Draft Luminosity Monitoring Run Plan
December, 2003

Before beam

- Install additional power supplies for pair spectrometer, but do not attach to detectors.
- Install TAC/Sci-Fi Monitor on beamline.
- Rip out beamline, install PrimEx window on pair spectrometer.
- Install He bag.
- Install camera on TAC
- Set timing for ADC gates.
- Install, cable up and test module 4 of Sci-Fi detector.
- Turn on HV for TAC in Hall.
- Set pair spectrometer magnetic field to B=13kGauss, I=2000Amps (for 5 GeV beam).

With beam setup

- Establish good beam.
- Plateau tagger detectors. (3 hours)
- Plateau pair spectrometer detectors. (3 hours)
- Triggering on pair spectrometer, verify pair spectrometer fiel is OK by looking at occupancy of T counters. (1 hour)

TAC commissioning

Note: The TAC HV will be set at -1800V. The signal is fanned and discriminated at four thresholds (35, 45, 55, and 65 mV), so we will always be doing threshold tests. The "TAC collimator" refers to the $4cm \times 4cm$ collimator which we will place in front of the TAC to simulate the central hole in HYCAL. The "beam collimator" refers to the standard $8mm$ beamline collimator. The triggers will be MOR, TAC_{1-4}, and clock. As a general rule, keep the TAC rates less than 150kHz with 35mV threshold.

Beam current(nAmp)	Radiator	TAC collimator in?	P.S. Magnet on?	Beam collimator in?	run time (hours)
0.05	B	yes	yes	no	0.5
0.1	”	”	”	”	0.5
0.5	”	”	”	”	0.5
1.0	”	”	”	”	0.5
0.1	”	”	”	yes	0.5
”	A	”	”	”	0.5
”	B	”	no	yes	0.5
”		”	”	no	0.5

Take TAC collimator out.

Beam current(nAmp)	Radiator	TAC collimator in?	P.S. Magnet on?	Beam collimator in?	run time (hours)
0.1	B	no	no	no	0.5
”	”	”	”	yes	0.5
”	”	”	yes	”	0.5
”	”	”	”	no	0.5
”	A	”	”	”	0.5

If there is time, do a voltage scan on the TAC. Do TAC runs for V = 1700, 1800, 1900 Volts, 0.5 nAmps, radiator B.

Pair Spectrometer Tests

Pair spectrometer rates are calculated as follows. The data acquisition event rate limit is taken to be 2 kHz. In these multi-hit TDC's which we are using, each event corresponds to looking at a $32\mu sec$ sample in time (For >=50nAmps, we will set this to $10\mu sec$). So, as long as the MOR rate is above 2 kHz, we record:

$$2 \times 10^3/sec \times 3.2 \times 10^{-5} sec = 6.4\%$$

of the events. Furthermore, the efficiency of the pair spectrometer in tagging a photon is taken to be 0.35%. Below is for a 5% X_o pair production target, radiator B. We require 1% statistics for each of 20 T counters in the tagger. The absolute maximum flux on the TAC corresponds to about 1 nAmp electron beam current with radiator B.

First, we start with a short run using just a single T counter trigger (T2) for TDC calibration purposes.(15 minute run)

For the runs below, we have MOR, clock, and pair spectrometer triggers. ADC information will be recorded. 5% radiation length target.

Beam current	MOR rate(Hz)	P.S. rate (physics)	P.S. rate (recorded events)	time to run
100nAmps	10^7	35kHz	2240 Hz	2 minutes
50nAmps	5.0×10^6	17.5kHz	1120 Hz	10 minutes
10 nAmps	10^6	3.5kHz	224 Hz	16 minutes
5 nAmps	5.0×10^5	1.75kHz	112 Hz	0.5 hours
1nAmp	10^5	0.35kHz	22.4 Hz	2.6 hours
0.5nAmps	0.5×10^5	0.175kHz	11.2 Hz	5.0 hours

For the following run, we have the 8 mm beam halo collimator in:

Beam current	MOR rate(Hz)	P.S. rate (physics)	P.S. rate (recorded events)	time to run
100nAmps	10^7	35kHz	2240 Hz	2 minutes

For the runs below, we have a 1.5% radiation length target on the pair spectrometer target ladder. Beam halo collimator out.

Beam current	MOR rate(Hz)	P.S. rate (physics)	P.S. rate (recorded events)	time to run
100nAmps	10^7	10.5kHz	672 Hz	7 minutes
50nAmps	5.0×10^6	5.25kHz	336 Hz	15 minutes
10 nAmps	10^6	1.05kHz	67 Hz	1 hour

Now, we put the 5% radiation length target back in and connect additional power supplies on 16 of the pair spectrometer detectors. Set the front detectors to V= and and back detectors to V=.

Beam current	MOR rate(Hz)	P.S. rate (physics)	P.S. rate (recorded events)	time to run
100nAmps	10^7	35kHz	2240 Hz	2 minutes
50nAmps	5.0×10^6	17.5kHz	1120 Hz	10 minutes
10 nAmps	10^6	3.5kHz	224 Hz	16 minutes
5 nAmps	5.0×10^5	1.75kHz	112 Hz	0.5 hours

Online monitor tests can mostly be done parasitically.
For reference, the pair spectrometer field *versus* current is plotted below:

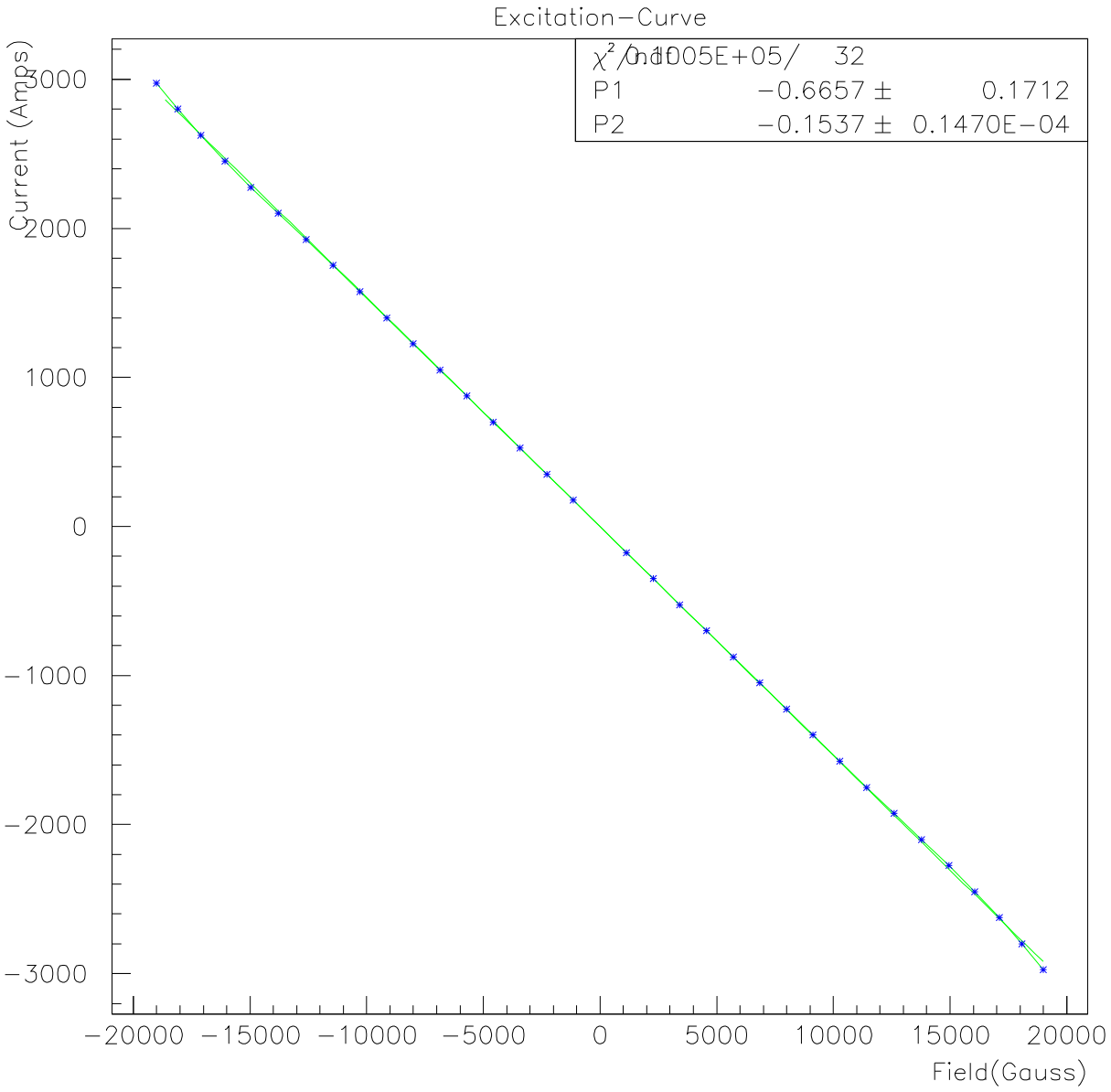

Figure 1: Central field *versus* dipole current.