

Abstract Submitted
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Development of a 3D particle treecode for plasma simulations¹

BENJAMIN ONG, ANDREW CHRISTLIEB, Michigan State University, ROBERT KRASNY, University of Michigan — In this work we present a fully 3-D Boundary Integral Treecode (BIT). We apply the method to several classic problems such as sheath formation and 3D simulations of a Penning trap. In addition, we investigate the ability of the solver to naturally capture Coloumb scattering. A key point in the investigation is to understand the effect of different types of regularizations, and how to appropriately incorporate the regularization in the BIT framework. This work builds on substantial efforts in 1- and 2-D. [1] R. Krasny and K. Lindsay, *A particle method and adaptive treecode for vortex sheet motion in 3-D flow*, JCP, Vol. 172, No. 2, 879-907 [2] K. Matyash, R. Schneider, R. Sydora, and F. Taccogna, *Application of a Grid-Free Kinetic Model to the Collisionless Sheath*, Contrib. Plasma Phys, Vol. 48, No. 1-3, 116-120 (2008) [3] K. Cartwright and A. Christlieb, *Boundary Integral Corrected Particle in Cell*, SIAM Journal on Sci. Comput., submitted [4] A. Christlieb, R. Krasny, B. Ong and J. Qiu, *A Step Towards Addressing Temporal Multi-scale Problems in Plasma Physics*, in prep.

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