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 & flexibility facilitates efficient & effective photonic designs."

Dr. Govind P. Agrawal,

Professor,

Institute of Optics, University of Rochester and author

of Fiber-Optics Communications Systems
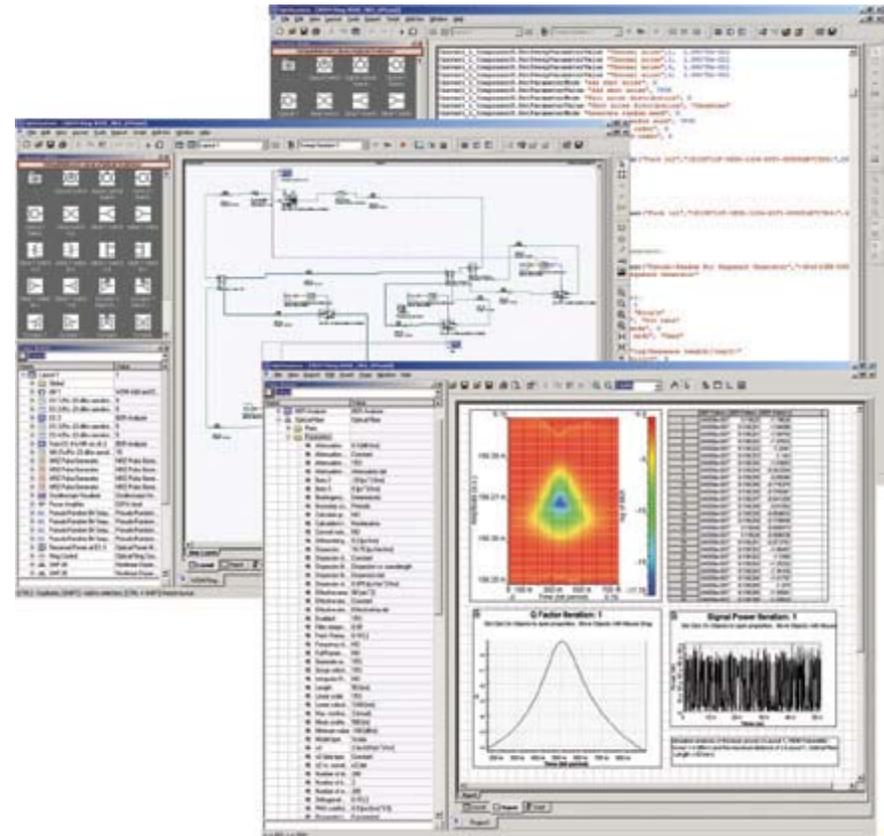
KEY FEATURES AND FUNCTIONALITY

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 level: OptiAmplifier, 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, 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 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.

NEW FEATURES IN OPTISYSTEM

The latest version of OptiSystem features a number of requested enhancements to address the design of passive optic network (PON) based FTTx, optical wireless communication (OWC), and radio over fiber systems (ROF).

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.
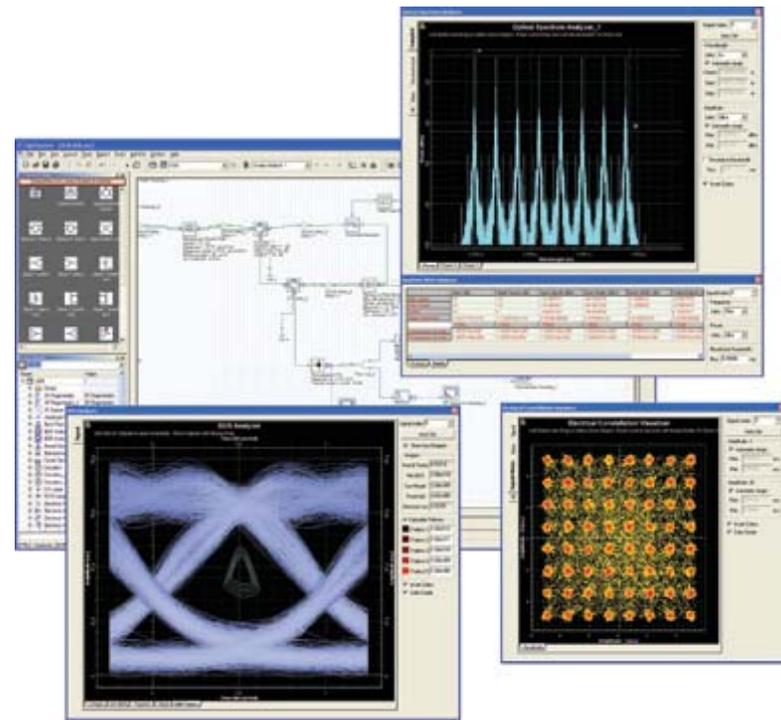
MORE NEW FEATURES IN OPTISYSTEM

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.

STAND ALONE DESIGN ENVIRONMENTS

In an effort to provide a flexible licensingIn an effort to provide a flexible licensing structure, Optiwave now offers the Amplifier and Multimode Editions of OptiSystem as stand alone design environments for users.

OptiSystem Amplifier Edition – Optical Fiber Amplifier & Laser Design Software

A pioneering and industry leading application, OptiSystem Amplifier Edition can improve design engineer's productivity, reduce risk, and lower overall costs related to design of optical amplifiers. The Amplifier Edition of OptiSystem assists the user in determining the tradeoff between EDFAs, EYDFs, EYDWs, YDFs, SOAs and Raman amplifiers cost and performance by calculating how metrics such as minimum output power, maximum noise figure, maximum gain ripple, and minimum pump power depend on device specifications such as pump wavelength range, passive component losses, component costs and much more. The component library includes single or double-clad fibers, static and dynamic amplifiers.

Specific applications include:

• Single and multi-stage EDFA design for CATV or WDM networks

• Reflective, split-band and bi-directional amplifiers

• Optically gain-clamped amplifiers

• Linear, nonlinear and ring fiber lasers

• Raman and Hybrid Raman/EDFA simulations

• ASE broadband sources

• Amplified System BER and link budget calculations

• Gain-flattening filter calculations
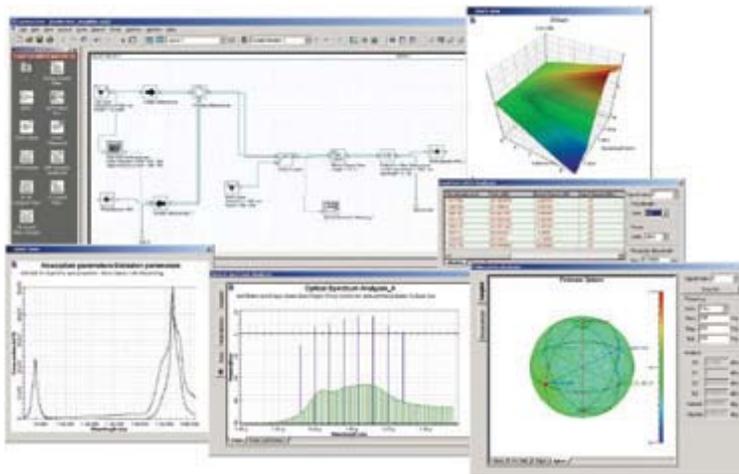
OptiSystem Multimode Edition – Multimode Optical Communication System Design Software

OptiSystem Multimode Edition allows the design, analysis and simulation of multimode fiber communication systems. By temporal and spatial propagation of signals, the Multimode Edition of OptiSystem can handle system-level analysis of communication technologies, including 10 GB Ethernet.

Specific features include:

• A library of multimode lasers and transmitters that generate transverse output fields with different profiles, including Laguerre-Gaussian and Hermite-Gaussian profiles.

• Multimode fiber models, including Parabolic-Index and Measured-Index profile.

• Advanced mode-solvers allow for the calculation of coupling coefficients and modal delays for different fiber profiles.

• Integration with OptiFiber that allows the users to

design fibers and import the refractive index profile into OptiSystem.

- Spatial couplers that allow for simulation of the rotation, shifts and tilts between different components, e.g. laser-fiber coupling.

- A library of multimode photodetectors and receivers that include the effects of losses due to optical misalignments.

- Lenses and aperture components that allow for manipulating the special distribution of optical signals.

- Encircled Flux Analyzer that allows for calculating Average Radial Intensity and Encircled Flux.

- Spatial Visualizer that displays different 3D graphs used for analysis of the spatial modes: Individual, weightened and the sum of all modes for each polarization.

- Differential Mode Delay Analyzer that transmits and

receives optical pulses, automatically introduces radial offsets between transmitter and fiber, allowing for analysis of Differential Mode Delay and Pulse Width versus radial offset.

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 PHOTONICS SYSTEMS INC*
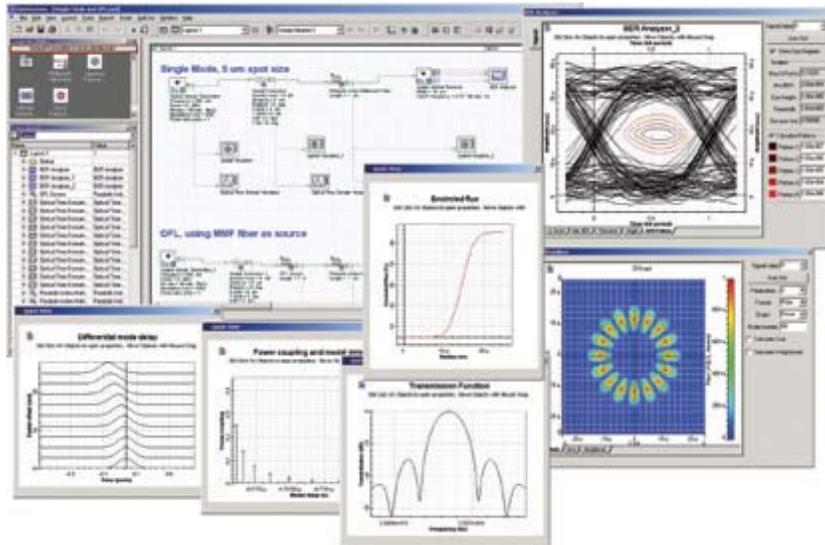
Opti*Performer*

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.
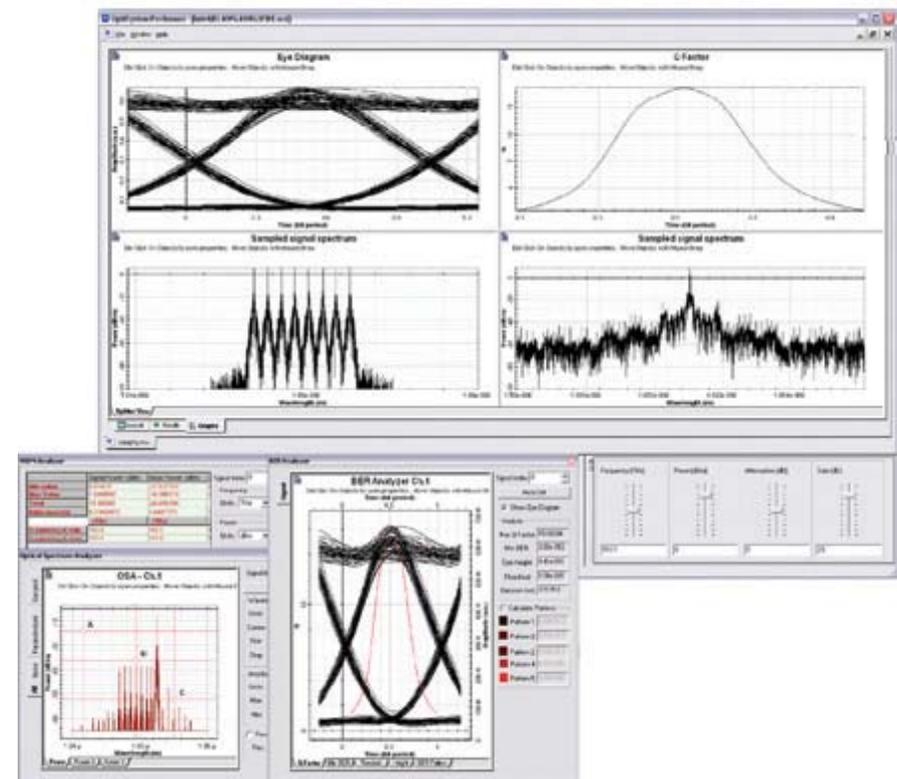
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