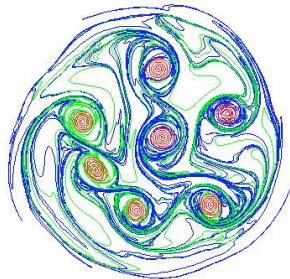# PARALLEL TREECODES & PARALLEL TIME INTEGRATORS

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We utilize a parallel boundary integral treecode (a grid free electrostatic *O(N log N)* field solver) and a parallel time integrator (based on integral defect correction) to solve a penning trap simulation. The benefits and overhead of implementing the parallel time integrator will be studied in this small-scale parallelization example.

The eventual goal of the group is to use these high order parallel time integrators in conjunction with a massively parallel gpu-treecode algorithm to fully realize the computing power that is presently available.

1. Christlieb, R. Krasny, J. Verboncoeur, J. Emhoff and I. Boyd, "Grid-Free Plasma Simulation techniques", IEEE Trans on Plasma Sci. (34), No. 2, pp 149-165.

2. A. Christlieb, C. Macdonald and B. Ong, "Parallel High Order Integrators", SIAM Sci. Comput., to appear.

3. T. Hamada, R. Yokota, K. Nitadori, T. Narumi, K. Yasuoka and M. Taiji, "42 TFlops Hierarchical N-body Simulations on GPUs, Super Computing 2009.