

FAST ELECTROMAGNETIC SOLVER FOR CAVITY OPTIMIZATION PROBLEMS

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Abstract

In order to meet the design and budget constraints of next generation particle accelerators, individual components have to be optimized using numerical simulations. Among the optimizations are the geometric shape of RF cavities and the placement of coupler and dampers, requiring large numbers of simulations. It is therefore desirable to accelerate individual cavity simulations. Finite-Difference Time-Domain (FDTD) is a widely used algorithm for modeling electromagnetic fields. While being a time-domain algorithm, it can also be used to determine cavity modes and their frequencies. Weak scaling of parallel FDTD yields good results due to the algorithm locality, but the maximum speedup is determined by the usually small problem size. Graphics Processing Units (GPUs) offer a huge amount of processing power and memory bandwidth, well suited for accelerating FDTD simulations. We therefore developed an FDTD solver on GPUs and incorporated it into the plasma simulation code VORPAL. We will present GPU accelerated VORPAL simulations, provide speedup figures and address the effect of running these simulations in single precision.

**CONTRIBUTION NOT
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