FERMILAB • SLAC
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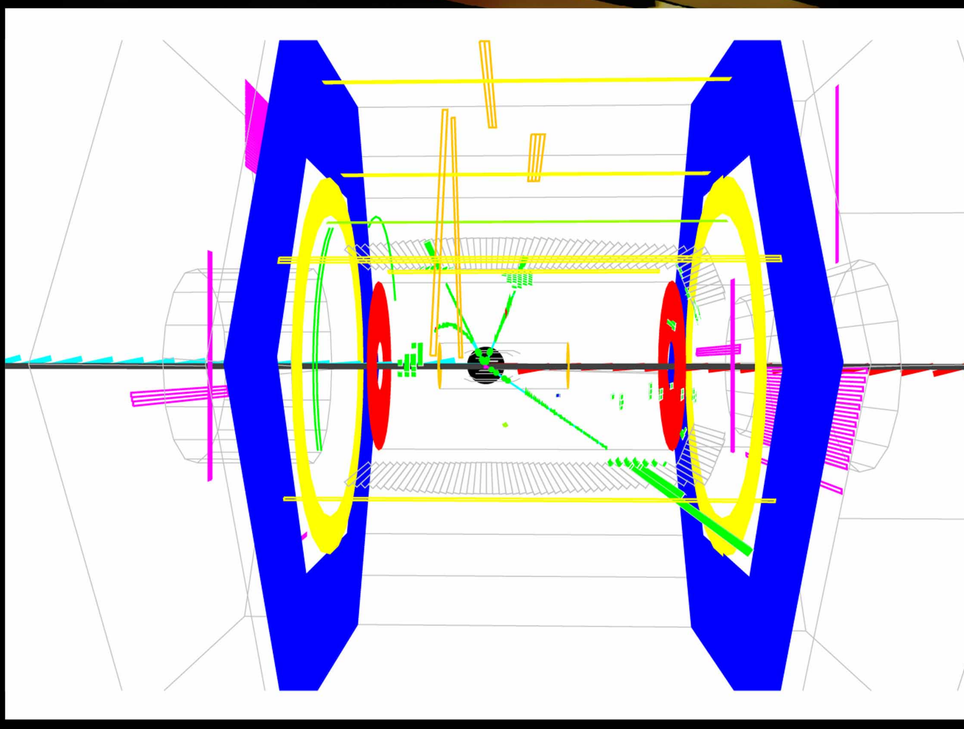


PARTICLES IN COLLISION

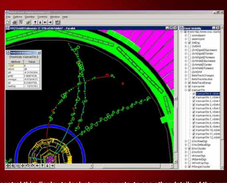
High Energy Particle Physics interactions recorded by the BABAR Detector at the Stanford Linear Accelerator Center's newest accelerator, PEP-II, appear on the display above. Such displays are used by physicists to debug and monitor their detectors and their data analysis software.

Accelerators such as SLAC's PEP-II or Fermilab's Tevatron collide bunches of particles onto bunches of antiparticles thousands or hundreds of thousands of times per second. At SLAC these particles are electrons and positrons (antielectrons); at Fermilab they are protons and antiprotons.

The particles themselves are so small that, though a bunch contains a tremendous number of particles in an area the size of a snippet of hair, the bunches generally pass clean through each other.
A small fraction of the time, a particle from one beam collides head on with a particle from the opposing beam. These collisions of tiny particles traveling at near the speed of light are what physicists call "events".

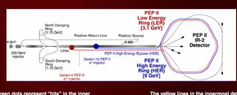
The energy released in the annihilation of the two original particles condenses into a new set of particles. As you can see if you look through many different events in these displays, no two "events" are exactly alike. They differ in the number and kind of particles created, and in the direction and speed of each individual particle. Statistical analysis of millions of such events gives insight into the laws of physics.

Event Display



You can control this display to look at more events, to see other details of the current event, or to zoom, rotate and otherwise transform the image. The right arrow icon at the top of the screen gets the next event. The left mouse button zooms the image. See the *help menu* for many more options.

The PEP-II Accelerator at SLAC



The green dots represent "hits" in the inner two subsystems of the BaBar Detector, a "stereo detector" made up of hundreds of specially designed silicon CCDs and a "drift chamber" containing thousands of charged wires strung through a volume of special gas. These CCDs and charged particles in the gas have passed through these CCDs or near these sense wires.

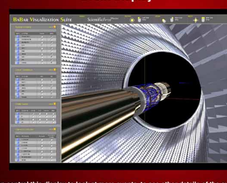
Software uses the hit positions to calculate the "tracks" of the charged particles that passed through the system. These tracks are shown here as blue lines. The detector is surrounded by a magnetic field which curves the charged particle tracks depending on track momentum. By studying the curvature of the reconstructed tracks, physicists determine the particle momentum.

The yellow lines in the innermost detector represent specific hit strips within the vertex detector's CCDs.

The square box shapes in the outer detector represent energy deposits seen by another specialized detector known as the "electromagnetic calorimeter." This calorimeter registers the energy of both charged and neutral particles. In this display, calorimeter deposits are shown in various colors depending on the deposited energy (from red for low energy to blue for high energy).

When momentum, energy and timing information from these and other detector subsystems are combined, hypotheses can be formed as to the particle identity.

Event Display



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