Fast Beam Loss Monitors and Power Supply Control Loop

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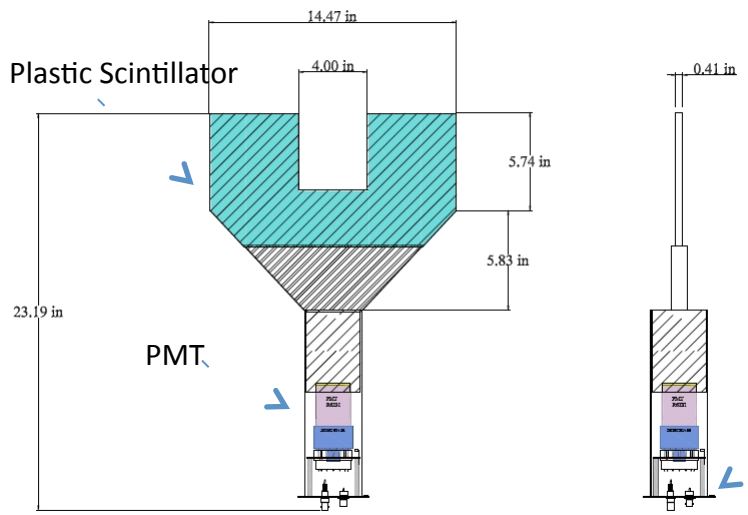
Fast Beam Loss Monitors (FBLMs)

- Consist of plastic scintillator interfaced with photomultiplier tube (PMT).
- Detect ionizing radiation.
- Fast response (<< 1 μs)
- Signal will be used to trigger a beam interruption or reduction.

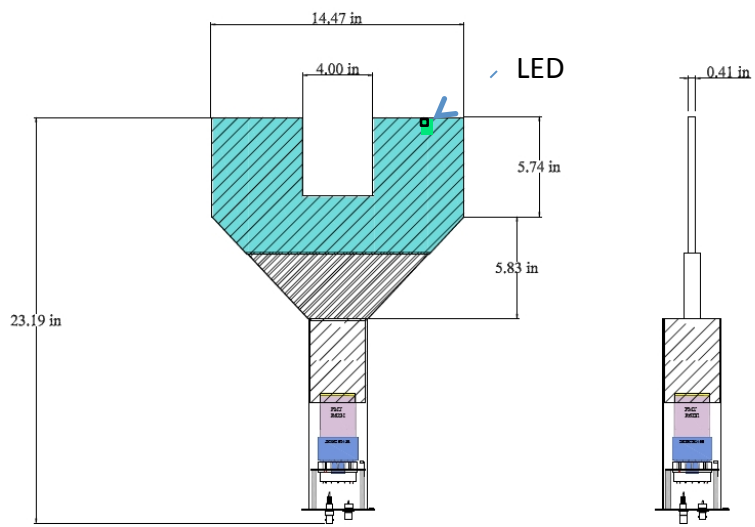


High Voltage (HV), LED, and anode signal BNC connections

Graphic adapted from a presentation given by Arden Warner

FBLMs cont'd.

- Contain a light-emitting diode (LED) to test that scintillator and PMT are functional.
- 10% of 40 PMTs were tested with LEDs (all functional).



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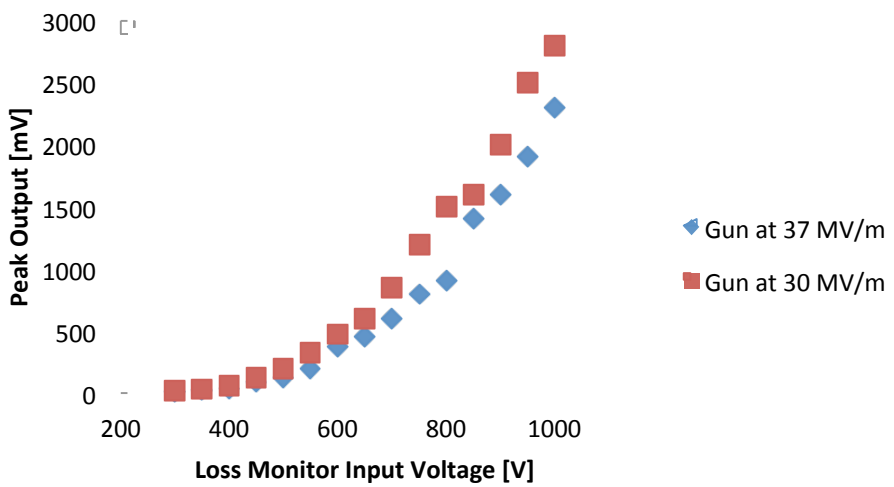
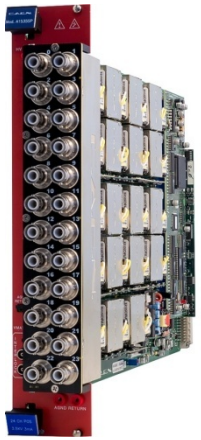
FBLM Gain Curve Characterization

- FBLM was put in beam line at A0 Photo-Injector at two different gradients.
- Data was taken at PMT input voltages of 300 V to 1000 V.
- Curve should be characteristic of all PMTs of same model. (Coefficients may differ.)



Power Supply (PS) Control Loop

- CAEN Technologies, Inc. PS and A1535SN HV board
- Objective was to control PS via modified LabVIEW program provided by CAEN.
- Code was altered to adjust voltages if there is a significant drift from set voltages.



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Power Supply Control Loop

- Controlled over TCP/IP by LabVIEW calls to a manufacturer-provided C++ library.
- Ping verifies TCP/IP connection, but LabVIEW fails to initialize.
- In future, C++ library could be used to diagnose this problem systematically or C++ program could be substituted for LabVIEW.

Machine Protection System (MPS)

- MPS will be employed at NML to safeguard accelerator from beam induced damage.
- Will use FBLMs in conjunction with Field-Programmable Gate Arrays (FPGAs) to monitor beam losses.
- Should be able to respond to losses within ns to μs range.
- Needs to be able to check functionality of FBLMs regularly with LEDs
- Each FBLM needs to be given a specific voltage based on its gain curve so that all are operating within a similarly linear portion of the curve.

Various Work for RF Group and NML

- Assembled and calibrated 30 kV anode modulator feedback loop printed circuit boards (PCBs)
- Assembled and calibrated fiber optic data acquisition transmitter and receiver PCBs.
- Helped clean parts for and assemble beam dump at NML.
- Installed flanged vacuum hose on vacuum cart in clean room at NML and checked system for leaks.
- Partially assembled 9-grid power supply chassis at MI-60.

Acknowledgements

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