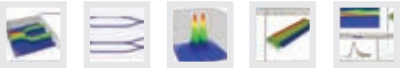
Opti*BPM*

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

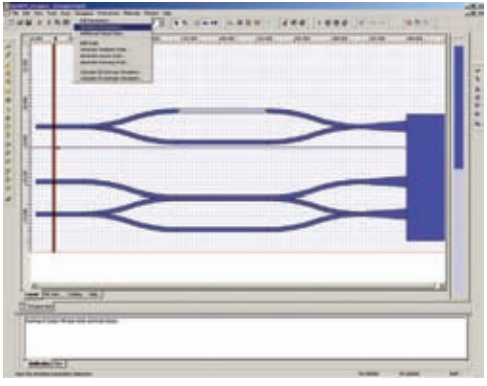
OptiBPM's integrated environment allows channel, fiber, and diffused waveguides to be combined on a single layout. A simple menu selection allows a layout to be simulated with either the 2D or 3D simulation engines, and simulations can be started at any propagation position using the new input plane 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.

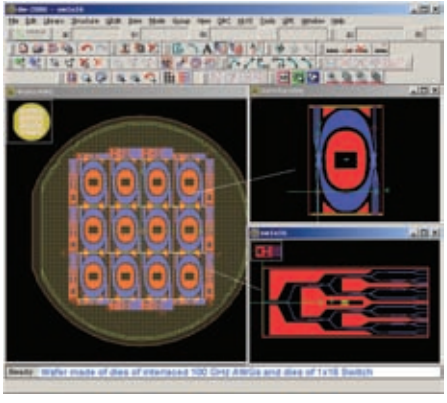
Improved Handling of Waveguide Geometry

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.