

The PEM Cosmic Ray Detectors  
LIGO-T010088-00-H  
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The LHO and LLO cosmic ray detectors each have 4 photomultiplier tubes (PMTs). The specific descriptions below apply only to LHO. The setup for LLO is identical, but with different details.

The detector is located on the floor below BSC1. Each PMT requires 1 high voltage input (about 1 kV) and one analog signal output.

The analog signals are carried by 4 RG58 coax cables with BNC connectors. The cables are 34 m long and terminate at rack 1X4. The 4 high voltage cables are terminated with MHV connectors. They also go to rack 1X4 at LHO.

The analog signals terminate in analog electronics which uses one slot in a Eurocrate (4U ?) in rack 1x4. This electronics, built at UO, provides two functions: (1) shape the analog signals and convert I to V for subsequent digitization; (2) provide a logic trigger signal if the input is above threshold. The fast (few ns) PMT signals are shaped to a few  $\mu$ s by this electronics, which is compatible with LIGO timing and the 100 kHz sampling rate of the A/D.

The shaped signals are passed to a VME-VMIC 3123 A/D which is in a slot in the 68040 side of VME crate 1 in rack 1X5. The trigger signal goes to a Brandywine GPS slave module in this crate, which is to provide a time stamp for the event. Special VxWorks-based software running in the 68040 will readout the A/D and include the time stamp in an "event record" which is then shipped to a file on CDS disk. We expect the average event rate to be about 1 per hour, or so.

The high voltage is provided by a unit (2U) which resides in 1X4. This unit was built at UO. It is based on Bertan modules for the high voltage. We provide the controls and spigots for monitoring. We would like to have 8 slow EPICs channels to monitor the voltage and current for each PMT. The high voltage can be set remotely via this box, but we do not expect to use this capability initially.

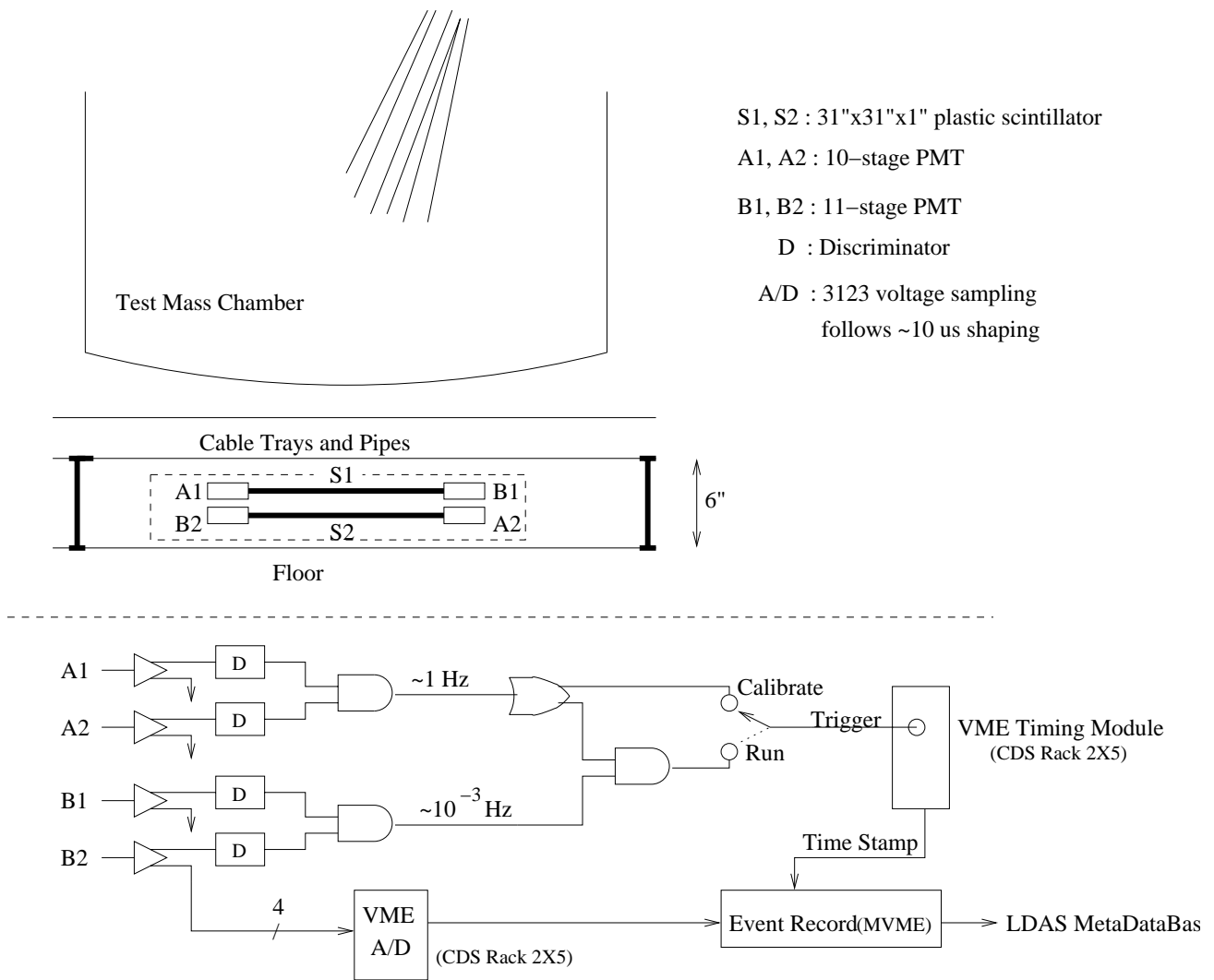


Figure 1: Schematic of cosmic ray detector and readout path.