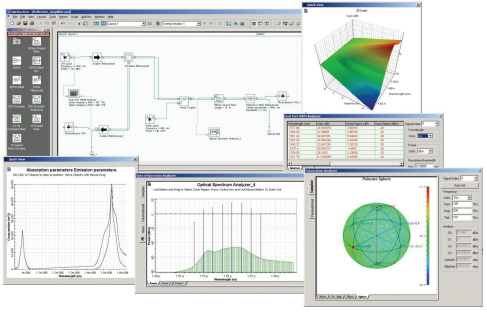
Receivers library

The Receivers library contains all the building blocks needed to accurately model optical communication receiver sub-systems. Components include regenerators (clock/data recovery, 3R), electronic equalizers, threshold detectors, decision circuits for PSK/QAM modulation, PIN and APD photo-detectors, demodulators (OFDM, frequency, phase amplitude), decoders (PAM, QAM, PSK, etc.), and digital signal processing (DSP) tool sets for single and dual polarization coherent PSK and QAM systems.

Optical fibers

Advanced, highly parameterized, optical fiber models can be used to characterize single mode and multi-mode signal propagation; including linear (dispersion), stochastic (PMD), and non-linear impairments (FWM, self-phase modulation, and cross-phase modulation). Using OptiSystem's Bidirectional optical fiber component, it is possible to model and measure Rayleigh, Brillouin and Raman scattering effects.





Amplifiers

A comprehensive suite of steady state and dynamic optical amplifier models is provided, including advanced doped fiber models (Er, Er multi-mode, Er-Yb, Yb, Yb multi-mode, Tm, Pr) for detailed physical fiber amplifier design; EDFA and EDFA black box (gain spectrum, noise figure measurements) for WDM network systems design; dynamic and average power Raman models; and 1D/2D semiconductor optical amplifier models (lumped rate equation, travelling wave, TLMM). Electrical domain amplifiers are also provided for receiver design (transimpedance, automatic gain control and limiting amplifier applications).

Network design tools

Network design tools include ideal and non-ideal models for optical switches, multiplexers, de-multiplexers, array waveguides (AWGs), fiber connectors, and PMD emulators.

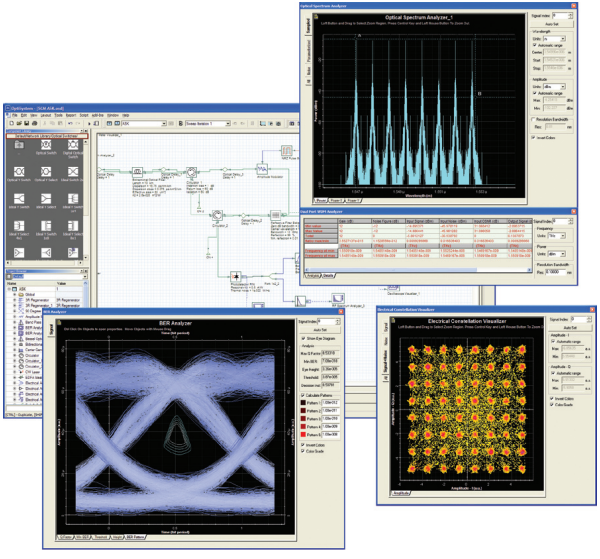
Filters

A variety of electrical and optical filters are provided for sub-system and system design simulation including standard filter functions (Bessel, Gaussian, RC, Raised Cosine, etc.), digital IIR/FIR filters, periodic filters, reflective/FBG filters, measured filters, S-parameters filter, and acousto-optic.

Passives

An extensive selection of optical and electrical passive components can be used to build a variety of component and sub-system designs. Optical devices include attenuators, couplers, splitters and combiners, polarization controllers, reflectors, taps, isolators, and circulators. Electrical devices include 180 and 90 degree hybrid couplers, DC blockers, power splitters and combiners, and RF transmission lines.

Models are also provided to allow designers to use measured data to characterize device transfer functions, including small signal scattering (S) matrices and the Jones matrix.



Signal processing
Signal processing tools are provided for manipulating optical, electrical and binary signals. Functions and operations include bias generators, gain, signal addition and subtraction, normalizers, electrical differentiators and integrators, down-samplers, serial-parallel and parallel-serial converters, electrical flip flops, and electrical/binary logic operators.

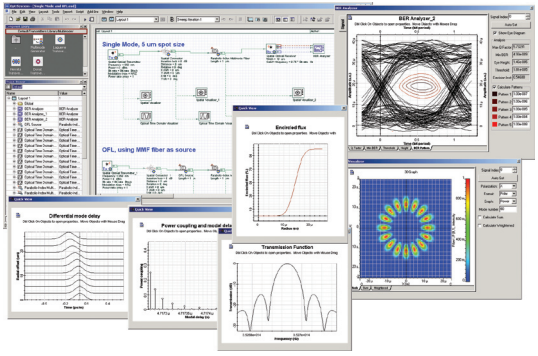
Spatial and free space optics design tools
OptiSystem has specialized components that can model free space optical channels (antenna characteristics, atmospheric propagation) and the spatial analysis of multi-mode signal coupling between devices (multi-mode generators, spatial connectors, thin lenses, spatial visualizers).

Visualization tools
Visualization and post-simulation analysis tools include BER test sets and analyzers, eye diagram analyzers, spectrum analyzers, oscilloscopes, optical time domain viewers, power meters, polarization analyzers, spatial visualizers, encircled flux, DMD analyzer, photonic all parameter analyzer, filter analyzer, and S-parameter extractor.

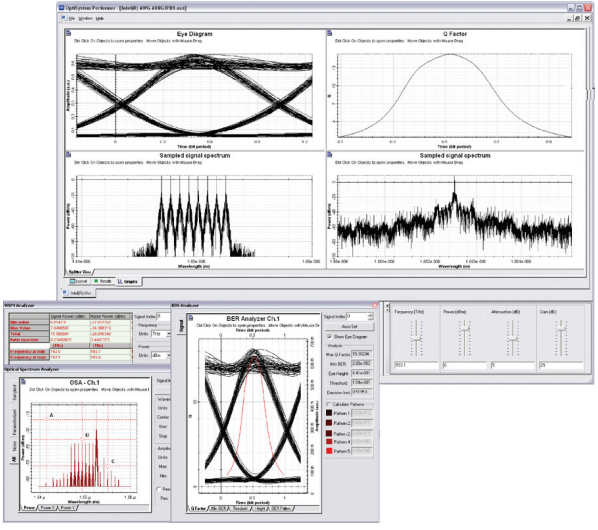
BTI utilizes OptiSystem simulation software for research in optical transmission link designs, ROADM capabilities and advanced research in optical signal regeneration and amplification.

"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 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.



OptiPerformer

OptiPerformer is 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 colleagues to enhance their understanding of photonic component & system design trade-offs.

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 using OptiSPICE's 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.
- Post simulation waveform analysis using OptiSPICE Waveform Viewer or OptiSystem's advanced visualization tools (OSA, eye diagrams, oscilloscopes).
- 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.

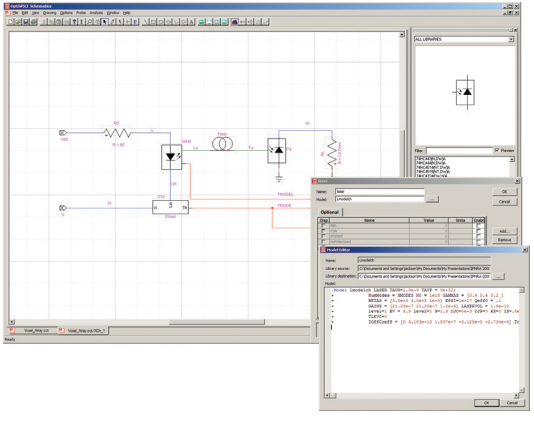
Schematic Editor

- 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, and listings by device for bill of materials.

- OptiSPICE includes several powerful technologies for scripting and customization that allows full access to all design data and virtually every program function.



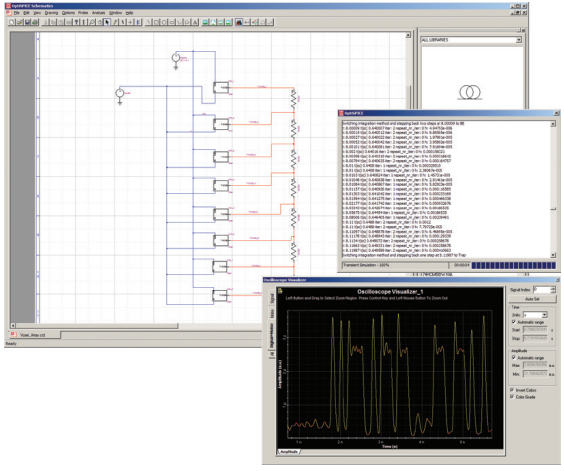
- The schematic editor can save diagrams in the standard PDF (Acrobat), WMF (Windows Metafile) and DXF (AutoCAD) graphics formats.

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 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.

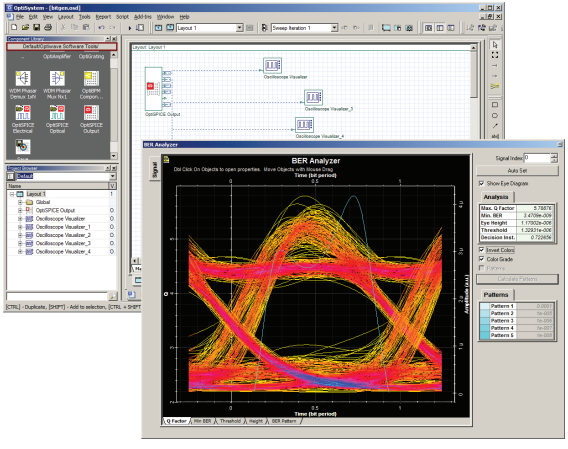


- Able to handle integrated optics, multiple optical channels (WDM), and multimode signals.
- Advanced numerical techniques for superior convergence. Advanced solver automatically selects the best convergence algorithm for reliable transient simulation convergence.

- 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.

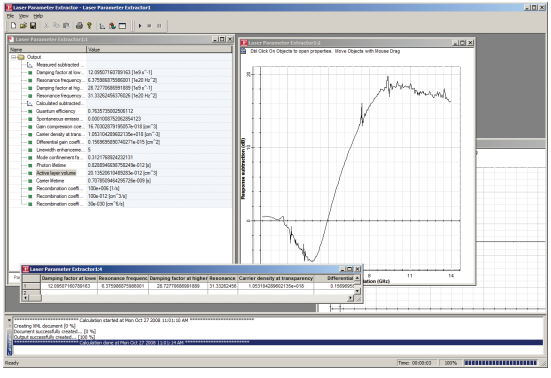
Waveform Analysis

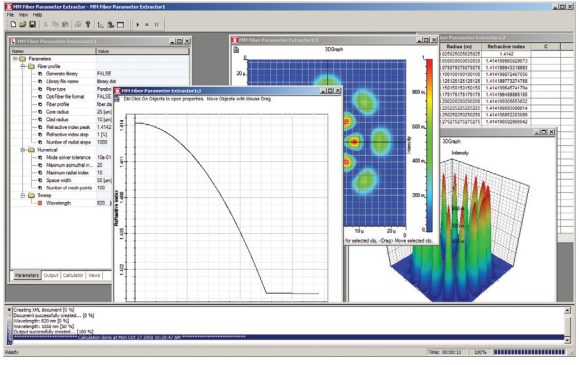
- OptiSPICE Waveform Viewer is a post simulation analysis tool that allows designers to view the optical and electrical signal data captured from any probe placed in an OptiSPICE circuit design.
- 2D visualization capabilities include bi-directional (time-domain) analysis of current, voltages; and optical power, magnitude, and phase measurements.
- A button activated control allows designers to automatically import the same probe data into OptiSystem's advanced post-processing environment for further analysis (including eye diagram and optical spectrum visualization, BER and Q factor measurements).



Parameter Extraction

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



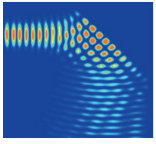
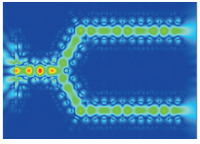
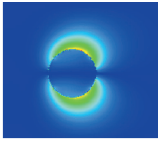


- Filter parameter extractor allows users to translate S-parameters into compact and efficient pole/residue representations.

- 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 Design Software

OptiFDTD dramatically improves productivity of design engineers by reducing time-to-market. This, along with integration with other Optiwave photonic design automation software, contributes to quicker return on investment.

OVERVIEW

OptiFDTD enables you to design, analyze and test modern passive and nonlinear photonic components for wave propagation, scattering, reflection, diffraction, polarization and nonlinear phenomena. 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 domains 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.

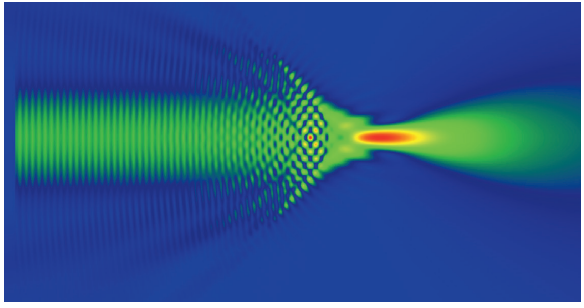
APPLICATIONS

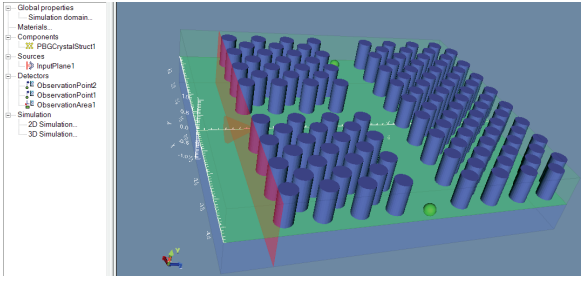
- Dielectric and metallic gratings
- CMOS sensors design
- VCSEL lasers passive design
- Photonic crystals
- Integrated optics
- Optical filters and resonators
- Solar cells
- LED and OLED passive design
- Nanolithography
- Plasmonics
- Surface Plasmon Resonance
- Nanoparticles simulations
- Diffractive micro-optics elements
- Tissue scattering simulations

KEY FEATURES

Integrated simulation environment

OptiFDTD provides a complete and user-friendly 3D graphical user interface to enable the design, simulation and analysis of complex devices. Designs from third-party CAD software can be readily imported and exported using widespread formats such as DXF and GDSII. OptiFDTD and OptiBPM can easily interoperate in order to extend the simulation range attainable by OptiFDTD alone.



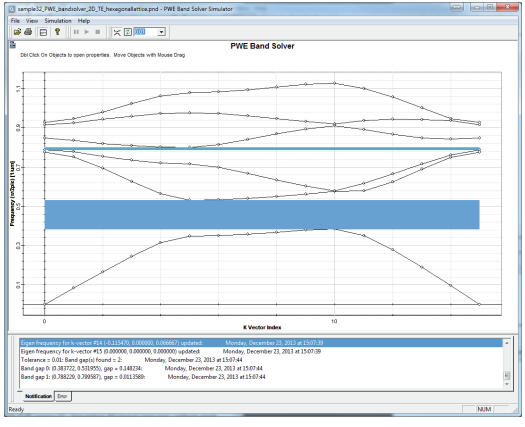


Powerful automation and parameter sweeps

OptiFDTD designs and simulations can be fully automated using a powerful Visual Basic scripting language. The language is easy to learn and provides standard programming structures such as objects, loops, and tests. Parameter sweeps provide an easy to use graphical interface for defining parametric simulations, where one or two parameters vary at each iteration. OptiFDTD post-processing tools can take advantage of automation functionalities and assist you in optimizing your design.

Plane Wave Expansion band solver for photonic crystals

Fully integrated 2D PWE band solver and photonic crystal editor can help you design and simulate any type of photonic crystal problem (1D, 2D, 3D). The PWE band solver can scan through k-space following the irreducible Brillouin zone and find eigenfrequencies of your structure. Band-gaps are automatically outlined in the resulting band diagram.



True parallel performance

OptiFDTD takes advantage of modern 64 bit operating systems and processors. It is optimized to run efficiently on multiple cores and processors in a single machine using shared memory, providing the best possible performance and minimum memory footprint (as compared to distributed memory architectures such as MPI). For memory intensive simulations, you can use our Linux 3D simulation engine, specifically designed to take advantage of Linux computer clusters.

"We are using OptiFDTD to perform 2D and 3D simulations of CMOS image sensor pixels to evaluate their optical effciency. 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

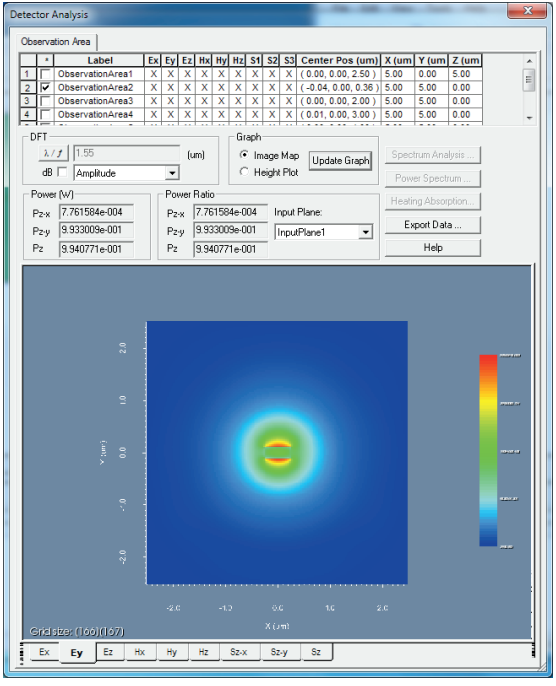
Dept. of Electrical Engineering,

Stanford University

Advanced simulation post processing tools

OptiFDTD provides extensive simulation analysis tools. Using OptiFDTD Analyzer, you can observe time domain and frequency domain (using FFT or DFT transforms) amplitude, phase, real or imaginary values of any field component recorded by your detectors. All field data can be exported for use in third-party software tools such as Matlab™ or Origin™ for further processing or publication.

Time-domain field evolution can also be visualized in the form of movies. Polarized power distribution, Poynting vectors, overlap integrals, heat absorption calculation and far-field transforms can be determined using OptiFDTD Analyzer and OptiFDTD Toolbox.



SUMMARY OF FEATURES

Sources:

- Waveguide mode input using OptiMode
- Gaussian beam input
- Plane wave
- Point source (dipole)
- Single wavelength (CW) source
- Pulsed source
- Linear or circular polarizations
- Simulation of multiple sources simultaneously

Materials:

- Dielectric (lossless and lossy) material, (n,k) direct entry or Sellmeier model for glasses
- Isotropic or anisotropic media
- Dispersive (Lorentz, Drude and Lorentz-Drude)
- Nonlinear media (2nd, 3rd order, Kerr and Raman)
- Perfect conductor material
- Extensive Material Library

Boundary conditions:

- Uniaxial Perfectly Matched Layers (UPML)
- Perfect Electric Conductor (PEC)
- Perfect Magnetic Conductor (PMC)
- Periodic Boundary Conditions (PBC)

Geometry:

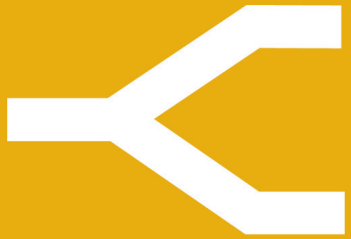
- Straight and titled waveguides with taper function
- Ring, arc, circle and ellipse waveguides with taper
- Parabolic and exponential waveguides with taper
- 3D shapes with clipping functions
- Photonic crystal lattice editor
- Import from 3rd party CAD layout software
- Export masks for lithography

Simulator:

- 2D TM or TE, 3D simulations
- Non-uniform meshing capabilities
- PWE band solver for photonic crystals
- Full 64-bit simulation, Multithreaded engine
- Cluster computing: hybrid multithreading / MPI engine on Linux clusters

Detectors and Post-processing:

- Point detector (temporal and spectral)
- Line and area detectors (DFT spectra)
- Mode analysis
- Poynting vector analysis
- Polarized power analysis
- Far-field transform
- Fields exported to text, images or movies



Opti*BPM*

Waveguide Optics Design Software





OVERVIEW

OptiBPM is a 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.

OptiBPM is based on the Beam Propagation Method (BPM) of simulating the passage of light through any waveguide medium, both isotropic and anisotropic. With OptiBPM you can observe the near field distribution and examine the radiation and guided field, simultaneously. OptiBPM can improve a design engineer's productivity, reduce risk, and lower overall costs related to design of waveguide devices.

APPLICATIONS

- Model waveguides integrated on a substrate, including channel waveguides, rib or ridge waveguides, buried waveguides, or waveguides from a diffused process.
- Design splitters, combiners, couplers, modulators, multiplexers, and AWGs.
- Design optical fiber based devices.

KEY FEATURES AND FUNCTIONALITY

Integrated Environment

OptiBPM can combine channel, fiber, and diffused waveguides into a single layout. A simple menu selection allows a layout to be simulated in either 2D or 3D. Integration with OptiSystem delivers continuity in simulation from the waveguide to the system or sub-system level. Complex field data transfer between OptiFDTD and popular ray tracing tools, allows OptiBPM designers to incorporate free space optical elements.

Waveguide Shapes

A vast number of waveguide shapes are available, including: Linear, Arc, Tapered (Linear, Parabolic, and Exponential), and S-Bend (Arc, Sine, and Cosine). Waveguides are fully parameterized so waveguide position and all other waveguide properties can be controlled with simple expressions. 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. Any waveguide shape that can be described by standard functions of a single variable can be entered.

Waveguides can be created and placed with a mouse-click or VB Script commands. Waveguides can be tapered in width and length in the X-Z plane, and height in the Y axis. Waveguides can be tapered in thickness, channel waveguides can be tapered linearly, and fibers can be tapered linearly or proportionately.

Import from AutoCAD DXF and GDSII File Formats

Import and export to and from these standard mask layout formats is supported in OptiBPM. Once you have designed and simulated your waveguide circuit in OptiBPM, you can export the optimized design as a mask for fabrication.

Fiber Vector and LP Mode Solver

Mode solvers based on a 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 meshed simulations. Over long propagation distances those small fields can still be significant. OptiBPM has a multi-layer fiber mode solver that uses a transfer matrix technique, instead of meshes, for LP and fiber vector modes. Accurate estimation of the field over many orders of magnitude is possible.

Advanced Optimization Algorithms

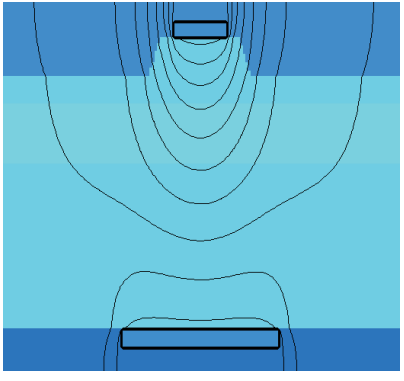
A good design can be obtained with physical insight and knowledge of basic design principles. However, finding the best design usually involves a tedious phase of optimization. OptiBPM has Optimization Algorithms that fully automate this important step. OptiBPM uses well established algorithms such as the Golden Search for one dimension and the 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 μm), but photonic circuits, on the other hand, can occupy an entire wafer (scale: 10 cm). A 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 layout of the entire 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 such as Lattice Filters, Interleavers, Ring-Coupled Resonators, and AWGs.

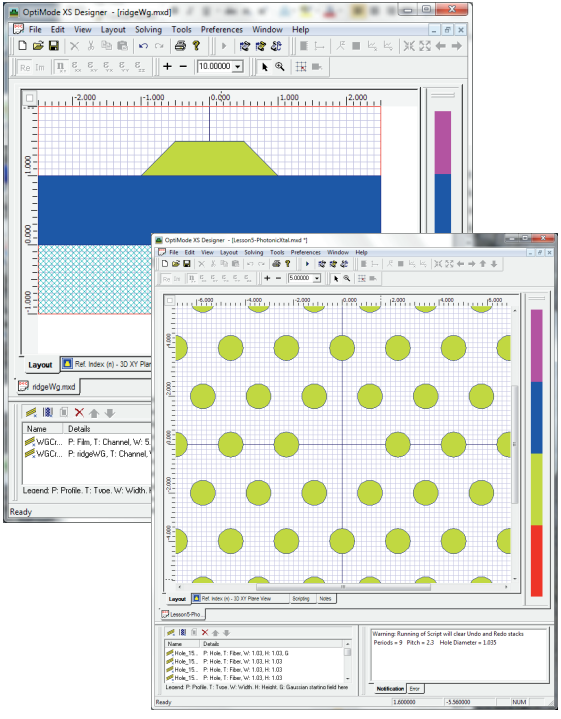
Electro-Optic Simulation

OptiBPM can simulate the linear electro-optic effect (Pockels Effect). You can make electrodes of any shape and add them to the layout. OptiBPM will calculate the static (or radio frequency) electric field in the transverse plane and calculate the optical propagation modified by the electro-optic effect.



OPTIMODE

OptiMode is a complete software suite dedicated to the modal analysis of waveguides, which is the first job in optical component design. Any waveguide can be analyzed by a number of numerical algorithms, and many levels of analysis are possible, including: scalar, semi-vector, full vector, electric formulation, magnetic formulation, isotropic, and anisotropic. The waveguide design can be parameterized, and optimized. Complex waveguides (such as photonic crystals) can be created with VB Scripts written in either OptiBPM or OptiFDTD. The copying of profiles and materials (by simple drag-and-drop) between OptiMode, OptiBPM and OptiFDTD is permitted as they all share the same Profile Designer. Post processing and review of simulation data is accomplished using OptiMode Analyzer.

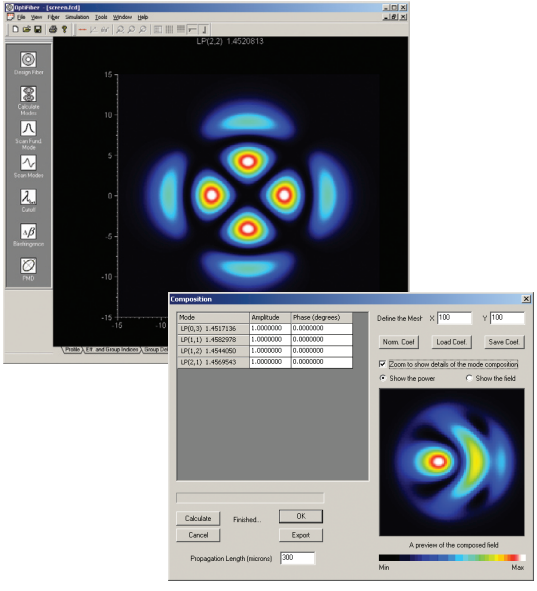


OVERVIEW

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 influence important linear and non-linear phenomena. OptiFiber uses numerical mode solvers and other models specialized to fibers for calculating dispersion, losses, birefringence, and PMD.

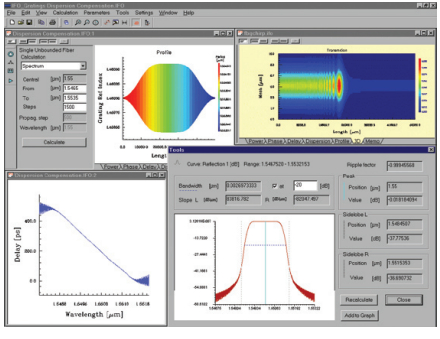
KEY FEATURES AND APPLICATIONS

- 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 flattened or shifted fibers
- Multimode fiber design, such as 50/125 µm and 62.5/125 µm 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



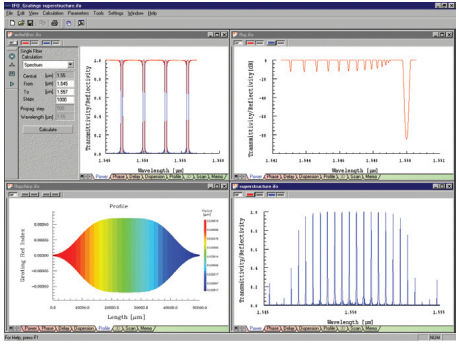
OVERVIEW

Emerging as a de facto standard over the last decade, OptiGrating has delivered powerful and user-friendly design software for modeling integrated and fiber optic 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 optic 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

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