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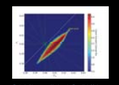
ComPASS

COMMUNITY PETASCALE PROJECT FOR ACCELERATOR SCIENCE AND SIMULATION

The ComPASS project is funded by the Offices of High Energy Physics (HEP), Nuclear Physics (NP), Basic Energy Sciences (BES) and the Office of Advanced Scientific Computing Research (ASCR). ComPASS is developing a comprehensive computational infrastructure for accelerator modeling and optimization. Tools developed under SciDAC1 are being enhanced with needed new capabilities and optimized for performance. This simulation suite contains a comprehensive set of interoperable components for beam dynamics, electromagnetics, and modeling of advanced acceleration concepts.



Period of beam oscillations in Fermilab Main Injector resulting from space charge effects

Facilities that are benefiting from this effort include a future lepton collider (ILC, CLIC), the LHC, the Tevatron complex, BELLA, and FACET. Also benefiting are Advanced Acceleration research and NP projects such as CEBAF and RHIC, a future electron-ion collider (e-RHIC and ELIC), and a future rare isotope facility.

Fermilab Main Injector

ACCELERATOR COMPUTATIONAL CAPABILITIES TO THE PETASCALE

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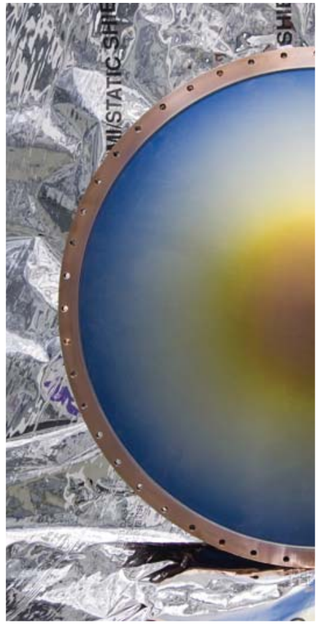

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ACCELERATOR MODELING

PARTICLE ACCELERATORS ARE CRITICAL TO SCIENTIFIC DISCOVERY IN THE UNITED STATES DOE PROGRAM AND INDEED THE WORLD

Accelerators are essential for advancing our understanding of the fundamental properties of matter. Secondarily, they advance research in materials science, chemistry, geosciences, and bioscience. Today's accelerator simulations utilize high-performance computing to model accelerators and their components for new machine design as well as existing machine optimization. These simulations typically require millions of field solves in combination with the propagation of hundreds of millions of particles.

Fermilab leads the SciDAC2 Community Petascale Project for Accelerator Science and Simulation (ComPASS) collaboration. This effort develops massively parallel simulation code that scales from hundreds to tens of thousands of processors in order to utilize leadership-class supercomputing resources to advance the state of accelerator science.

Superconducting Radio Frequency Cavities

ACCELERATOR COMPUTATIONAL CAPABILITIES TO THE PETASCALE

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OUTSIDE