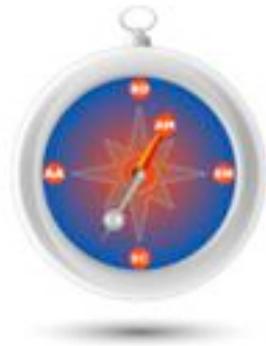


Plans and needs from BNL

Wolfram Fischer



COMPASS – SciDAC-2

Plans and needs from BNL

Three areas of interest with COMPASS:

1. Gun / rf simulations – J. Kewisch
2. Cooling simulations (now Coherent Electron Cooling) – V. Litvinenko
3. Beam-beam simulations – Y. Luo

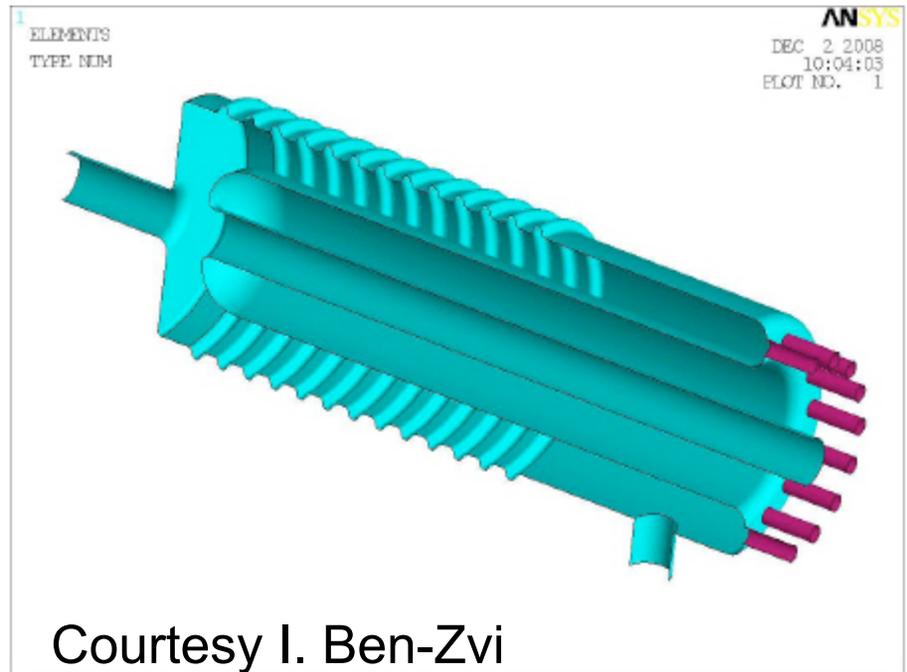
Gun / rf simulation – J. Kewisch

Last year (FY2009):

- Used NERSC to simulate multipacting at HOM damper in 56 MHz SC cavity under construction for RHIC
- Corrugated structure to suppress multipacting has radius of 10 mm, need about 1 mm mesh size
- Could only get 5 mm due to memory limitations

Current year (FY2010):

- Currently no specific request



Coherent Electron Cooling Simulations – V. Litvinenko

Last year (FY2009):

- Demonstration that it is possible to simulate electron density modulation due to single ion with PIC
- Differences between VORPAL and the analytical calculations of Wang & Blaskiewicz are less than 30% over a plasma period
- Δf electrostatic PIC algorithm in VORPAL does a better job at CEC modulator simulations than conventional PIC, with about 4x less run time
- CEC modulator simulations treat a small region within co-propagating electron and ion beams as 3D rectangular domain; boundary conditions that assume semi-infinite electron distribution; require ~2,000 processor hours for Δf electrostatic PIC and ~8,000 processor hours for conventional electrostatic PIC; running efficiently on 1,000 Franklin cores. Members of the BNL electron cooling group helped to plan the simulations and to interpret the results.
- BNL and Tech-X personnel collaborated to clarify some essential aspects of the friction force in conventional electron cooling systems [4].

[1] V.N. Litvinenko, Y.S. Derbenev, Phys. Rev. Lett. 102, 114801 (2009)

[2] G. Wang and M. Blaskiewicz, Phys. Rev. E 78, 026413 (2008)

[3] D.L. Bruhwiler, PAC'09, invited talk.

[4] A.V. Sobol, D.L. Bruhwiler, G.I. Bell, A. Fedotov and V. Litvinenko, submitted to New J. Phys.

Coherent Electron Cooling Simulations – V. Litvinenko

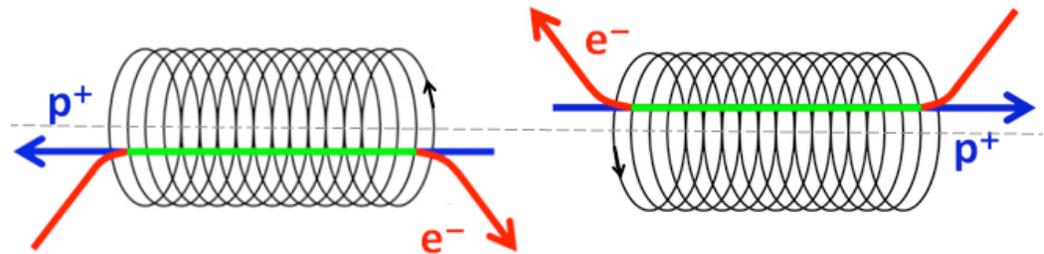
Current year (FY2010):

- Incorporate the 3-D FEL algorithms into the multi-processor CeC simulation by Tech-X and to compare it with the theory.
- Tech-X personal involved in this research includes are A.V. Sobol, D.L. Bruhwiler and G.I. Bell
- At BNL there are four people who are involved are Y. Hao, V.N. Litvinenko, G. Wang and S. Webb.

Beam-beam simulations – Y. Luo

Last year (FY2009):

- Have used all available CPU time on NERSC for beam-beam simulation in support of RHIC electron lens project
- J. Qiang performed strong-strong simulations for ring-ring version of electron-ion collider

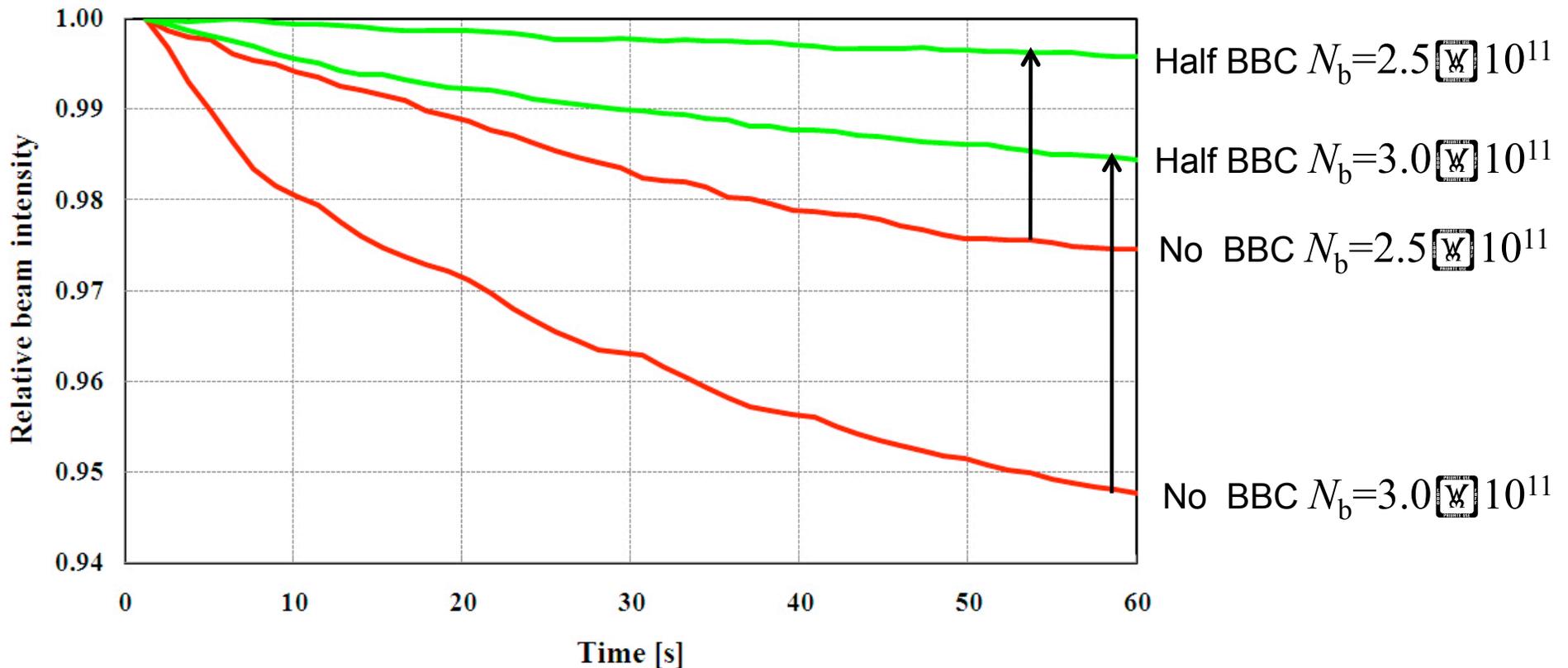


Current year (FY2010):

- Still need all available CPU time on NERSC for beam-beam simulation in support of RHIC electron lens project
 - Benchmarking of experimental data
 - Parameter scans to test sensitivity of implementation with respect to a number of technical parameters
- Likely to ask for limited number of strong-strong simulation for RHIC electron lens (J. Qiang)

Beam lifetime simulations – Y. Luo et al.

Weak-strong beam-beam simulations with detailed lattice (SixTrack)



[Conditions: nonlinear IR errors and arc sextupoles included, 4D BB at IP6 and IP8, zero length e-lens at IP10, core tunes at (0.67,0.67) and chromaticities of +1 for all cases, 250 GeV, 6.5k particles in Gaussian distribution]