Product: SENTRI

SENTRI – Scalable Engineering Tools for RF Integration

What it is:

- Computer Aided Engineering Software for DoD Electromagnetic Applications
- Designed for High Accuracy – Full Wave (non-optical) Numerical Methods
  - Finite Elements
  - Boundary Integral
  - Harmonic Expansions
- Designed for Extensibility, Maintainability, and Flexibility
  - Not All Electromagnetic Applications are the same
  - Need for Specific and Tailored Methods for Unique Applications
- Designed to Run on Wide Range of Computers
  - from Engineering Workstations to High Performance Computers

CREATE-RF Requirement Summary

- **Antennas on Air, Sea, Ground, And Space Platforms**
- **Communication, Navigation, Surveillance, Target Recognition, Electronic Attack, Countermeasure, Etc.**

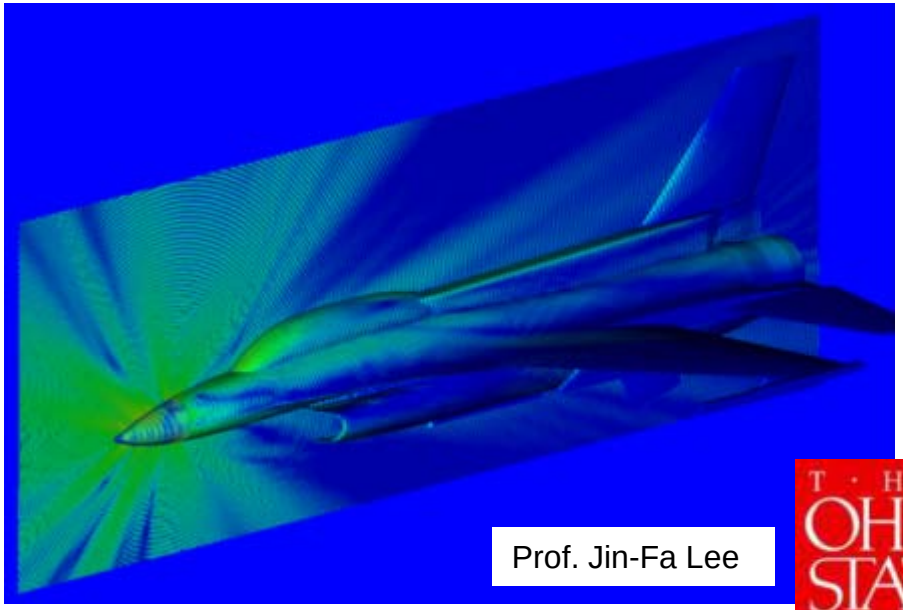





Computational Electromagnetics Applies to Almost All DoD Systems

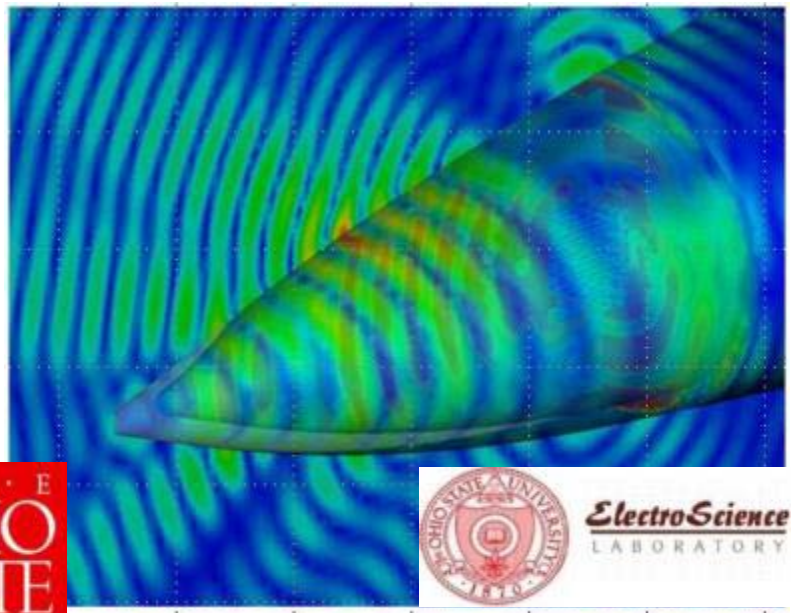
Challenge of Computational Electromagnetics

- Complex Geometries, Complex Material Application, Multi-Scale Geometries
- Computationally Expensive for Accurate Full-Wave Analysis
- Electromagnetic Phenomena (Singularities, Resonances, Wide-Band)



Prof. Jin-Fa Lee

THE OHIO STATE UNIVERSITY



ElectroScience LABORATORY

Development Approach

Product Roadmap

SENTRI at version 2.0

Antenna Modeling

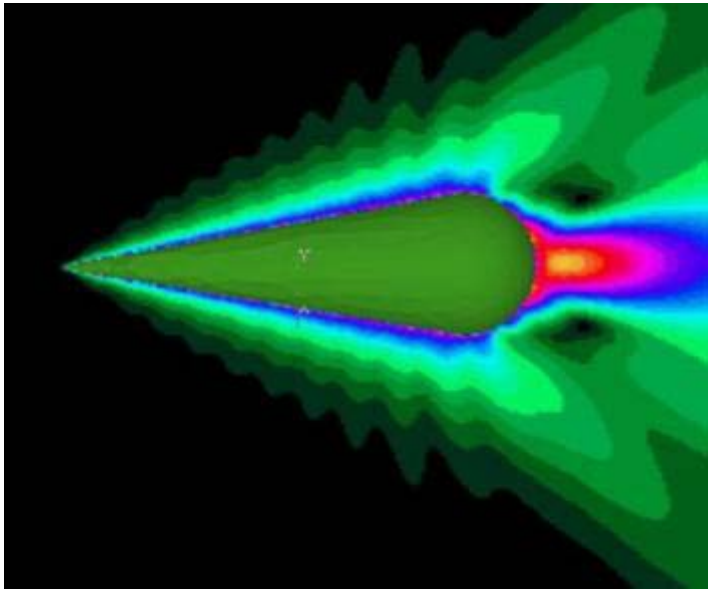
- Patch, Notch, Horn, Spirals (Applications: Radar, Communication, GPS)
- Phased Array Antennas
- Cavity Backed Antenna (Approximate In-Situ Analysis)

Periodic Structures

- Frequency Selective Surfaces
- Circuit Analog Absorbers
- Metamaterials
- Infrared Filters / Absorbers

Microwave Circuits

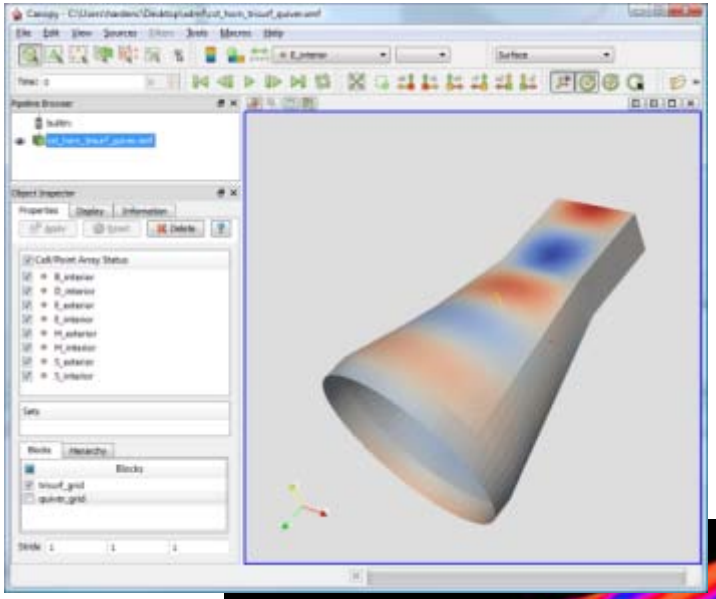
- Power Splitting
- Material Measurement
- Filters
- Circulators

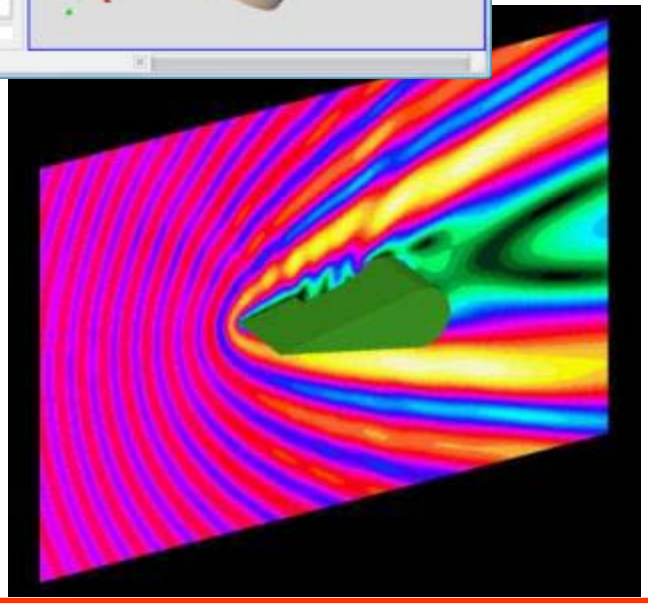


Future Releases of SENTRI

Full End-to-End Analysis System

- Graphical User Interface
- Material Database
- Visualization of Solutions
- Analysis Traceability
- Optimization





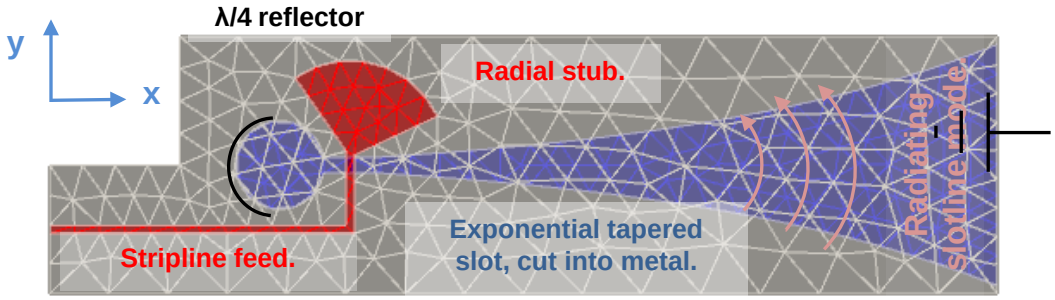
Programmable System

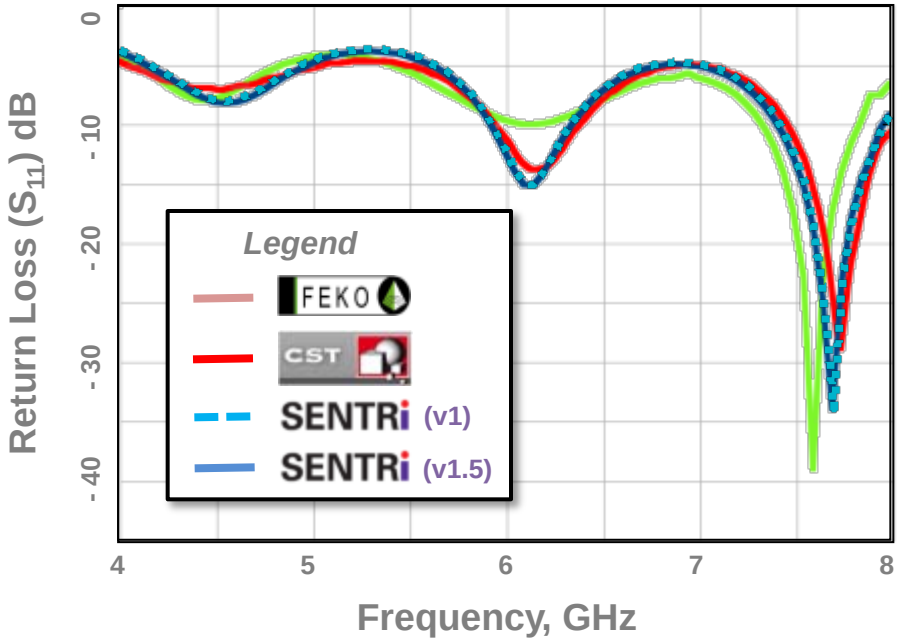
- Software Release as a Application Programming Interface for Further Tailoring by End User

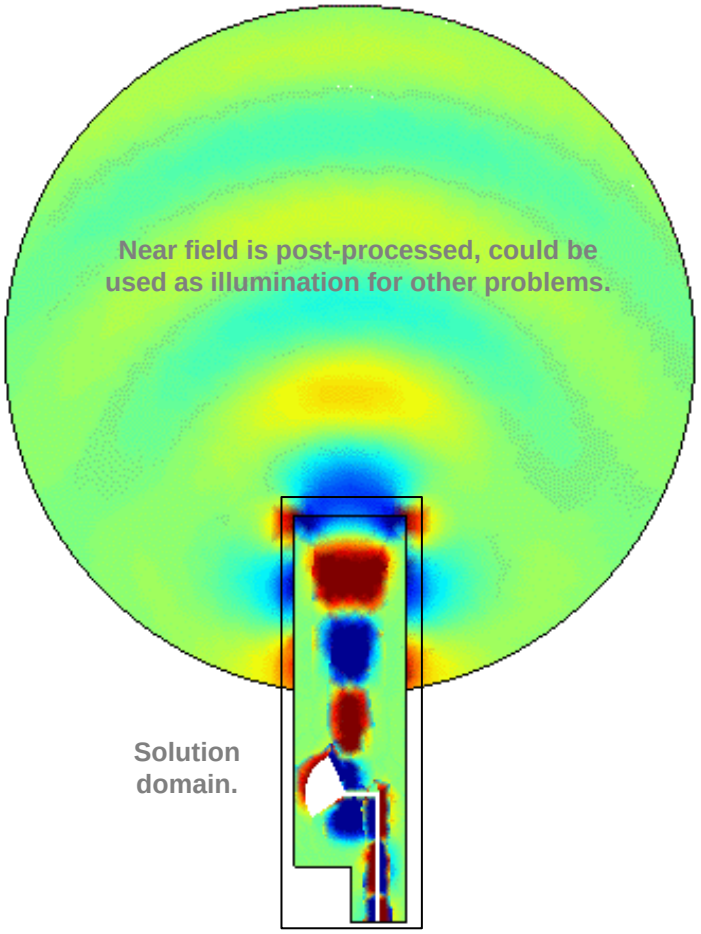
Application Examples

Printed Circuit Antennas

SENTRI vs. Commercial Codes





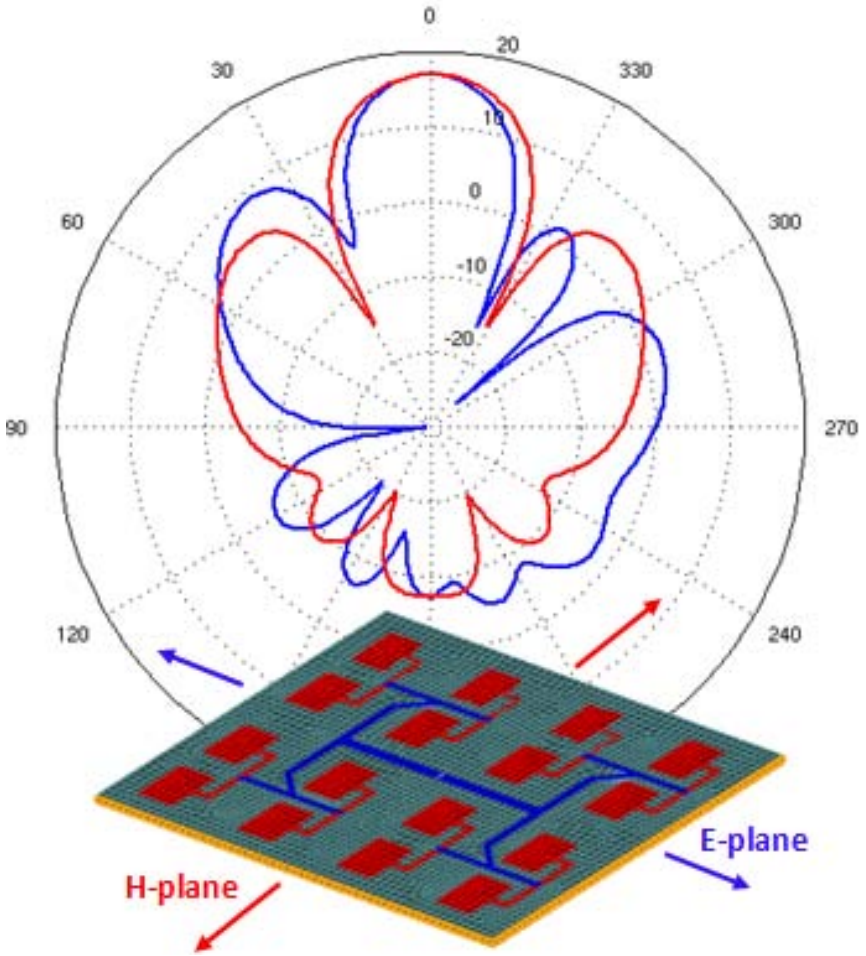


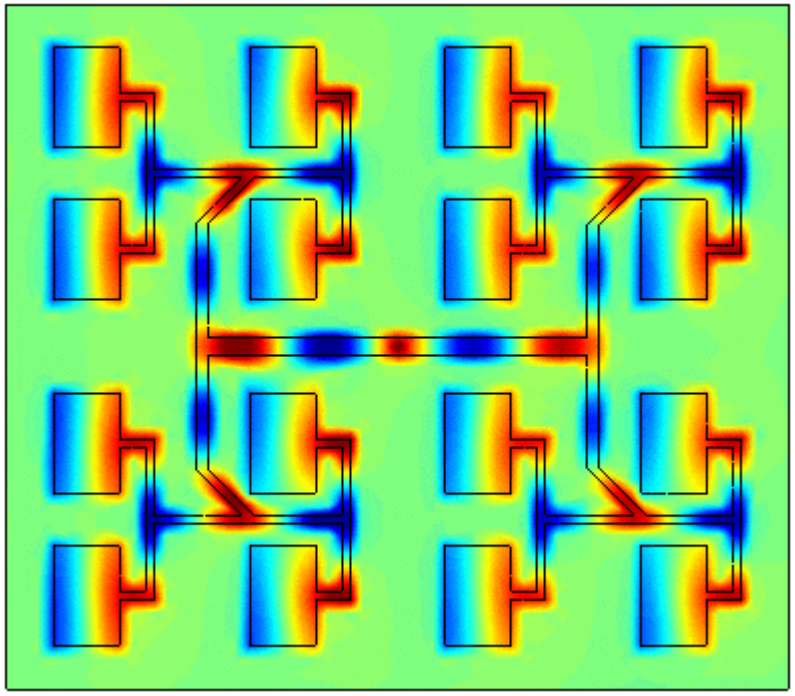
Successfully Benchmarked w/ Independent Software Vendor Tools

Application Examples

Antenna Patch Array

A large printed array is an antenna-type problem that also benefits.



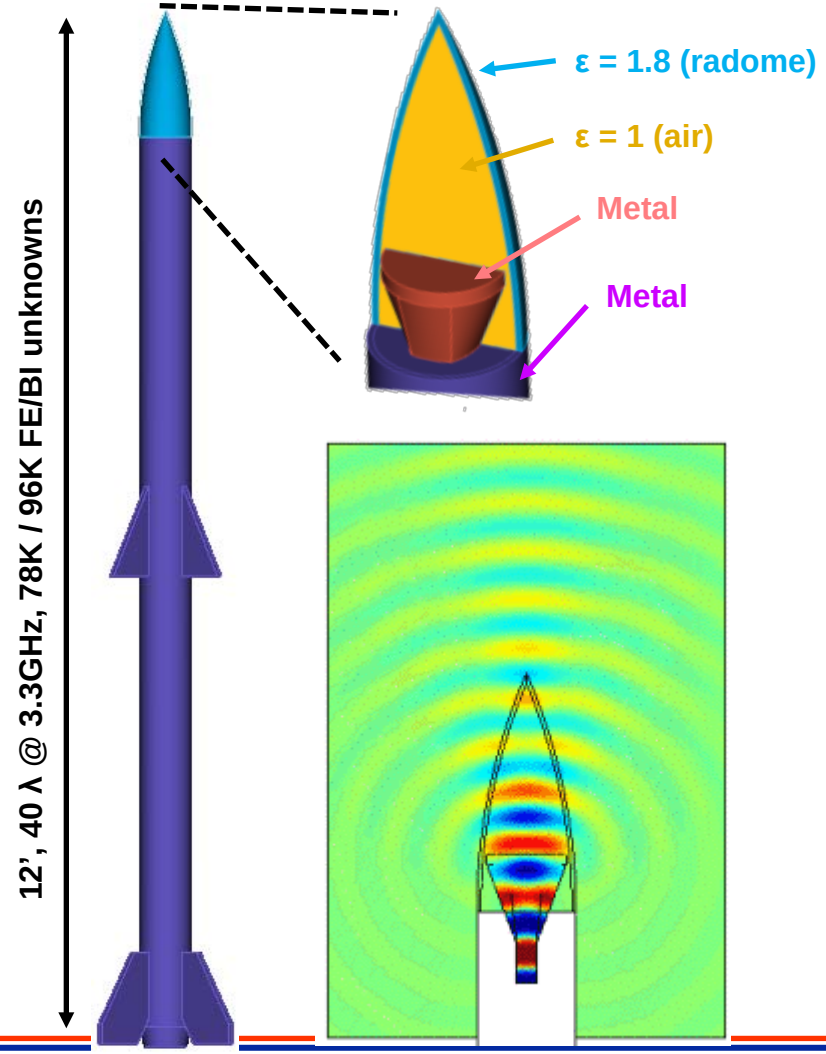


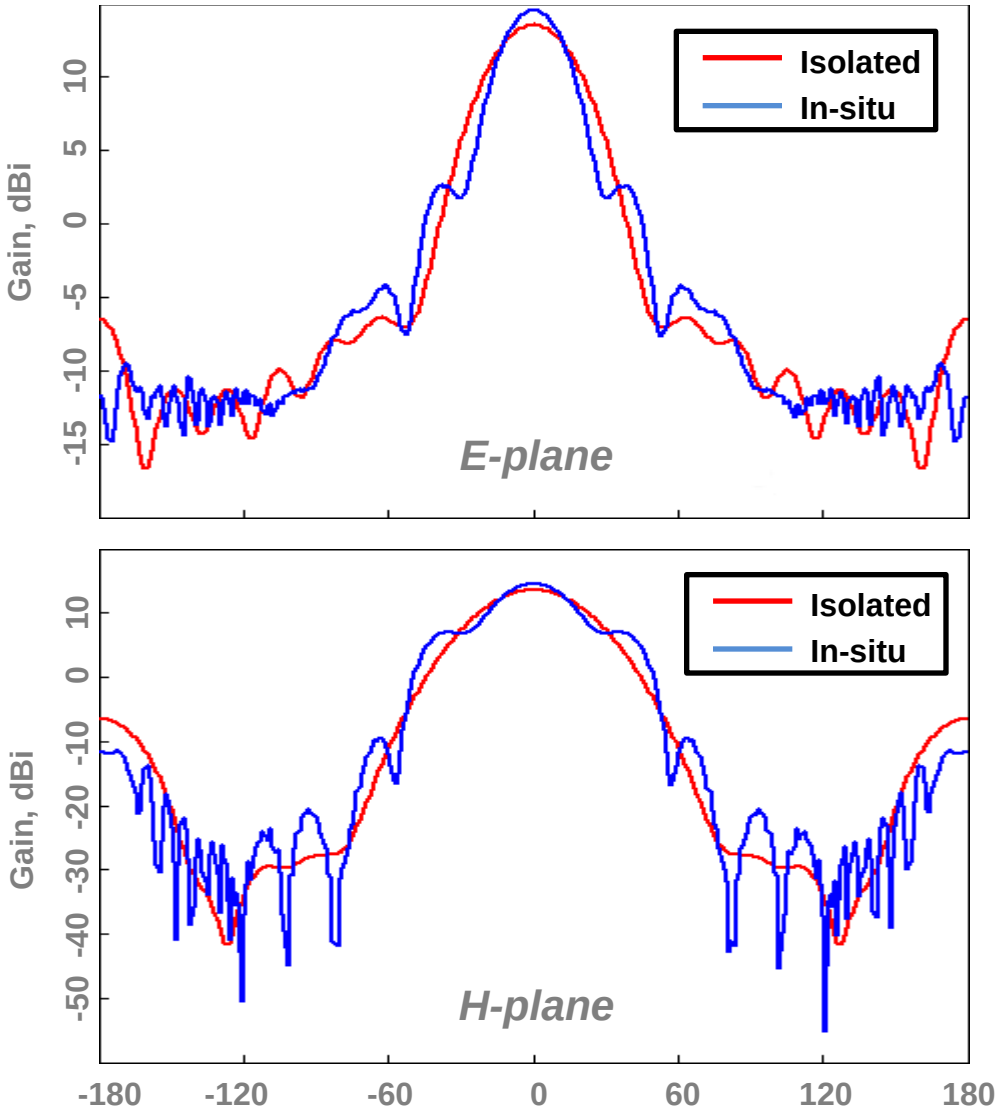
Gain (left) & field structure (right).

Application Examples

In-Situ Antenna Analysis

Lofted horn on notional missile.



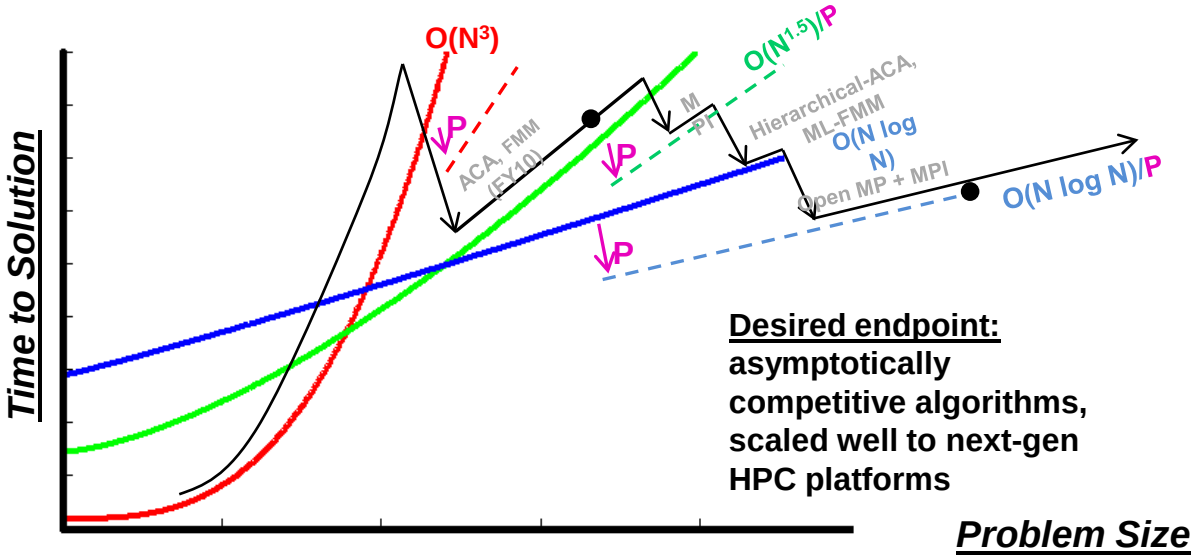


Analysis Scalability

Running Large, High Fidelity Models

Big Computers Not the Total Solution

Big Computers + Algorithms that Scale with Problem Size



Desired endpoint: asymptotically competitive algorithms, scaled well to next-gen HPC platforms