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**Effects of Macroparticle Number on Electrostatic and Electromagnetic Space-Charge Models<sup>1</sup>** IAN ANDERSON, MARK HESS, CHONG SHIK PARK, Indiana University Cyclotron Facility — When simulating the physics of space-charge dominated beams using a macroparticle representation of the beam, it is essential to accurately compute the beam space-charge fields. Depending on the characteristic length and time scales associated with the space-charge fields for a particular beam system, one may find that electrostatic space-charge calculations may be appropriate, while in other regimes a full electromagnetic space-charge calculation may be necessary. In this paper, we investigate the accuracy of space-charge calculations for both the electrostatic and electromagnetic cases with the assumption of a free space boundary condition. Specifically, we look at the convergence of the electric and magnetic space-charge fields for an accelerating spherical bunch using both Coulomb's Law and Lienard-Wiechert formulations as a function of the macroparticle number and discuss its implications for modern beam space-charge simulations.

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Mark Hess  
Indiana University Cyclotron Facility

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