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A Low-frequency FDTD Solver

Fast solver overcoming low-frequency breakdown for accurate EM design in comms and imaging.

Researchers at Purdue University have developed a rigorous and fast frequency-domain electromagnetic solver which is able to produce accurate solutions, even at low frequencies. A full-wave solution of Maxwell's equations has been known to break down at low frequencies (typically at or below tens of megahertz), especially in highly multiscale problems. This problem has been very hard to solve and can affect other time-domain methods since the root cause is finite machine precision; the required number of time steps for an explicit FDTD solver can exceed a few million in some cases. Implicit methods can theoretically allow for low frequencies but often suffer from accuracy degradation. The Purdue researchers' solution does not break down under low-frequency conditions and maintains greater accuracy compared to implicit FDTD solvers. This technology was validated but conducting numerical simulations of transient phenomena with arbitrarily low input frequencies. The solution generated by a state-of-the-art implicit and unconditionally stable FDTD solver was wrong due to low-frequency breakdown while the Purdue method completed in just 1.03 seconds and generated an accurate result consistent with the analytical solution. Potential applications include design and modelling of communication systems, medical imaging systems and other electronics

Advantages:

-Does not break down under low-frequency conditions

-Maintains greater occupancy computer to implicit FDTD solvers

Potential Applications:

-Design and modelling of communication systems

-Medical imaging

-Other electronics

TRL: 5

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Category

Semiconductors/IC Design & EDA Tools

Materials Science & Nanotechnology/Nanomaterial Characterization & Imaging Tools

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Intellectual Property:

Keywords: frequency domain EM solver,low frequency Maxwell equations,accurate multiscale EM modeling,communication system design tools,medical imaging electromagnetics,high precision FDTD alternative,fast frequency domain solver,low frequency electronics modeling,numerical EM accuracy improvement,advanced EM simulation software