

The HADES3D Electromagnetic Solver Family

- With a Focus on Nano-Optics -

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Nano-fabrication technology has rapidly advanced in the last few years. In particular, the realization of structures with dimensions on the order of a few nanometers has definitely appeared on the horizon, recently. This offers unprecedented opportunities to study functionalized, plasmonic devices for a wide span of application areas. In tandem with these applications goes the need to theoretically predict and optimize specific structures and devices *before* their fabrication. With this need in mind, a computational electrodynamics solver family, HADES3D, has been developed with the prime capability to theoretically analyze, real-life, nano-optical structures. HADES3D contains a family of 3-dimensional, full-wave electrodynamic solvers. These solvers are capable to solve the most demanding problems in computational electromagnetics. They have been used for the emerging field of nano-meter sized optical structures and plasmonics. HADES3D offers both transient and frequency domain analysis which ever is better suited for the task at hand. HADES3D uses the proven finite element method and operates in 3-dimensional space. The solvers employ unstructured, tetrahedral grids to describe complex, curved geometry for real-world applications. A wealth of material models, including measured wavelength dependent data, enables precise modeling of any system. HADES3D solvers run on the laptop, on the desktop workstation, on distributed-memory parallel compute clusters and supercomputers. Thus, the solvers easily scale and grow with the size of your computational problems. Eventually, the size of electromagnetic problems analyzed are only limited by the available compute power. HADES3D is continuously developed and integrates the most advanced, accurate and latest electromagnetic techniques. The HADES 3D solver family runs on any reasonable Linux operating system, including the Mac OS X environment. Here, we present the HADES3D solver family and its application areas.

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