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A Smart Filtering Method for Space-Charge Dominated Beam Simulations[1] SEAN BARTZ, Xavier University and Indiana University, MARK HESS, Indiana University Cyclotron Facility — We present a "smart" filtering method that removes the small-wavelength noise in beam simulation programs which can occur due to numerical errors. This method utilizes Fourier transforms and a low-pass filtering scheme to remove noise from space-charge generated electric fields. In particular, for a uniform-density (beer can) beam distribution, we find the necessary amount of Fourier k-space for removing field errors while maintaining the electric field's maximum peak value and its full width at half maximum. The term "smart" refers to the method's applicability for general beam distributions which have equivalent root-mean-square sizes as the uniform-density case. We demonstrate the ability of the algorithm to filter the longitudinal and radial components of the electric field in both one dimension and two dimensions. This method has the potential to reduce computational run-time while maintaining a high level of accuracy, i.e. less than two percent field error.

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