

Particle Detectors – Fact Sheet

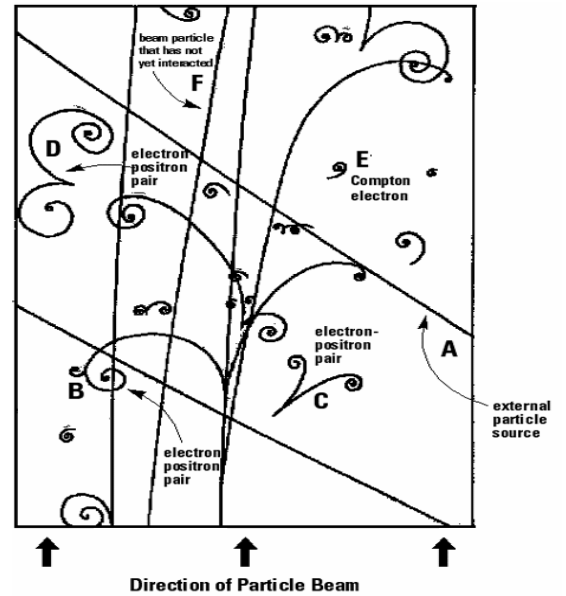
Background

Bubble chamber – chamber of superheated liquid in magnetic field

- Charged particle enters and leaves trail of bubbles
- Lorentz force – relates trajectory of particle to charge and direction of magnetic field in chamber

Famous particle detectors

- Fermilab – highest energy collider in operation – discovered bottom and top quarks
- Other places – CERN, Brookhaven National Lab, SLAC, DESY



Hermetic Detectors - Modern particle detectors composed of many specialized detectors.

Electromagnetic Calorimeter

- Measure energy of high energy photons and electrons.

Hadronic Calorimeter

- Measure energy of hadrons by measuring radiated light as particles pass through scintillators.

Time of Flight Detectors

- Used to determine the mass to charge ratio of a particle.

Semiconductor Tracker (SCT)

- Charged particles liberate electrons; electric current shows where it's been.

Cerenkov Detectors

- Can be used to measure the speed at which a particle is traveling.

Mysteries and the future/ What we have learned from particle detection

- $E=mc^2$ – LHC will be highest energy collider to help recreate conditions of Big Bang. The higher energy of this collider will be able to be converted to more massive particle (i.e. Higgs Boson).
- The Standard Model – consists of 12 matter particles (Quarks and Leptons) and 4 force carrier particles (gluon, photon, W and Z bosons).
- Neutrinos have no electric charge and hardly ever interact with other particles.
- Every particle has corresponding antiparticle. Antiparticles make up antimatter.
- The only force which currently has no force carrier particle is gravity.