Opto-Solver

SemiVi LLC, Switzerland.

Salient features - FDTD solver

The FDTD solver calculates time evolution of electromagnetic waves using finite-difference-time-domain method.

Salient features –

- Materials with wavelength dependent real and imaginary permittivity,
- Dispersive material models – Drude, Debye, Lorentz, and Kerr models.
- Use plane-wave source with uniform beam, Gaussian beam, or mode-beam, also dipole source.
- Apply BCs – reflective, periodic (+ oblique incidence), PML
- *built-in hardware acceleration enabled.*

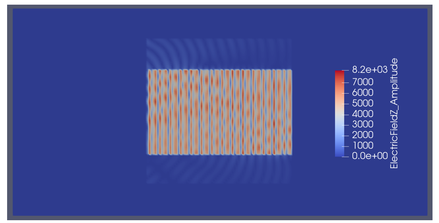
Easy-to-use Config file

- Include a new device structure.
- Define the source window.
- Apply specific boundary conditions.
- Set solver parameters.

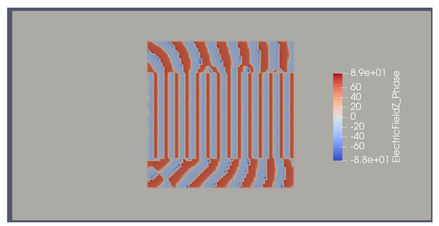
```
File: { Device = "fdtdSiWG_str.cfg";}

Solver: { MaximumTime = 15E-14; }

Source*left: {
  Type = "PlaneWave";
  BeamShape = "ModeBeam";
  Position: ([-0.6, -0.2, 0.], [-0.6, 0.2, 0.]);}

Boundary*xbdr: { Axis = ["Xmin", "Xmax"];
  Model = "CPML"; PMLLayers = 20.;}

Boundary*ybdr: {
  Axis = [ "Ymin", "Ymax", "Zmin", "Zmax"];
  Model = "CPML"; PMLLayers = 20.; }
```

Results Visualization

- `Pointsensor`: Saves temporal data at given point in a csv file.
- `Movie`: Saves temporal data at the cross-section as a movie.
- `TimeAverage`:Stores temporal average of the data.
- `PhaseCalculator`: Calculates magnitude and phase of the data at a time-point. Also, saves an *xdmf* script for visualization in *paraview*.
- `Detector`: Checks if the given quantity has stabilized over time. When yes, stops the simulation.
- Saves an *xdmf* script for visualization in *paraview*.



(a) Magnitude of Electric Field



(b) Phase of Electric Field

Modeling dispersive regions

- Dispersive materials are modeled by "Auxiliary Differential Equation" method.

```
Dispersive*DispersiveRegSi: {
  ...
  PoleFreq = [2.31E15, 2.18E15, 2.08E15];
  DampFact = [5.5E12, 4.353E12, 10.88E12]; }
```

Salient features - BPM solver

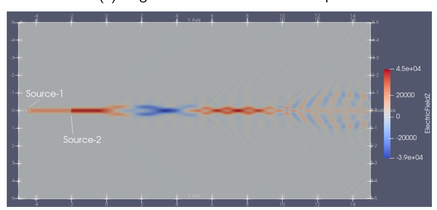
The BPM solver calculates spatially varying envelopes (SVEs) of electric field and magnetic flux along the waveguide propagation direction.

- Materials with constant / wavelength dependent real and imaginary permittivity.
- *Scalar* or *vectorial* mode-equation can be selected.
- Bi-directional BPM solver supported (experimental basis).
- Supports both 2D and 3D structures.

Results Visualization

- The solver creates an *xdmf* file for visualization in *paraview*.

(c) Magnitude of electric field envelope



(d) SVE of E_z

License Purchase

Send the organization details along with –

- Node-locked licenses: mac-id of the machine.
- Server licenses: mac-id of the server.

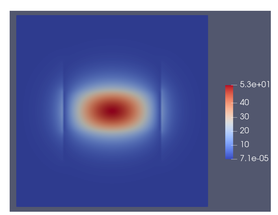
Salient features - Mode Solver

The Mode solver calculates optical modes of 2D device structure *or* 2D/1D cross-section of 3D/2D device structures.

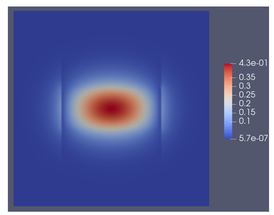
- Materials with constant / wavelength dependent real and complex permittivity.
- *Scalar* or *vectorial* mode-equation can be selected.
- *power method* or *ARPAK routines* used for mode calculation.
- Calculates multiple modes near the *effective index*.
- Stores normalized electric and magnetic field vectors in hdf file + creates an *xdmf* file for visualization in *paraview*.
- Supports reflective BC at the boundaries

Results Visualization

- Stores normalized electric and magnetic field vectors in hdf file + creates an *xdmf* file for visualization in *paraview*.



(e) Normalized mode E_y



(f) Normalized mode H_z

Contact Information

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