Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Particle-In-Cell simulations of electron beam microbunching instability in three dimensions[1] CHENGKUN HUANG, Y. ZENG, M.D. MEYERS, S. YI, B.J. ALBRIGHT, T.J.T. KWAN, Los Alamos National Laboratory — Microbunching instability due to Coherent Synchrotron Radiation (CSR) in a magnetic chicane is one of the major effects that can degrade the electron beam quality in an X-ray Free Electron Laser. Self-consistent simulation using the Particle-In-Cell (PIC) method for the CSR fields of the beam and their effects on beam dynamics have been elusive due to the excessive dispersion error on the grid. We have implemented a high-order finite-volume PIC scheme that models the propagation of the CSR fields accurately. This new scheme is characterized and optimized through a detailed dispersion analysis. The CSR fields from our improved PIC calculation are compared to the extended CSR numerical model [1] based on the Lienard-Wiechert formula in 2D/3D. We also conduct beam dynamics simulation of the microbunching instability using our new PIC capability. Detailed self-consistent PIC simulations of the CSR fields and beam dynamics will be presented and discussed.

[1] C.-K. Huang et. al, Phys. Rev. STAB 16, 010701 (2013).

[1]Work supported by the U.S. Department of Energy through the LDRD program at Los Alamos National Laboratory.

Chengkun Huang
Los Alamos National Laboratory

Date submitted: 12 Jul 2013 Electronic form version 1.4