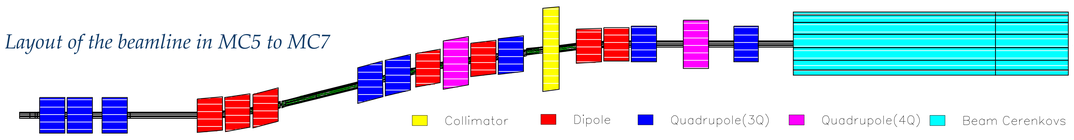
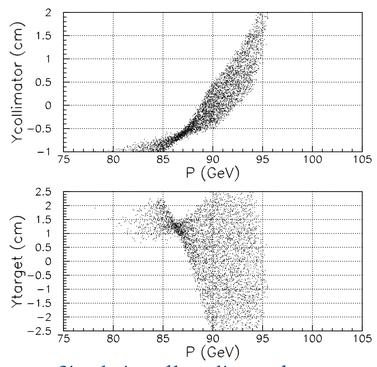
MIPP • Main Injector Particle Production Experiment • *(FNAL - E907)*

Beam

Layout of the beamline in MC5 to MC7



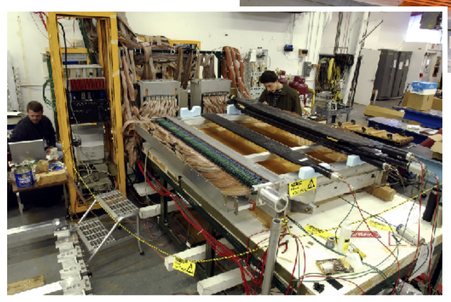
Protons from the Main Injector produce the MIPP secondary beam on a copper primary target in MC6. The beam line provides 5% Δp/p momentum selection with ~1% momentum resolution and low angular divergence in the beam Cherenkovs. Primary intensities of 10^8 to 10^{11} protons per second are needed, depending on secondary beam energy. Using a "double slow spill" mode in the booster, MIPP beam could be produced with little impact on other experiments. Installation of the MIPP beamline is in progress.



Simulation of beamline performance: Y vs P at the momentum collimator and the secondary target

Wire Chambers

Wire chambers will be located at various distances downstream of the target to complement the TPC tracking. Chambers from the E690 experiment are being refurbished completely.



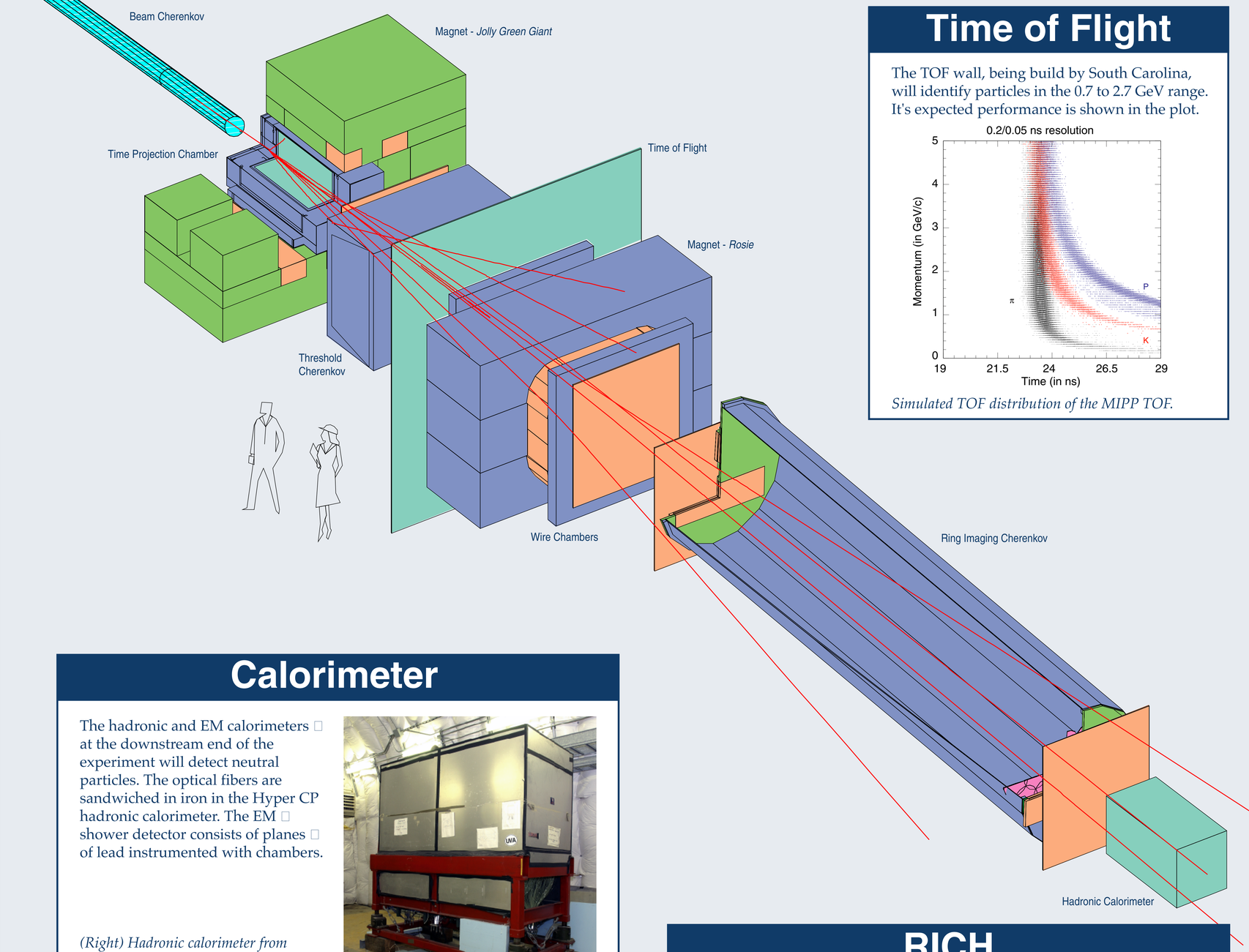
(Above) Dave Miller working on one of the E690 chambers.

(Left) Chamber undergoing cosmic ray test at Lab 6

Magnets

Two large aperture magnets, the Jolly Green Giant and Rosie, have been installed and tested in the experimental hall. The fieldmap of these magnets has been taken in December 2002 and January 2003 with high precision, using the Ziptrack.

Jolly Green Giant with TCP Support Stand



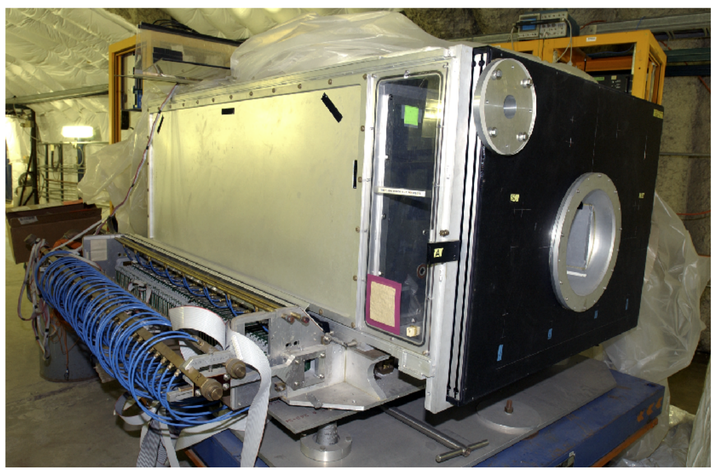
Time of Flight

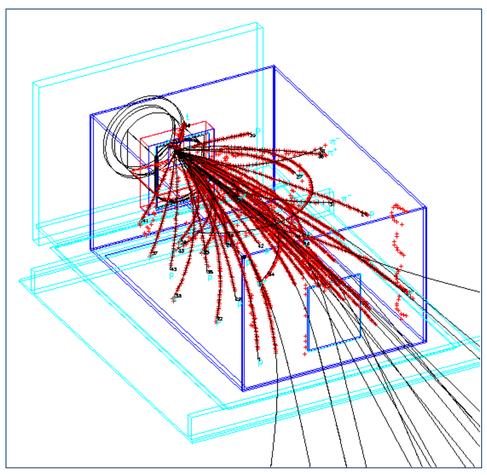
The TOF wall, being build by South Carolina, will identify particles in the 0.7 to 2.7 GeV range. It's expected performance is shown in the plot.

Simulated TOF distribution of the MIPP TOF.

Time Projection Chamber

The Time Projection Chamber (TPC) is the centerpiece of the experiment. It is located in the 0.7 T magnetic field of the Jolly Green Giant. Ionization tracks in the P10 gas that fills the 96x75x150cm^3 active volume can easily be reconstructed using about 4 million voxels. The TPC was originally built at Berkeley for the EOS experiment at the Bevalac and was used for two experiments at the Brookhaven AGS afterwards. While the electronics currently limits the event rate to 60 Hz, the TPC could operate at up to 60 kHz, limited by the 16 μsec drift time of ions through the chamber.





(Above) The EOS TPC in the Worm at MC7 in the meson area.

(Left) A Ni Cu collision at 1.9 AGeV. The red crosses are reconstructed ionization clusters, and the lines are reconstructed tracks.

Calorimeter

The hadronic and EM calorimeters at the downstream end of the experiment will detect neutral particles. The optical fibers are sandwiched in iron in the Hyper CP hadronic calorimeter. The EM shower detector consists of planes of lead instrumented with chambers.

(Right) Hadronic calorimeter from HyperCP.
(Below) Holger Meyer in front of prototype plane of the EM calorimeter.

RICH

The Ring Imaging Cherenkov Detector is a 10 meter long, CO_2 filled vessel. It will give MIPP 3σ separation of π/K to 80 GeV/c and K/p separation to 134 GeV/c. Particles are identified by the radius of the ring image generated by the particle's Cherenkov radiation.

Thermally isolated RICH vessel in MC7.

Fermilab