D0 BLM Tevatron Abort System Initial Calibration
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N. Ahmed, S. Duesening. K. Gounder, R. Lipton, Axel Naumann

1.1 Introduction

The BLM based abort system for D0 is designed to be functionally similar to the system used in CDF during Run I. The D0 system consists of 8 glass ion chamber BLMs located behind the end calorimeters at z=+/- X m at a radius of 4.8". The system is described in detail in D0 note 3837. This note covers calibration and results of initial Tevatron running.

1.2 BLM Chassis

The BLM "Tevatron" chassis is used to house 8 logarithmic amplifier daughter cards that amplify the BLM currents. A "Beamline" chassis was initially tried but did not provide stable results. The chassis also houses a positive HV supply. This supply is normally digitally controlled but this chassis was modified to control the HV value using an internal pot. Each logamp daughter card was modified for longer falltime using a 2 MΩ resistor and the output with no input was adjusted to 0.52 V.

1.2.1 Current Source Tests

A Keithley 2400 voltage/current source was used to calibrate the response of the chassis. The results are given in figure 1 for a representative channel.

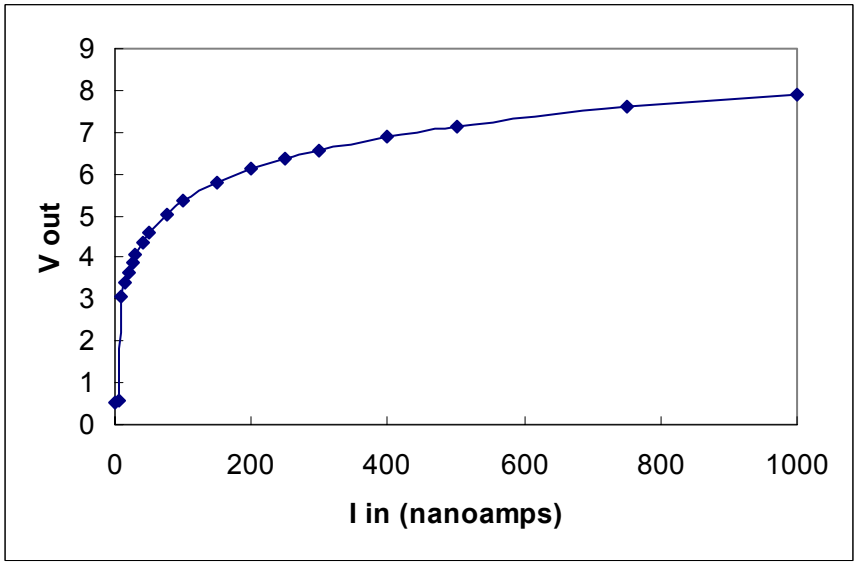


Figure 1. Response function of BLM log amp

The overall calibration is shown in the lower curve in figure 2. The upper curve is the expected response for a nominal output of 1 rad/sec for a 70 na BLM curent.

The factor of 6.2 discrepancy is due to an error in the 336 module transform from ADC counts to rads and will be corrected during the April shutdown.

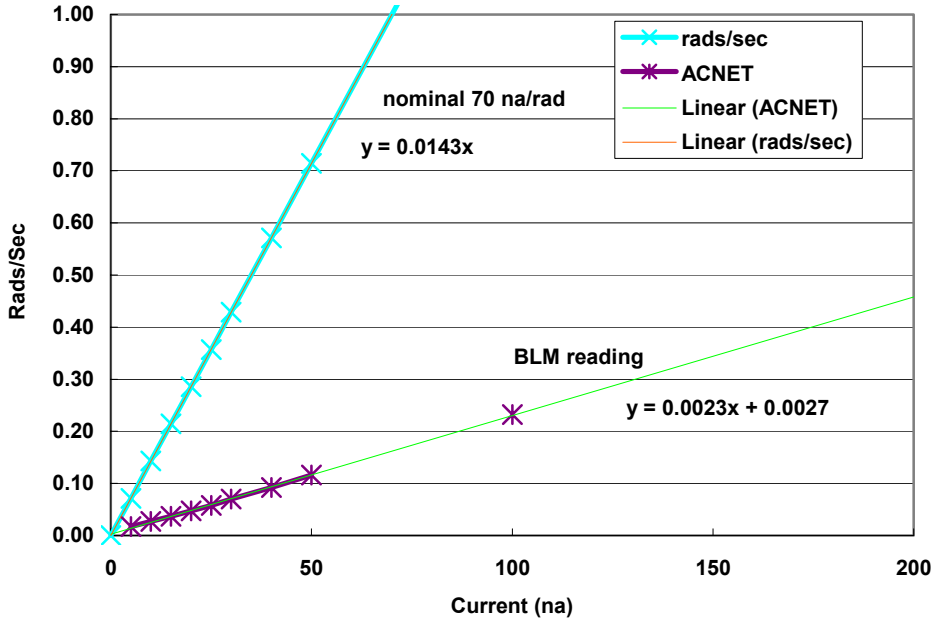


Figure 2. BLM system gain calibration

1.2.2 Pulse Tests

The following circuit was built in a NIM kludge module to test the BLMs using a charge pulse:

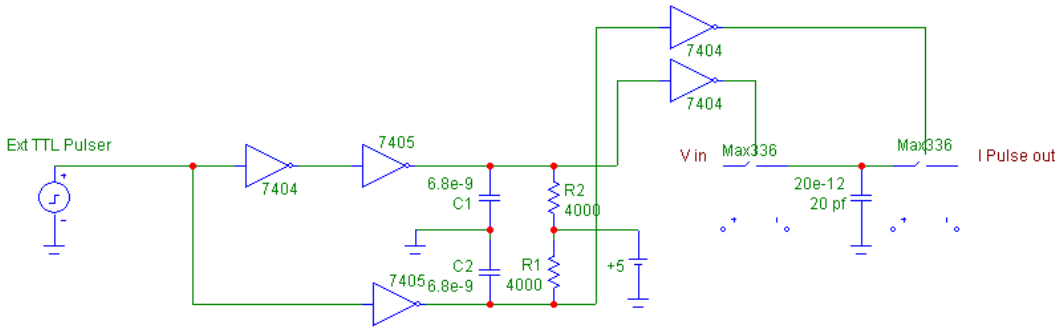
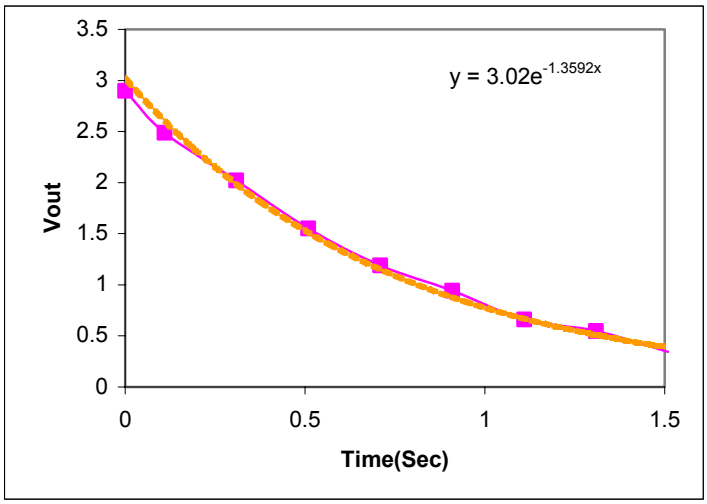


Figure 2. Test pulser schematic

The circuit uses Maxim 336 ultra low leakage (<10 pA) analog switches to provide a high impedance charge pulse at the frequency of the TTL Pulser with Q = 20e-12 farad * Vin or I = Q*freq. The 7405 open collector gates and associated RC circuits are used to delay the on time of the I_{out} switch with respect to the V_{in} switch so that there is no direct connection between the input and output. This limits the frequency of operation to ~500kHz.

Using the pulser in single pulse mode we measured the fall time of the logamp with the 2 MΩ resistor. The results are shown in figure 3; the fit value of 1.36 seconds is about 50% larger than the expected value of 0.91 sec.



1.3 ACNET readout

C336/337 modules

Data logging

1.4 TLD and Foil Measurements

Due to the extreme space constraints in the D0 detector the BLMs are located rather far from the IP behind substantial shielding. It is therefore important to cross calibrate the BLMs with the dose seen near the IP. Table 1 shows the arrangement of foils and TLDs in the H disk region.

H disk TLDs and Foils

		North				South			
		high	west	low	east	high	east	low	west
radius	sensor	2:30	4:30	7:30	10:30	2:30	4:30	7:30	10:30
1.9	Beam Pipe								
2.5	TLD								
3.8	Al foil	416	401	402	417	411	403	400	405
5.0	TLD								
6.3	Al foil	408	412	414	404	419	406	418	407
7.5	TLD								
12.5	TLD								
17.5	TLD								

above numbers are foil ID numbers

In addition a set of TLDs were installed around the beampipe and at the inner radius of the BLMs on the North and South sides.

1.5 Beam Data

Figure 3 shows the record of the rates in the BLM system during a ~18 hour period in the first week of running. Losses are clearly observed, with the largest loss at ~5 am on March 9th. The losses were all small, well below the 2 rad/second trip value and indicate that the system is functioning properly.