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Parallelizing and Optimizing Simulations of Nonneutral Plasma Instabilities in a Malmberg-Penning Trap MELISSA POWELL, GRANT MASON, ROSS SPENCER, Brigham Young University — A Malmberg-Penning trap is a cylindrical apparatus which confines non-neutral plasma (electrons only) with an axial magnetic field and negative electric potentials on both ends. It is a simple system for studying basic plasma behavior, so simple that theory and experiment ought to agree. Theory predicts that a hollow plasma density profile is unstable, and experiments agree. However, the experimental growth rate of the m =1 diocotron mode of the instability is much larger than the theoretical growth rate, by a factor of around 2-4. We are collaborating with Travis Mitchell's experimental research group at the University of Delaware to find the cause for this discrepancy by recreating experimental conditions in our simulation. The growth rates of our simulation test cases have remained less than half the growth rates of Mitchell's experiments. I will report the results of parallelizing the simulation to increase the number of particles to 2 billion. We also optimize the code by converting the field solver from a two grid to a three grid multigrid solver in order to increase the number of grid points.

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