The Fermilab Test Beam Facility

Mandy Rominsky
ICHEP 2016
05 August 2016
Introduction

• In operation since 2005
  – Served about 1000 people from over 175 countries
  – Diverse program from many areas of High Energy Physics

• 2 Beamlines
  – MTest (2-80 GeV mixed, 120 GeV protons)
  – MCenter (200 MeV – 2 GeV mixed)
Facility Layout

- Experimental Areas
- Work Areas
- Control Rooms
Beams Details

- Full details can be found: [http://ftbf.fnal.gov/beam-overview/](http://ftbf.fnal.gov/beam-overview/)
  - 4 sec spill every 60 seconds
  - Tunable rate (100 Hz – 100,000 Hz), beam available 24/7
- MTest Beam line
  - 120 GeV protons
    - Primary beam
  - 1 – 80 GeV secondary beam
  - Spot size: 1-2 cm
- MCenter Beam line
  - Tertiary beamline down to 200 MeV
  - Currently have cryogenic support for LArIAT (Liquid Argon In A Test Beam)
Facility Instrumentation (MTest)

• 2 Cerenkov Detectors

• 1 Pixel Telescope

• 4 MWPC Tracking Chambers

• Lead Glass Calorimeters

• Assorted Trigger scintillators
Facility Infrastructure (MTest)

- Remote controlled Motion Tables
- Laser Alignment
- Helium Tubes
- Web-based Cameras
- Crane Coverage (30 tons)
- Climate controlled Huts
- Gas Patch panels (Flammable)
- Signal, Network, & High Voltage cable patch panels
Facility: MCeneter

- Recommissioned the MCeneter beam line for LArIAT
- Will continue to develop this beamline for future users
  - Would like feedback from the community
  - Possible magnet for users? (Jolly Green Giant)
Facility Beam Studies (MTest)

• Series of studies done by E. Skup and D. Jensen

• Complete suite of studies planned

• Record running conditions in a database
Muons at the Test Beam

• We can produce a broadband muon beam in the MTest beam line with an absorber in place

32 GeV Pion Beam

32 GeV Muon Beam

After absorber

32 GeV Muon Beam

10m from absorber

Studies done by D. Jensen
Data Acquisition System

- Using MIDAS from Triumf
- Currently includes the MWPCs and triggering detectors.
- Will add slow controls and other instrumentation through the summer
- Online Analysis
Physics at the Test Beam: Collider Physics

• T1018, T1048, T1037, T1044 (RHIC, EIC)
  – Developing W powder SciFi technology for use in RHIC and EIC
  – Tests of calorimeters, Time of Flight systems
• T992
  – Testing radiation hard sensors for SLHC
  – Developed a silicon strip/pixel telescope that will stay at test beam once they are done
• T1068
  – ATLAS group testing telescope for sensors
Physics at the Test Beam: Muons

• T1043: Mu2e Cosmic Ray Veto
  – Measured PE yields in their scintillation counters
  – Publishing in NIM when analysis is done

• T1073: Mu2e Beam Monitor
  – Used as particle telescope to study profile of “out of time” beam

• T1042
  – Used the facility for rate of rise tests on straw chambers
Physics at the Test Beam: Neutrinos

- **MCenter: LAriAT**
  - Liquid argon detector, installed cryogenics
  - Characterize performance of liquid argon

- **MCenter: pLAPPDs**
  - Time of Flight System for ProtoDUNE
  - Will also use our Cosmic Ray test stand
Physics at the Test Beam: General R&D

• T1069: Muon strips
  – Test of muon detectors in future colliders

• T1065
  – Testing time and position resolution of fast, radiation hard, low cost calorimeters
  – 13 ps timing resolution demonstrated
  – Coming back for continued studies.
FTBF: Training Ground for Students

• Work with summer students on projects that benefit the facility and users
  – DAQ this summer built by students

• Opportunities for students to “get their hands dirty”
  – Can run an experiment beginning to end

• Test Beam participates in EDIT detector school
  – One is being planned for next year.
Conclusions

- The Test Beam facility is a world class facility dedicated to detector R&D.
- We are excited to help our users achieve their goals and make their test beam run as smooth as possible.
- Please contact me for information on scheduling beam time (rominsky@fnal.gov, for scheduling: http://goo.gl/forms/GECh9hSoXjt6jUeU2)
- Website: http://ftbf.fnal.gov
Backups
Procedure for Getting Beam

• First step is to write the TSW (Technical Scope of Work) and contact facility manager (me)
  – Agreement between test beam collaboration and the lab over what resources are used.
    • Do you need significant engineering or tech support? Computing support?
  – TSW information can be found here: http://ftbf.fnal.gov/tsw-how-to-write/
    • Can be a broad document, cover multiple years and uses
    • Approval process typically takes 4-6 weeks, but can be faster, depending on needs.
  – My job is to help you with this, don’t hesitate to ask
Running an experiment

• Running at the test beam
  – We change over experiments on Wednesdays. It’s best to get here the Monday before if you can
    • Take care of training (we can arrange special classes and many can be done online before you come)
    • start staging equipment, get computing access.
  – Install on Wednesday, plan for an Operational Readiness Clearance walk through.
    • A committee of safety experts review equipment, decide it’s safe to operate in the beam environment.
    • Walkthroughs can be quick, but sometimes signatures can take time.
    • Advance electronic drawings are required
Tips for a Successful Run

• When planning run times – take into account that we can only guarantee 80% up time of the accelerator
  – Might be useful to request more time than necessary
  – Plan on having some troubles getting started
• We can help in advance with DAQ integration, building support structures…
• Provide detailed electrical drawings. Will make the walkthrough go faster