FemSIM

FemSIM is a generalized mode solver based on the Finite Element Method (FEM) that can calculate any number of transverse or cavity modes of an arbitrary structure on a non-uniform mesh. FemSIM employs a full-vector implementation and has been enhanced with many features to compute complex modes. The tool is flexible and extendable to a wide range of problems such as high index contract, plasmonic, and photonic bandgap based waveguides.

Benefits

- Advanced implementation of the FEM algorithm allows for a wide range of simulation and analysis capabilities for different types of devices.
- Can be used in conjunction with other RSoft tools to solve for modes and then propagate them through a device.
- Fully integrated into the RSoft CAD Environment (page 6).

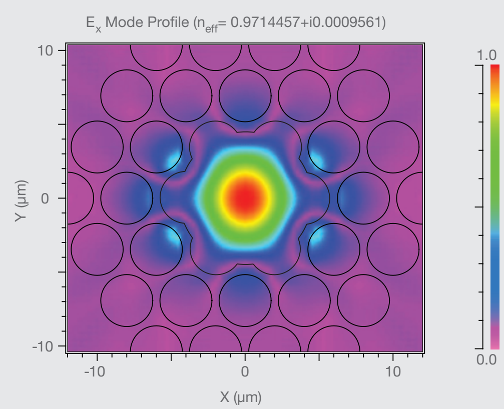
Applications

FemSIM has applications for mode solving to a wide range of integrated and nano-optic devices including, but not limited to:

- Structures with arbitrary profiles, including those with curved or uncommon shapes
- Structures with high index contrast and/or small feature sizes
- Air or solid core photonic fibers
- Lossy structures
- Silicon-based devices such as SOIs
- Polarization rotators
- Plasmonic waveguides
- Laser and PBG defect cavities

Featured Application

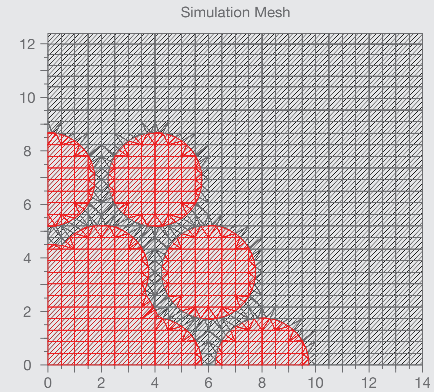
Computed mode profile for an aircore photonic crystal fiber. Symmetric boundary conditions were used in the calculation to provide a speedy solution. The simulation mesh can be seen in the following figures.



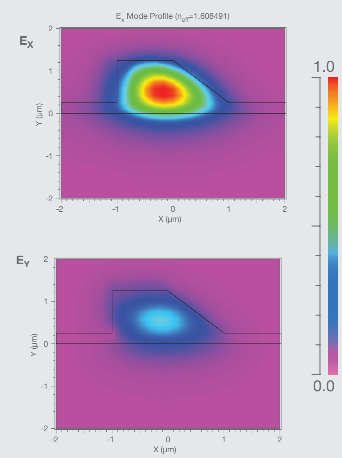
Features

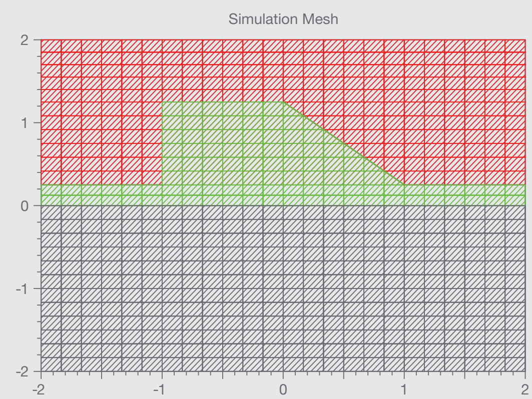
- Full-vector analysis for both Cartesian (1D, 2D) and cylindrical (azimuthally symmetric) structures.
- Increased performance through multi-threading on computers with multiple cores/CPUs.
- Accommodates complex index for lossy materials and high index contrast profiles.
- Robust meshing scheme that conforms to the index profile using hybrid triangular and rectangular mesh elements.
- First and second order elements used to avoid spurious modes.
- PML and symmetric/anti-symmetric boundary conditions.
- Determination of propagating, leaky, and cavity modes.
- Higher-order modes can be found with minimal additional computational expense.
- Bending modes can be computed.
- Computation of dispersion diagrams.
- Output information includes field profiles, propagation constants, overlap integrals, confinement factors, and diagnostics.
- Automated parametric studies and design optimization using MOST (page 24).

SEE PAGE 42 FOR SYSTEM REQUIREMENTS



Simulation mesh for aircore photonic crystal fiber.





Simulation mesh for a rib waveguide with a tilted facet with a highly hybrid polarization; both Ex and Ey components of the mode are shown.