

HEP: Accelerator Modeling

Objective: Use INCITE resources to help design and optimize the electron beam for LBNL next-generation Free Electron Laser.

Implications: Numerically optimizing the beam lowers cost of design / operation and improves X-ray output, helping scientific discovery in physics, material science, chemistry and bioscience.

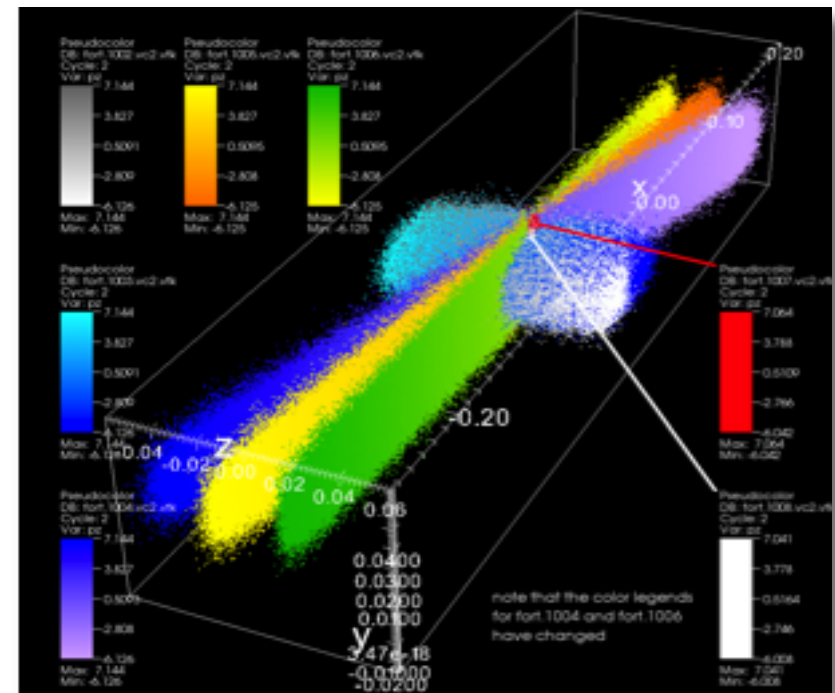
Accomplishments: Code includes self-consistent 3D space-charge effects, short-range geometry & longitudinal synchrotron radiation wakefields, and detailed RF acceleration / focusing.

- **Billion-particle** simulation required for details of high brightness electron beams subject to microbunching instability.
- **Key NERSC** visualization support.

NERSC:

- 400k hours used in 2009 (~50% of allocation).
- Uses IMPACT code, part of NERSC6 test suite.

PI: Ji Qiang (LBNL)



Visualization of an electron beam bending and changing orientation as it passes through a magnetic bunch compressor.