Fermilab's Detector Test Beam Facility

Activities related to CALICE installation

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New Installations

- Activity at MTest includes:
  - New roof!
  - Workshop
  - Removal of section 2 hut
  - 400 V transformer
  - Cerenkov cables
  - Pixel telescope

Beam Rates and Content

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	<10%	>90%
1	69,000	21,000	<10%	>90%

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	<10%	>90%
1	4,900	120	<10%	>90%

*Rates here are normalized to 1E11 at MW1SEM

**Measured at exit of facility with PbG calorimeter

Geant 4 Simulation of Beamline

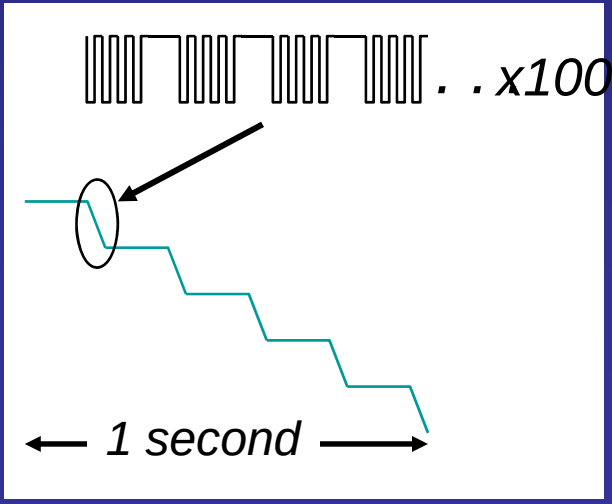
Energy	Lead (mm)	#pions	#electrons	Ratio
1 GeV	0	710	9990	0.07
	0.5	15	129	0.12
	1	8	43	0.19
	2	5	6	0.83
	5	2	5	
2 GeV	0	2440	9990	0.24
	0.5	268		
	1	88	158	0.6
	2	46	27	1.7
	5			
4 GeV	0	5030	9990	0.5
	0.5			
	1	671	548	1.2
	2	308	110	2.8
	5	109	2	

New extraction schemes

- Accelerator Division has implemented a new extraction cycle with a 1 second spill. They can deliver two of these per minute. This is particularly useful for beam limited data taking (I.e. muons, low energy pions, etc.)

- Radiation Safety Group has approved a new run condition that allows an increase in primary intensity from 2E11 to 1E12. They ask that this run condition be used in a single contiguous period for each run period.

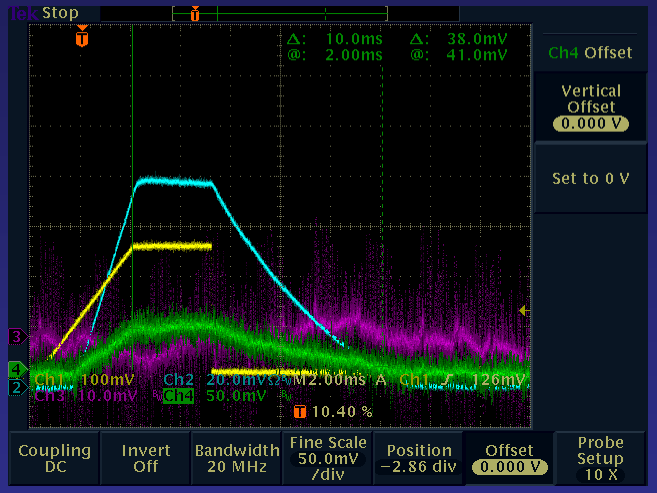
- The AD have also worked on creating a shorter - 2 msec? - partial extraction cycle ('ping') using a pulsed current to the already existing quadrupole resonance magnet. The goal is to fit 5 of these pings in the 1 second spill



Simulating ILC Beam Structure

Peter Prieto in front of pulsing circuit for QXR

QXR quadrupole in Main Injector



Pulsing the QXR supply with ~3 ms / 45 Volts

Accelerator Division will continue to work on this exciting possibility.

Summary

- About 1.5 years ago, Fermilab initiated a very significant investment in the Meson Test Beam Facility.
- As a consequence of this investment, both the beamline and user facilities were improved considerably over the last few years of running.
- Activities related to CALICE testing include:
  - Removal of section 2 hut
  - Installation of 400 V transformer
  - Addition of fast cables from Cerenkov to section 2
- With the increase in primary beam running conditions, raw pion beam rates at 2 GeV should approach 2000/spill, but accompanied by more than x10 electrons.
- A Geant 4 beamline is being studied to determine optimal thickness of lead at focal point to reduce electron content.
- The newly commissioned differential Cerenkov detector can help tag events and, if signals can be made fast enough, participate in the trigger.
- Accelerator Division is working on ILC pulsed extraction and should achieve it very soon.