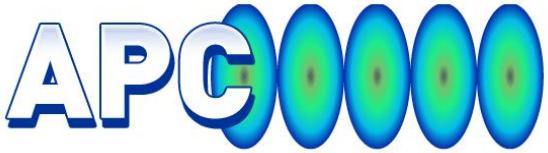


Advanced Accelerator Simulations

Computational Physics for Accelerators (CPA)

http://cd-amr.fnal.gov/aas/Advanced_Accelerator_Simulation.html

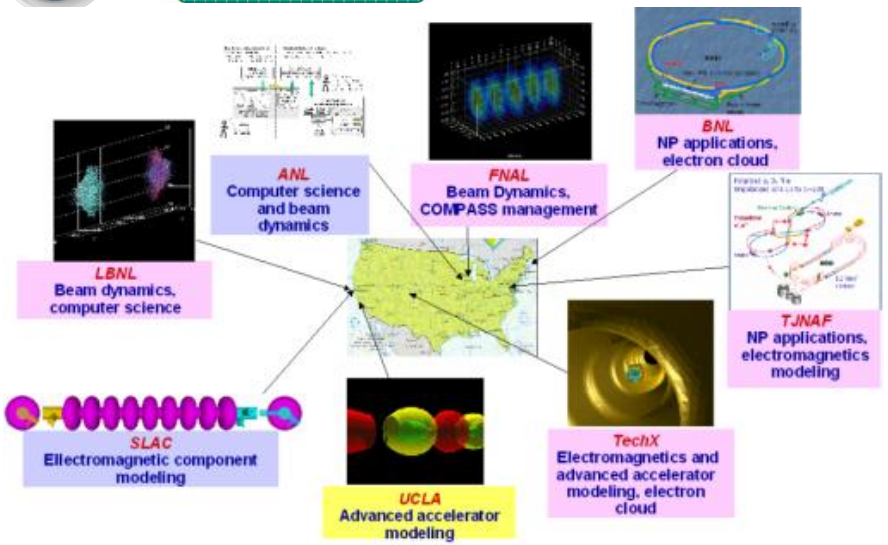
CPA: activities

- Development of HPC accelerator modeling tools and applications
  - Multi-particle dynamics
  - Scalable and efficient solvers
  - Management of ComPASS collaboration
- Development and support of CHEF
  - general framework applicable to problems relevant to future machine design.

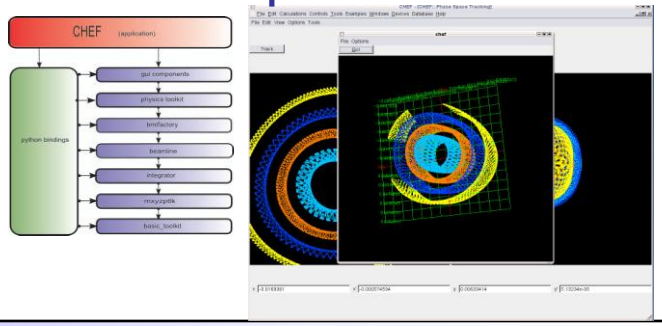
The SciDAC ComPASS collaboration

SciDAC Scientific Discovery through Advanced Computing

https://compass.fnal.gov/

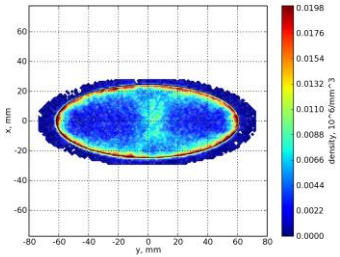


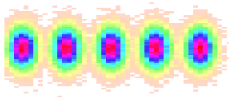
Collaborative Hierarchical Expandable Framework

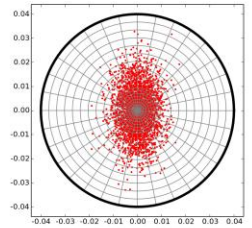


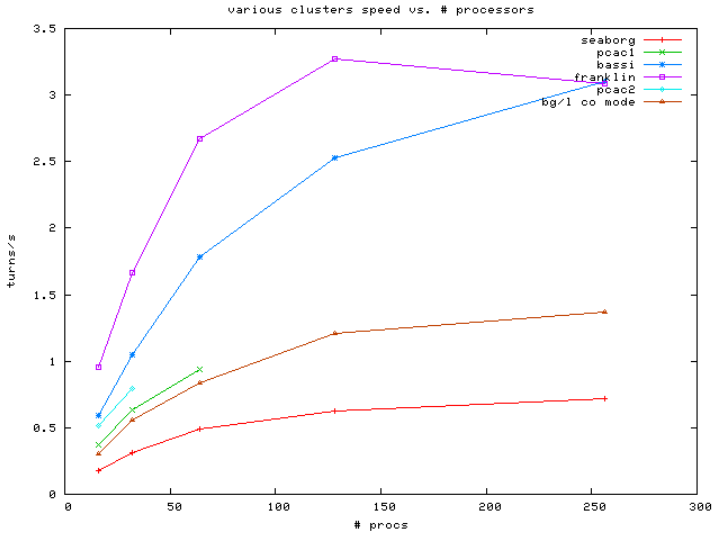
CPA: Plans for 2008

- Extend Synergia2, to enable multi-physics applications
  - Incorporate e-cloud prototype in Synergia
  - Incorporate impedance model and extend to multi-bunch
- Develop more efficient Poisson solvers
  - Better geometry description, smart grids
- Continue porting and optimizing our tools on HPC platforms



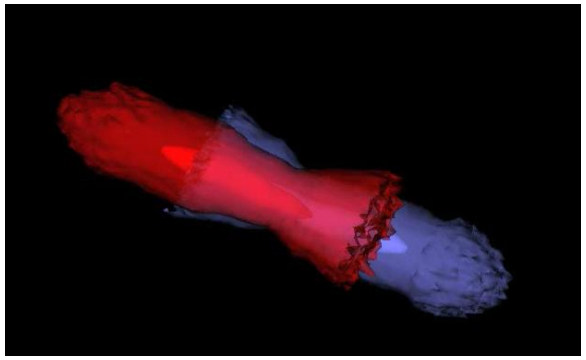


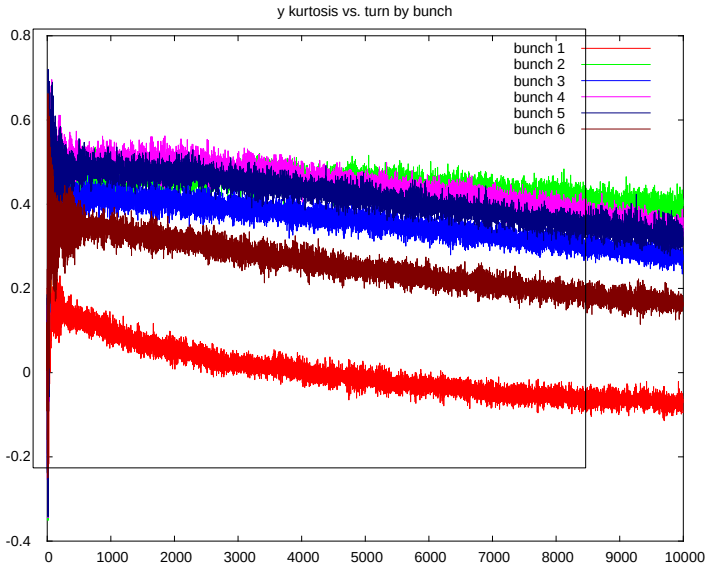




CPA: FY08 target applications

- Utilize mature 3D space-charge capabilities
  - Recycler (Project-X), Booster
- Conclude multi-bunch Tevatron simulations
  - Beam-beam 3D & impedance
- Begin MI e-cloud simulation
  - @ FNAL & within ComPASS
- Continue development of CHEF generic linac applications
- Explore possibilities for using CHEF in other APC activities
  - Ionization cooling, LHC





SciDAC codes for reference…

Beam Dynamics (3D, parallel)

- BeamBeam3D, IMPACT, ML/I, Synergia

Electromagnetics (3D, parallel)

- Omega3P, Tau3P, S3P, T3P, Track3P, VORPAL

Advanced Accelerators (3D, 2.5D, parallel)

- OSIRIS, VORPAL, QuickPIC, UPIC

CPA code, CPA co-developed code, CPA user expertise