A Novel Time Domain Method for Characterizing Plasmonic Field Interactions

PROBLEM DESCRIPTION
Simulation of transient fields on plasmonic nanostructures

PROPOSED SOLUTION
Formulate and implement a time domain Poggio-Miller-Chan-Harrington-Wu-Tsai (PMCHWT) [1] integral equation solver
Advantages:
• Time domain, broad band analysis
• Requires only surface discretization (instead of the whole computation domain)
• Implicitly satisfies radiation condition
Challenges:
• Determination of Green function of dispersive media
• Temporal convolutions due to Green function of dispersive media

IMPACT
Potential to replace low-order, inaccurate, unstable finite difference time domain (FDTD) methods dominating all engineering fields

PMCHWT FORMULATION
Consider this generic problem

Scattered and incident fields are related to each other by boundary conditions to yield PMCHWT equation

Scattered fields are written in terms of equivalent surface current densities

Green function of the dispersive medium is obtained by fast relaxed vector fitting (FRVF) algorithm [2]

REFERENCES