Tracking in Accelerators with Parallel Computing*

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PIC tracking of a particle beam in an accelerator can be done by using a "herd" of representative macroparticles randomly generated. Particles are propagated through the accelerator lattice using transfer maps, consisting of matrices in the six dimensional particle phase space, and higher order transformations. For high intensity beams, the interactions inside the beam and between macroparticles and accelerator chamber walls becomes important and in some case are the dominating effect, leading to the formation of halo. Computing can be very demanding and time consuming. Another case involving intensive computing is tracking in an accelerator while the optical properties of the machine itself are being varied. In both cases parallel computing is the only practical approach.

We will present results using a Pentium Cluster for two problems: (i) orbit tracking with the code ORBIT of the an intense proton beam in the Oak Ridge Spallation Neutron Source 1 GeV accumulator ring and in the Brookhaven AGS proton synchrotron, and (2) orbit and spin tracking with the code SPINK of the polarized proton beams in the Brookhaven RHIC collider .

*Work Supported by the US Department of Energy