of the Americas (28 September 2009 - 04 October 2009) - Mozilla Firefox

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Wednesday, 30 September 2009

[45] **Introduction and Status of Fermilab test beam facility** — slides
by Dr. Erik RAMBERG (Fermi National Accelerator Laboratory)
(Trailblazer: 08:30 - 08:50)

[46] **Proposal for a SLAC end station test beam**
by John JAROS (SLAC)
(Trailblazer: 08:50 - 09:05)

[47] **Status of Asian test beam facilities**
by Katsushige KOTERA (Shinshu University, Faculty of Science,)
(Trailblazer: 09:05 - 09:20)

[48] **European test beam facilities**
by Dr. Erik RAMBERG (Fermi National Accelerator Laboratory)
(Trailblazer: 09:20 - 09:35)

[54] **ATF and Beamline Instrumentation Testing Plans** — slides
by Nobuhiro TERUNUMA (KEK)
(Trailblazer: 09:35 - 09:50)

Thursday, 01 October 2009

[50] **Vertex Detector Test Beam Issues** — slides
by carlos MARINAS (valencia)
(Trailblazer: 13:30 - 13:50)

[51] **Tracking Detector Plans for Test Beam**
by Dr. Ron SETTLES (Max-Planck-Institut fuer Physik)
(Trailblazer: 13:50 - 14:10)

[52] **ILC Calorimetry in Test Beams**
by Dr. Lei XIA (Argonne National Laboratory)
(Trailblazer: 14:10 - 14:30)

[53] **Muon Detector Test Beam Plans**
by Dr. Paul RUBINOV (Fermilab)
(Trailblazer: 14:30 - 14:50)

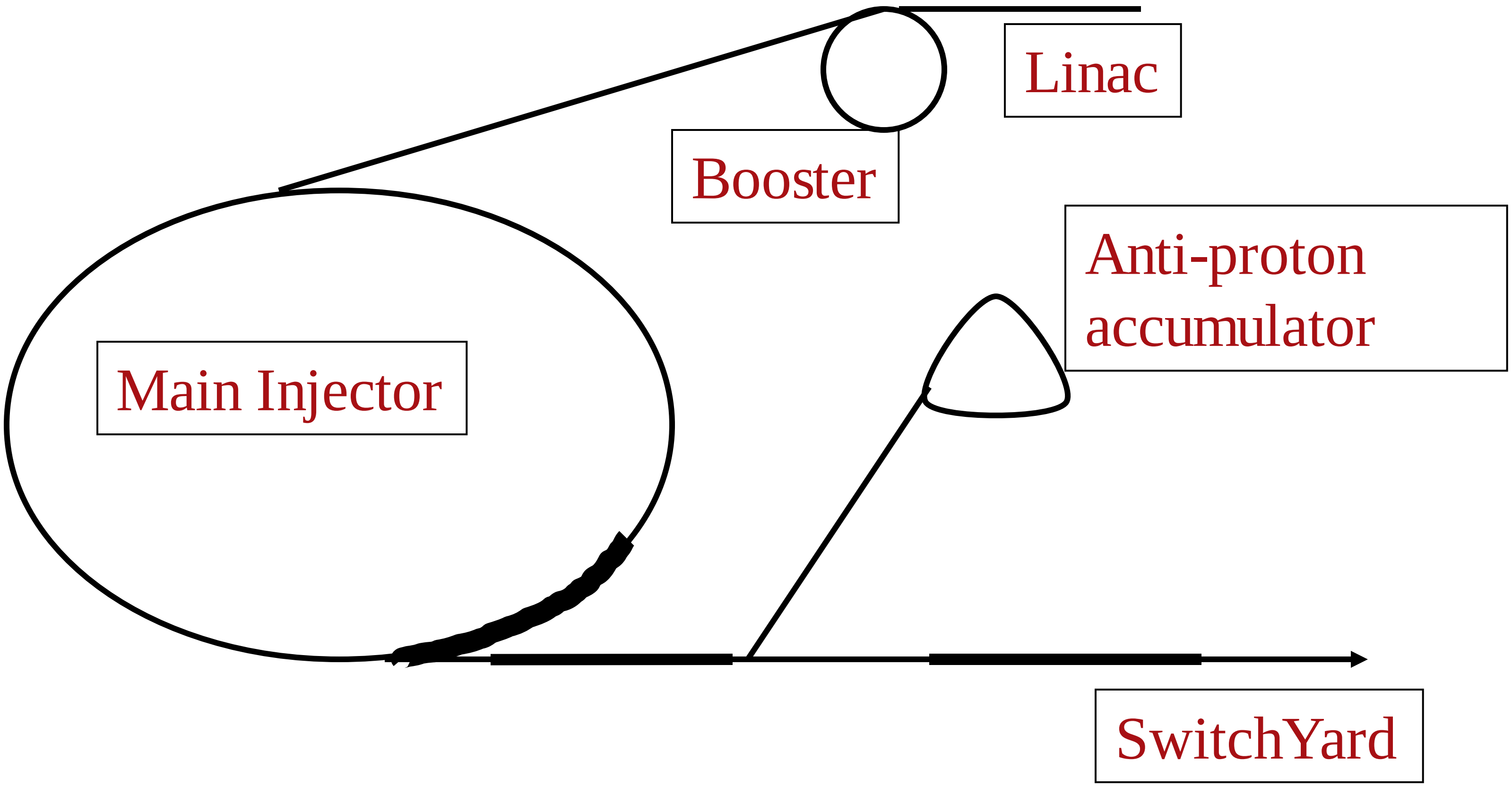
[49] **2nd ILC Test Beam Workshop information**
by Roman POESCHL
(Trailblazer: 14:50 - 15:00)

The Status of Fermilab's Meson Test Beam Facility

Erik Ramberg
Fermilab

30 September, 2009
ALCPG09

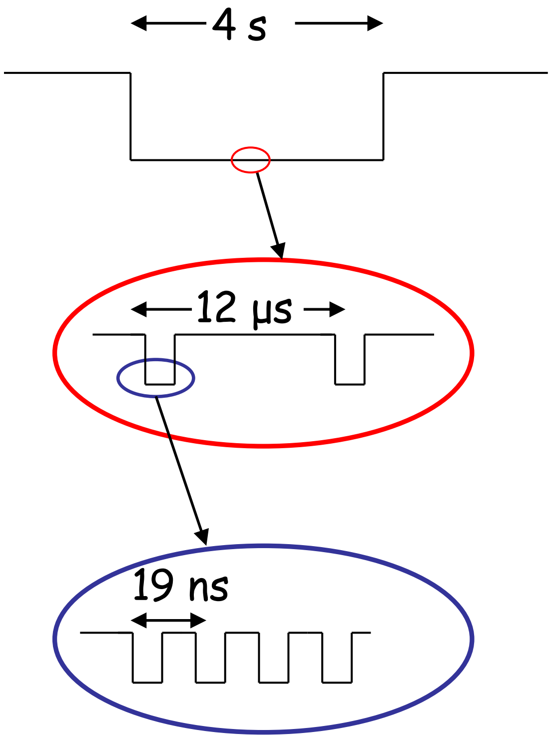
Main Injector Extraction



Extraction of beam from Main Injector:

- Load 1 batch from Booster to the Main Injector
- The batch length ranges from 0.2 to 1.6 μsec in length – Full batch equals 2E11 protons
- A fraction of the beam is resonantly extracted in a slow spill for each Main Injector rotation

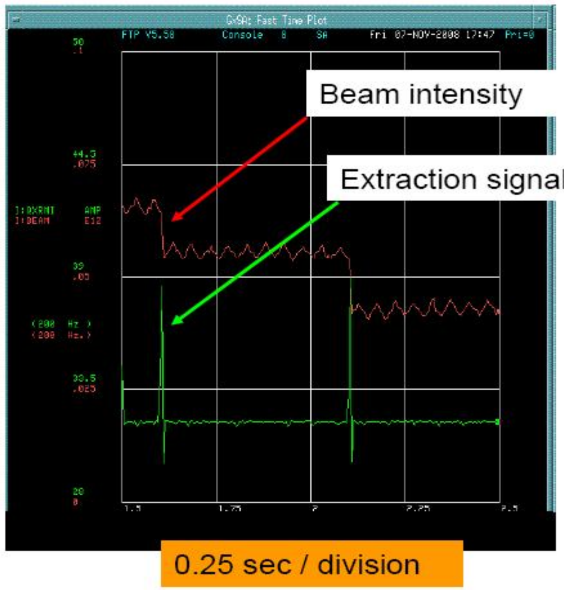
Spill options available at MTest

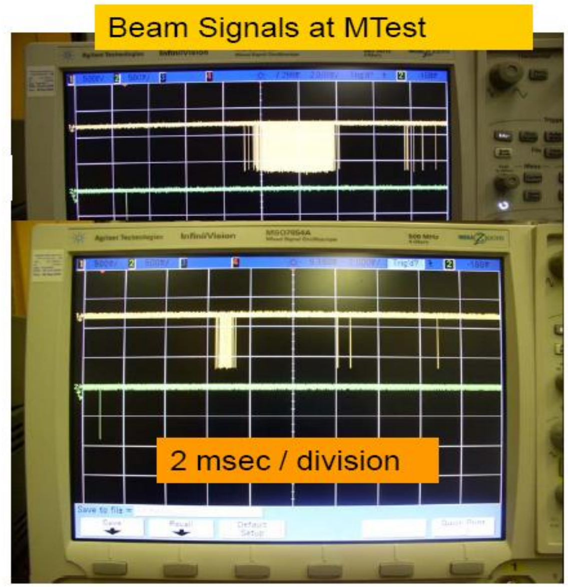


- Daily hours: 04:00 to 18:00
- Spills per min: One 4 second spill/minute, or
  Two 1 second spills/minute
- # Pulse trains: ~80,000 'batches'/second
  (1 microsecond train, followed by
  11 microsecond void)
- # Pulses: from 5-60 'bunches' per 'batch'
  (each bunch is 19 nsec long)

Millisecond pulsed extraction

First Pings to MTest





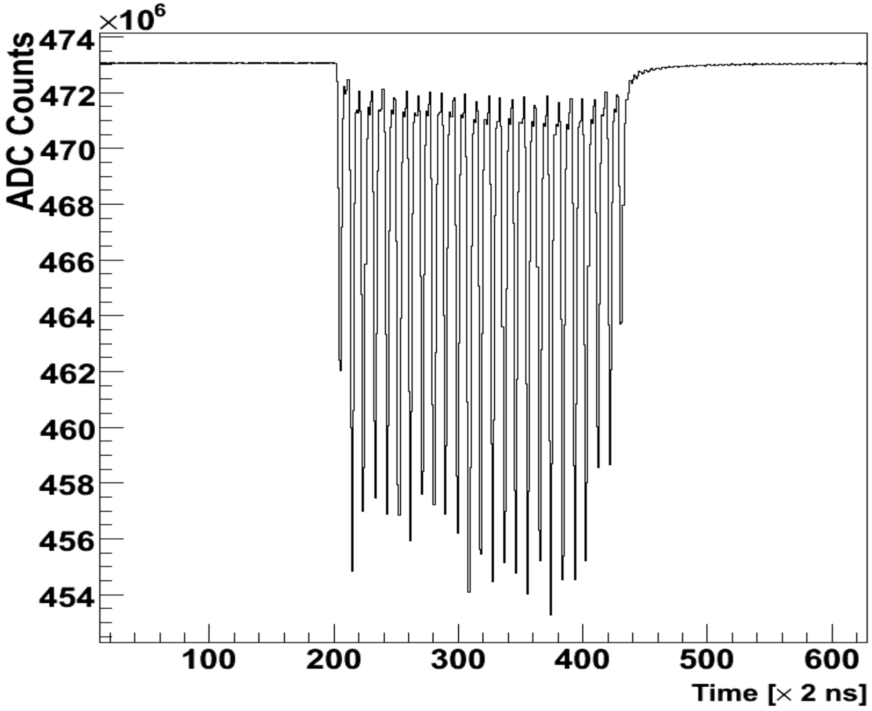
5 msec extraction

1 msec extraction

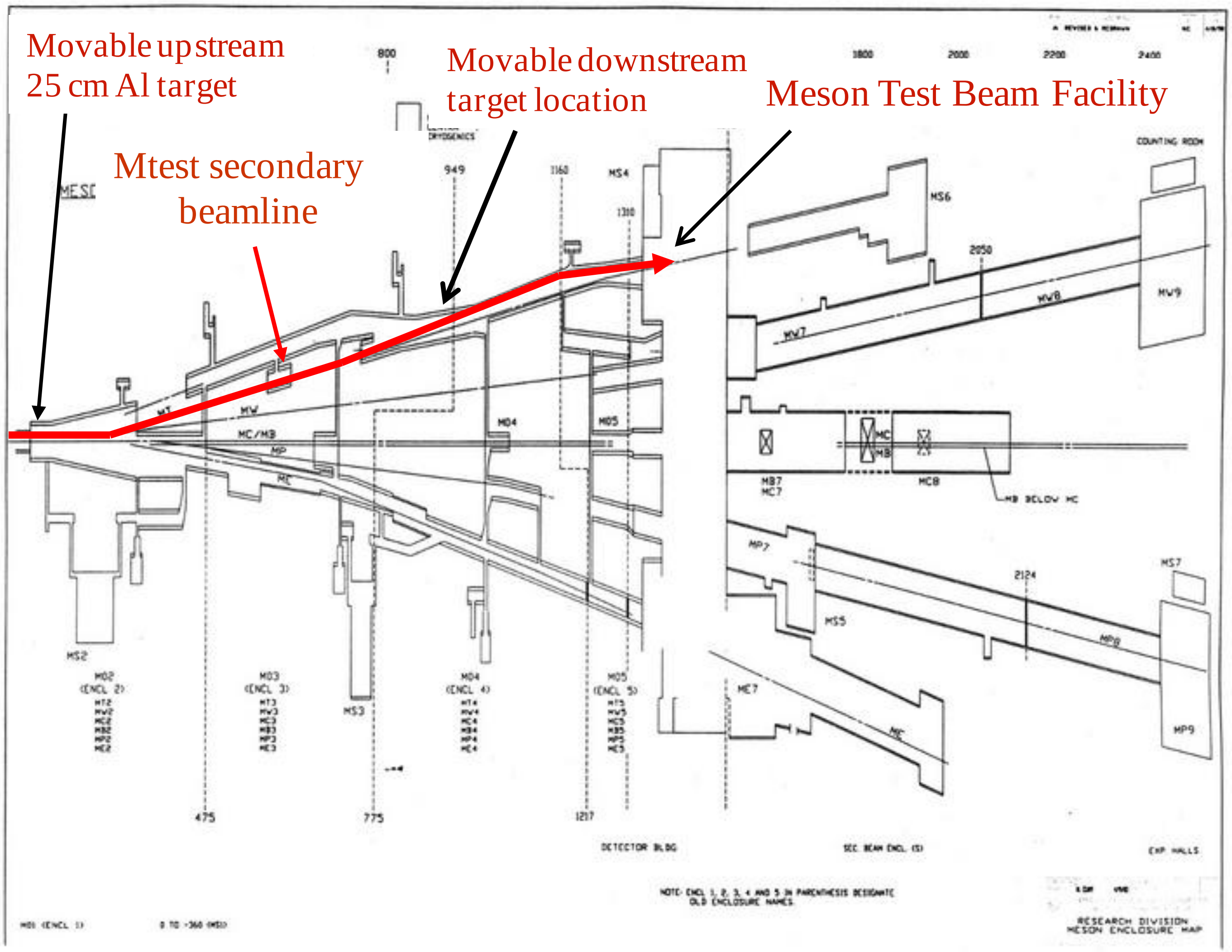
The Accelerator Division has installed pulsed quadrupole extraction hardware that can deliver beam within 1 to 5 millisecond short spills, or ‘pings’. Several of these pings can be delivered within the assigned 1 second spill time.

Uniformity of Beam Delivery

- The Airfly collaboration (T988) has built a DAQ that can resolve the bunch spacing of beam arrival (19 nsec) within the entire macroscopic 4 second spill
- The population distribution is relatively uniform in each batch, as shown here



Beam Delivery to MTest User Facility

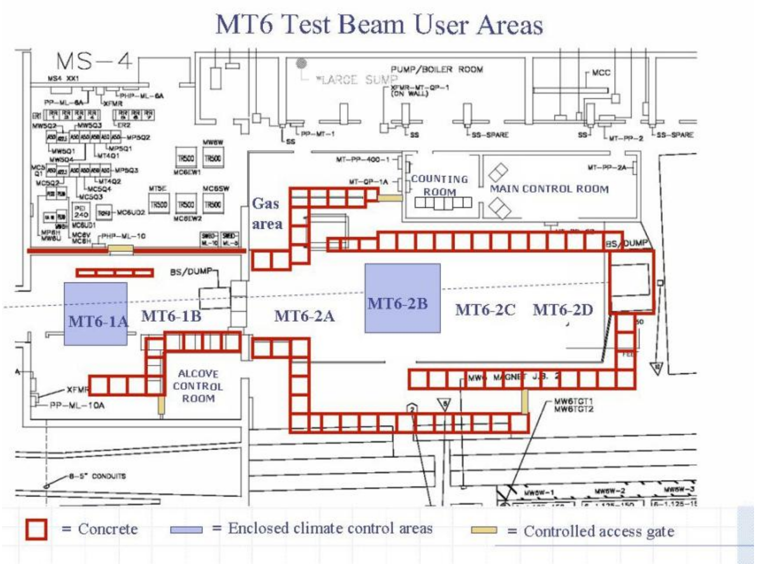


Proton Mode: 120 GeV protons transmitted through upstream target

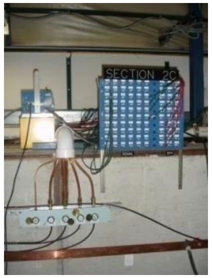
Pion Mode: 8-66 GeV beam tuned for secondaries from upstream target

Low Energy Pion Mode: 1-32 GeV beam tuned for secondaries from downstream target

User Facility



Spacious control room



Signal and HV cables

Gas delivery to 6 locations

4 station MWPC spectrometer

Two motion tables

Beam Rates and Electron Content

Measured rates* without lead scatterer

Beam Energy (GeV)	Rate at Entrance to Facility (per spill)	Rate at Exit of Facility (per spill)	%Pions, Muons**	% Electrons**
16	132,000	95,000	87%	13%
8	89,000	65,000	55%	45%
4	56,000	31,000	31%	67%
2	68,000	28,000	<30%	>70%
1	69,000	21,000	<30%	>70%

Measured rates* with 1/4” lead scatterer

Beam Energy (GeV)	Rate at Entrance to Facility (per spill)	Rate at Exit of Facility (per spill)	%Pions, Muons**	% Electrons**
16	86,000	59,000	100%	0%
8	31,000	18,000	98%	2%
4	5,400	1,300	74%	15%
2	4,100	250	<30%	>70%
1	4,900	120	<30%	>70%

*Rates here are normalized to 1E11 at MW1SEM

Beam Delivery for CALICE

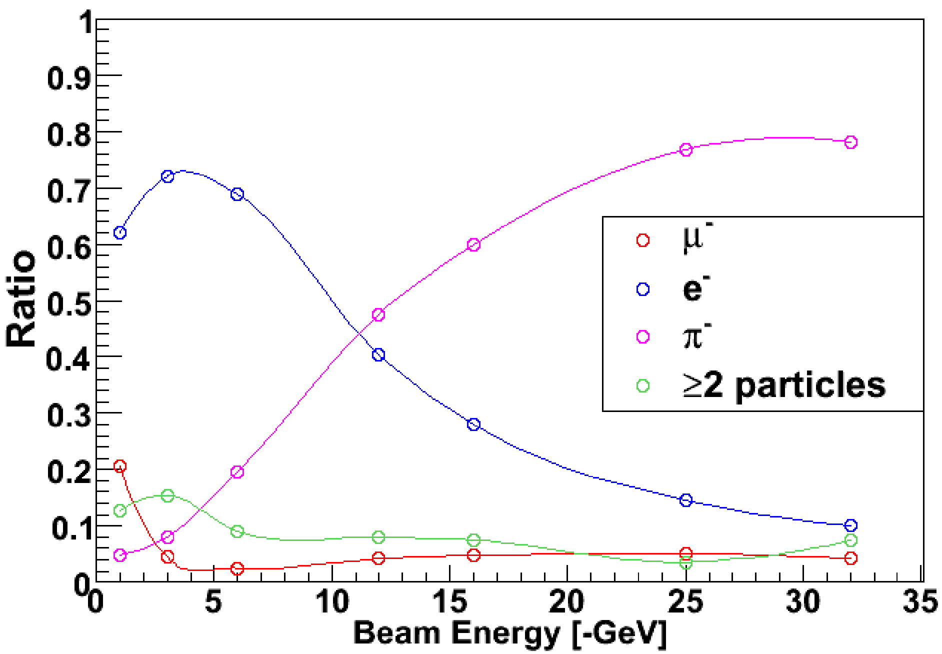
- The CALICE experiment (T978) has been the most comprehensive detector system to be installed at MTest and has summarized their results for beam composition.
- The Fermilab Accelerator Division has created beam tunes for CALICE as follows:

  Negative

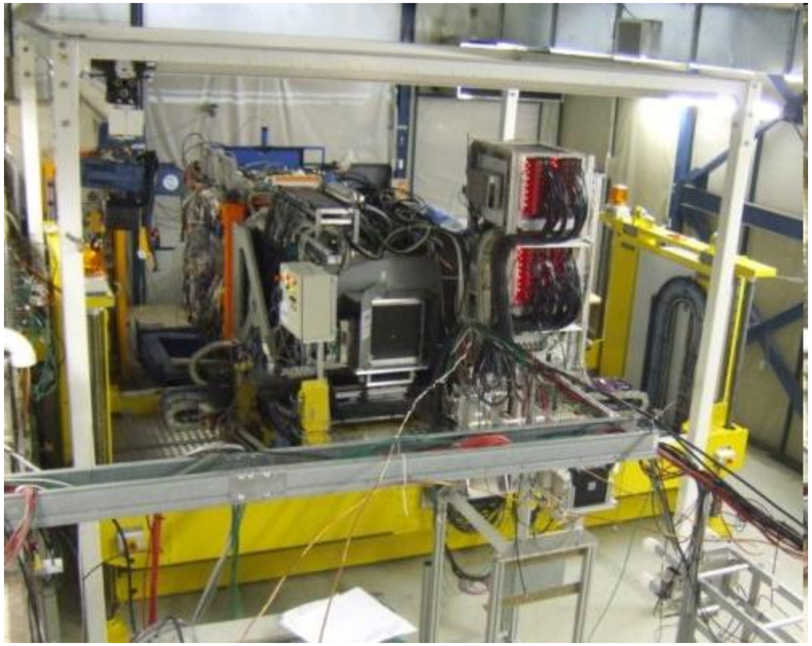
  1,2,3,4,6,8,10,12,15,20,30 GeV

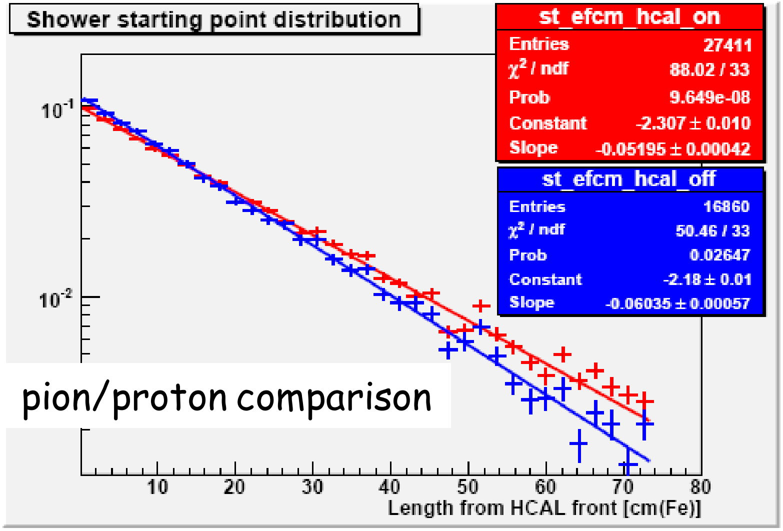
  Positive

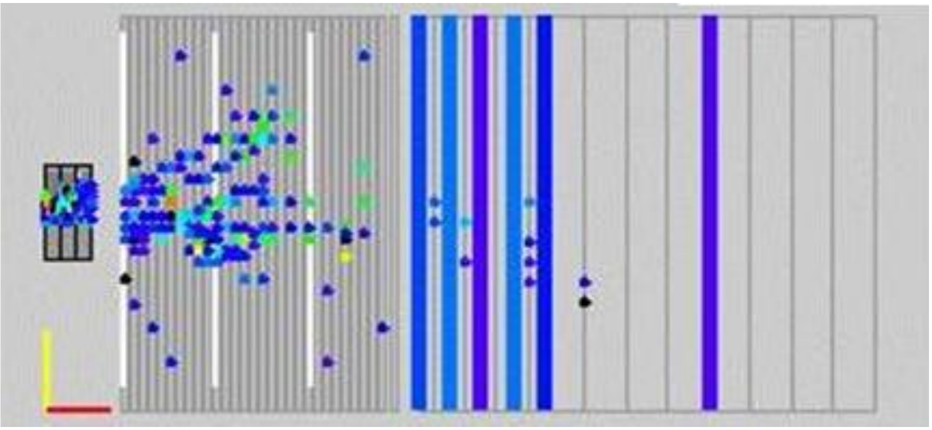
  32 GeV (high rate muon mode), 120 GeV (proton mode)



CALICE runs continue to be analyzed

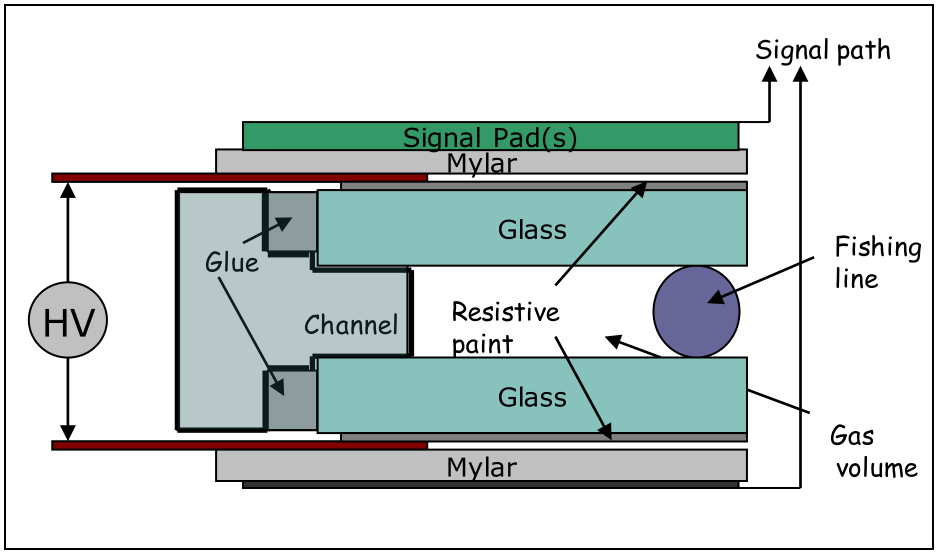


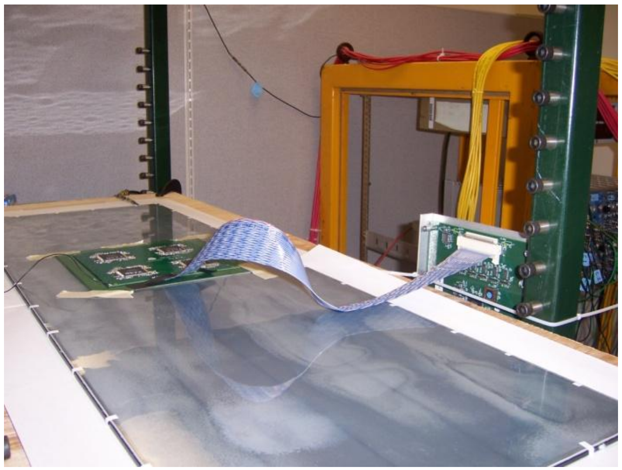




Next step for CALICE

- Exchange the active layers of the AHCAL with the DHCAL ones
- Go for the final test beam campaign





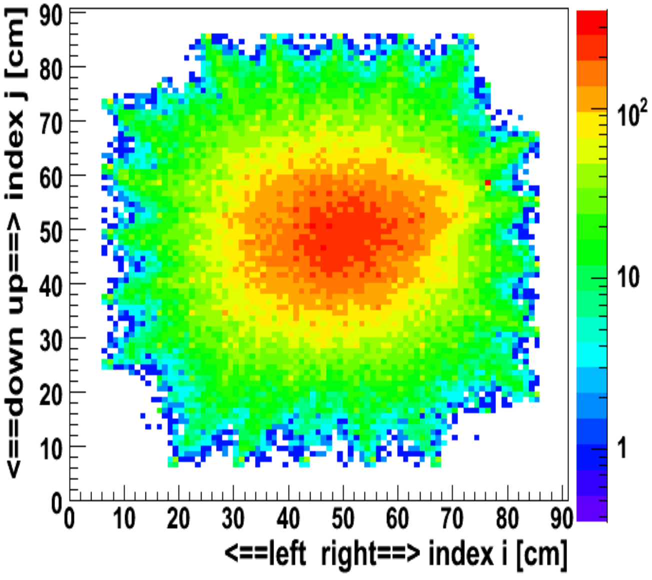
cassettes with resistive plate chambers and GEM are being built and tested

➔ Compare technologies for ECAL / HCAL with data from the same test beam

expected to be ready by end of 2009 for installation in absorber frame

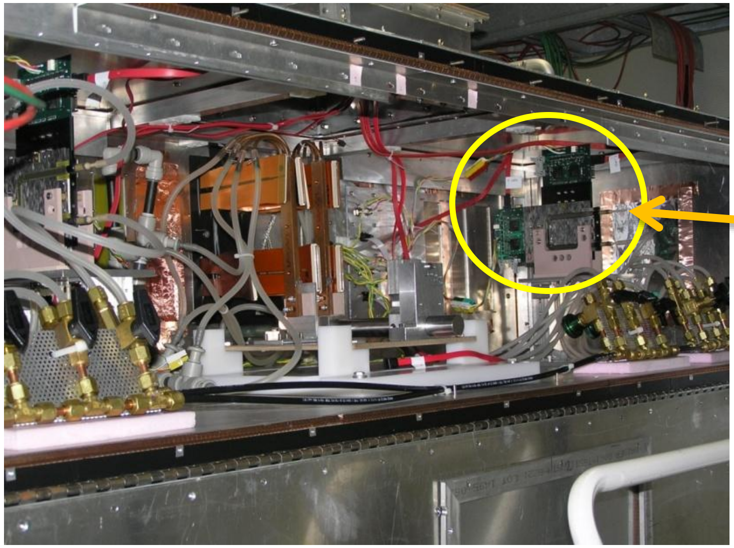
Muon beam at MTest

- Can maximize muon flux by running high intensity at 32 GeV, and inserting 2.5 meter beamstop just before the user area.
- Broad-band muon flux can be delivered at >5 kHz over a square meter, as shown by CALICE



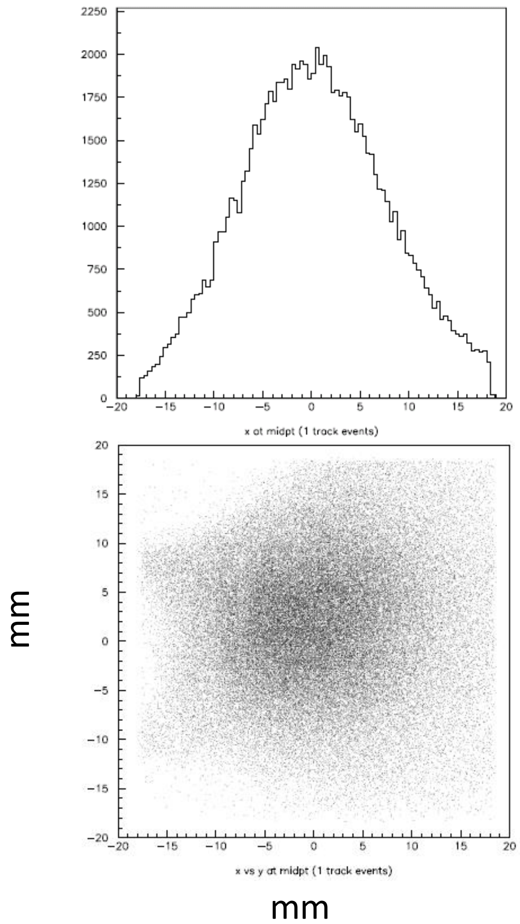
2 New Pixel Tracker telescopes in MTest

BTeV/PHENIX SENSOR TELESCOPE:

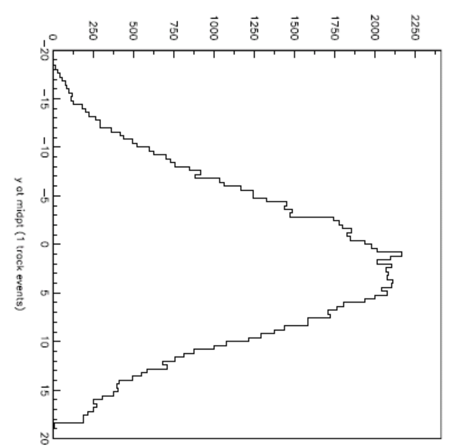


- Sensors are spares from BTeV project, read out with FPIX chip
- Pixel size is 50 x 400 micron^2
- Total active area per X-Y station is 6x6 cm^2
- Two stations currently, which should give 6 micron resolution

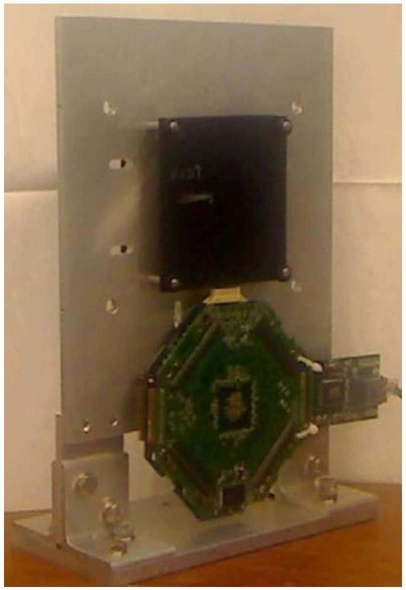
Beam spot (last quads off)



120 GeV proton beam:
1-track events; 3-4 spills
at low intensity
(5 Booster buckets)
93k tracks
3/20/09



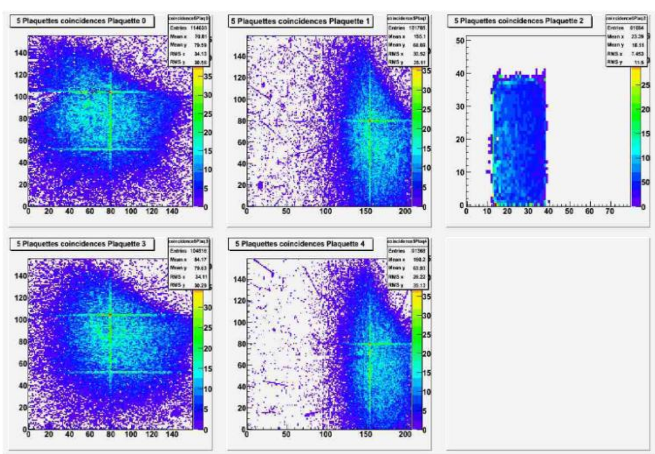
New CMS Sensor Pixel Telescope



Sensors are B-grade, but functional at low intensity.

Overlap area is 2 cm x 2 cm

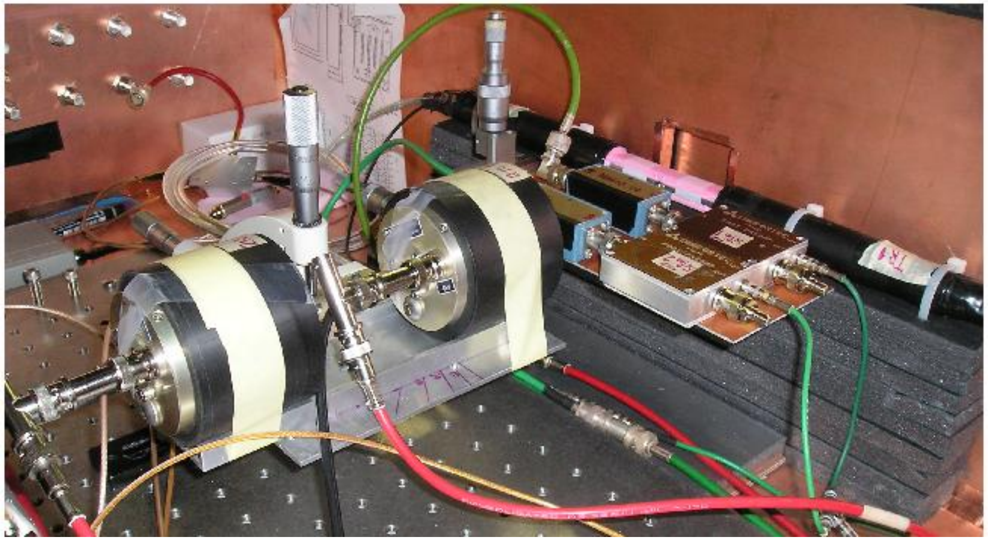
4 stations of 100x150 μm^2 pixels gives 4 μm resolution



Clever vertically integrated DAQ, called “CAPTAN”, has node processing boards and data conversion boards. Horizontal connectivity for output. Multi-threaded application software running on Windows.

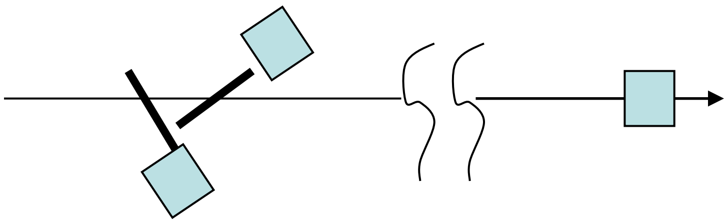
Fast Timing Detectors at MTest

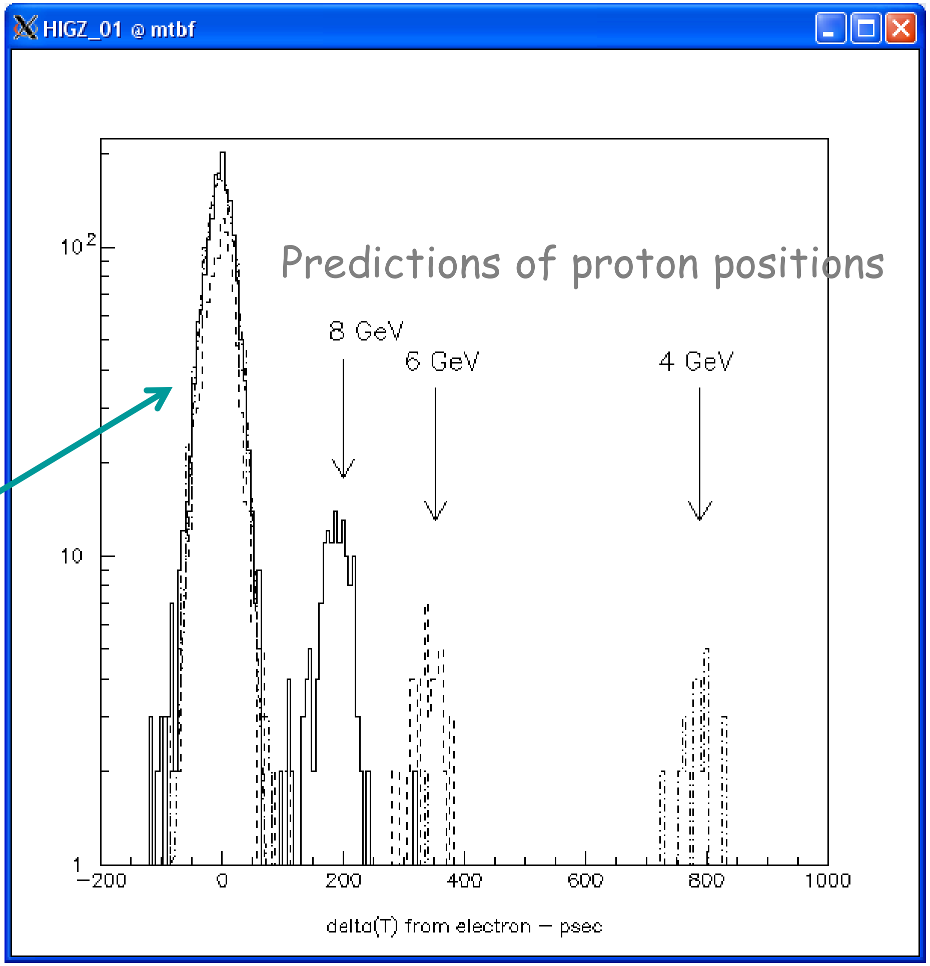
- Use Photek 210 (10 mm area) and 240 (40 mm) devices
- Several different configurations tested in last run
- In-line configuration gives astonishing 6 psec resolution with the 240 device
- Configuration with quartz bars at Cerenkov angle minimizes material at first measurement position



Extreme Time-of-Flight System

Start = Double-Q-bar
Stop = Photek 240
Start-stop dist. = 8.7 m



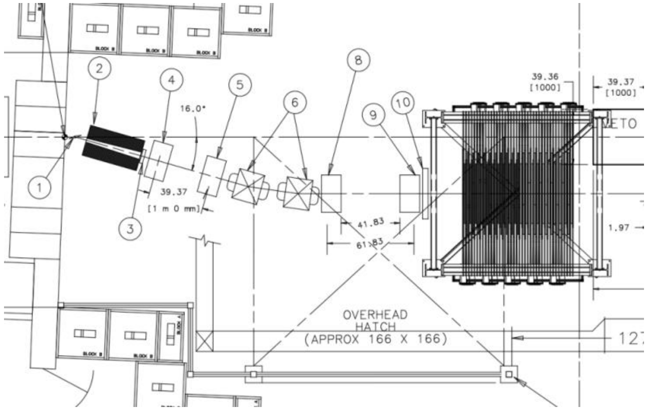


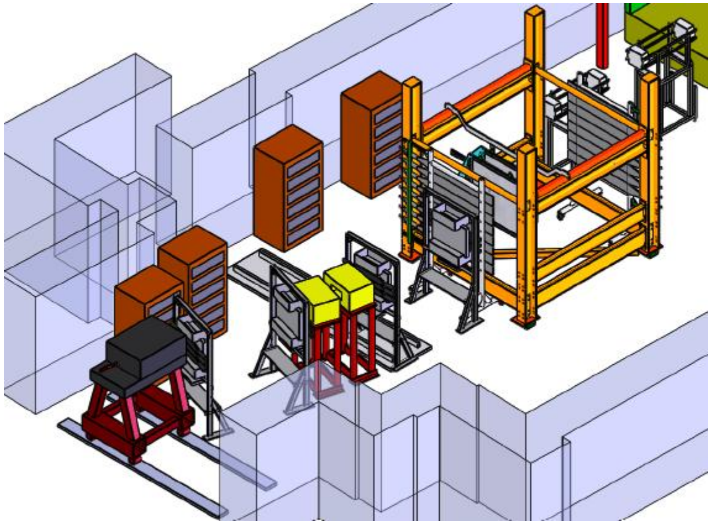
24 psec resolution positron peak, using average of A & B times

We can measure momentum of a high-energy proton using this system.

Tertiary 300 MeV/c Beamline for MINERVA

- The MINERVA experiment requested space to create a new tertiary beamline that could deliver pions down to 300 MeV/c momentum.
- The Particle Physics Division and Accelerator Division have agreed to help and are proceeding on installation.
- Full tracking and TOF will allow for momentum measurement and particle i.d.
- Target station rolls away for other users.
- The full spectrometer will be tested in November, 2009





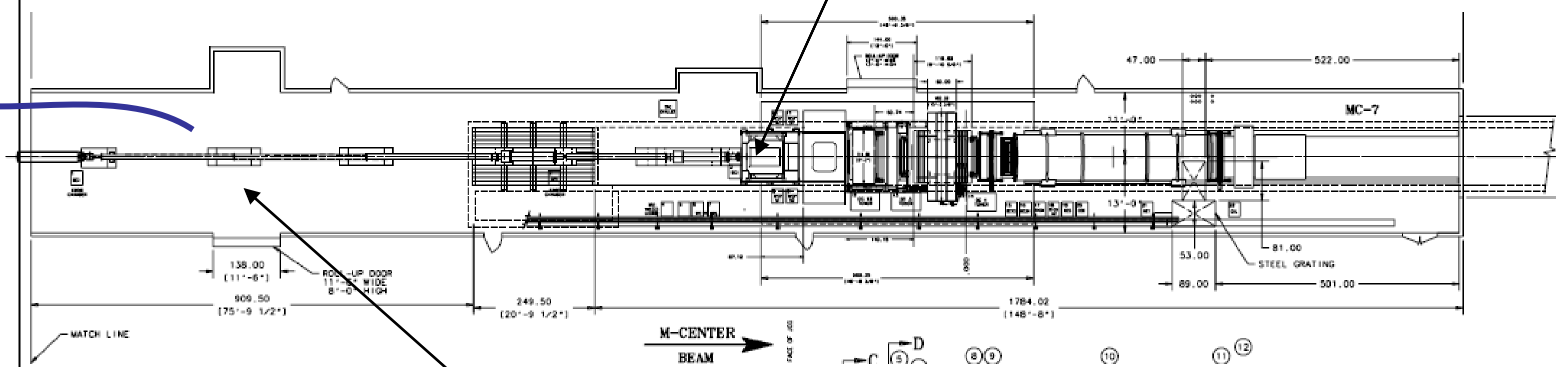
A proposal for a test beam area in MCenter

Current MTest control room

A small control room in the MWest alcove

Have test beam users use walkway in this area

Small, temporary stand for users who need Cerenkov i.d.

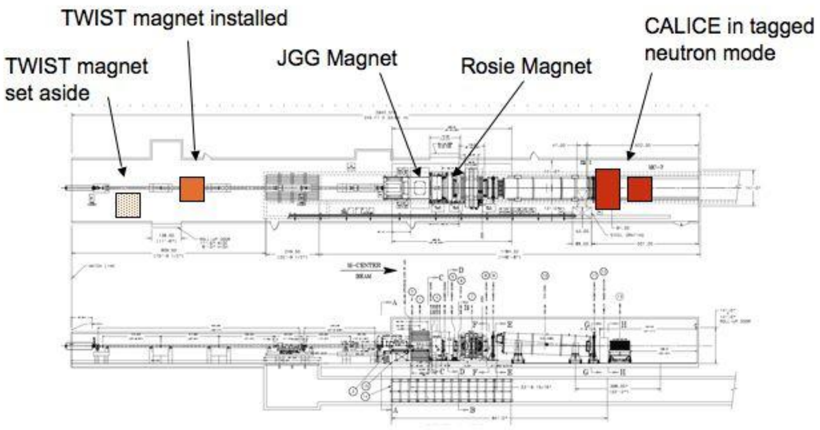


Cable route
For users

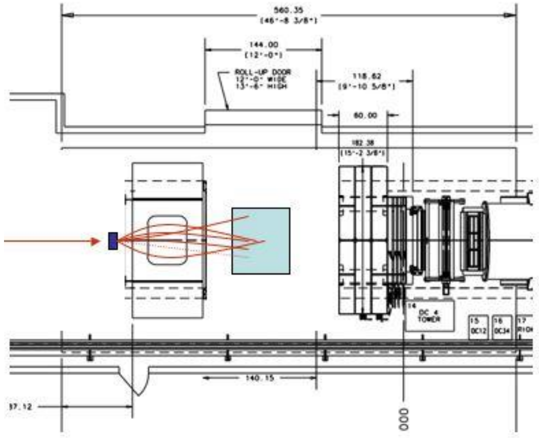
Make this section of beam pipe easily removable.
Put concrete blocks for user stands there.

A possible future program at MCenter

- MIPP experiment performs measurements with updated tracking and a repaired JGG magnet.
- Use the MIPP apparatus to create a tagged neutron facility.
- Import a large bore solenoid for TPC tests
- Use the MCenter spectrometer to simulate jet physics for advanced calorimetry.
- The status of a future run of MIPP and MCenter as a test beam will be reviewed Oct. 9



Programs possible at MCenter



Creating a 'jet' in the Jolly Green Giant

Summary

- The MTest facility continues to support a large variety of advanced detector tests
- The beamline is quite versatile, delivering secondary beams from 1 to 64 GeV, and a primary beam of 120 GeV protons. Electrons are dominant at low energies. Muons can be selected for with a beam stop.
- A new tertiary beam is being developed, which should deliver tagged pions down to 300 MeV/c.
- Two new pixel telescope systems have been created for the facility, with resolutions of 5-10 microns.
- A new TOF system has been tested, with a resolution of 24 psec. Individual measurements on a 4 cm MCP/PMT show 6 psec resolution
- A proposal is being studied at Fermilab to support test beam activities in the MCenter beamline, perhaps in conjunction with the MIPP experiment.