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Modeling and Scalability Analysis for Single Pancake Charging Solenoid using both Direct and Iterative Solvers[1] MUHAMMAD MOHEBUJJAMAN, SYUN'ICHI SHIRAIWA, JOHN WRIGHT, Massachusetts Institute of Technology — We present a mathematical model for the charging simulation of a single pancake solenoid and propose its fully discrete backward-Euler scheme. The parallel implementation of the scheme is done in Petra-M, which is a physics layer built on the top of PyMFEM, a python wrapper for Modular FEM (MFEM) library. For the iterative solver, flexible inner-outer Krylov subspace approach is considered with FGMRES as the outer solver and GMRES as the inner solver. As a direct solver, we use Multifrontal Massively Parallel Sparse (MUMPS) direct solver. The scalability analysis is performed with the iterative and direct solvers for both single turn solenoid and T-1 (twenty turns magnet) models. We observe the iterative solver together with the Auxiliary Space Maxwell Solver (AMS) preconditioner outperforms over the direct solver in both cases.

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