

## Installation and commissioning of ALICE Photon Multiplicity Detector

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### Introduction

Photon Multiplicity Detector (PMD) [1,2] in the A Large Ion Collider Experiment (ALICE) at CERN, Geneva comprises of large arrays of hexagonal gas cells. The honeycomb structure forms the cathode with a wire at the centre of each honeycomb acting as the anode. The detector operates at a voltage of -1300V with Ar and CO<sub>2</sub> gas mixture in 70:30 proportions by weight. The preparation for installation was carried out in steps. Testing of module was done first on the test-bench at surface area, then on the detector stand, installations in ALICE-cavern and finally testing and commissioning of the detector.

### Testing on the Bench:

All the detector modules were tested with shorting connectors on the test bench with High voltages up to -1400V. After testing, backplane PCB's were fixed on the detector modules. The FEE boards and translator boards were mounted along with the kapton cables. The kapton cables are the flexible PCBs which carries detector signals to FEE boards. A test setup was made to test all the detector modules at surface area and modules have been tested with LV, HV and tested with Data Acquisition System (DAQ).

### Testing on detector Stand:

The detector modules are placed on the stainless steel support structure (SS) plates. Lead plates are mounted on the SS plates as well. Finally it

was fixed on the stand. All 40 modules were mounted on the SS plates with all FEE chains. We have 200 chains, readout by 4 CROCUS crates. Each CROCUS reads 50 chains (768channels/chain). All the 200 patch bus cables were laid on the sides of the modules, LV cables were connected to Translator boards and gas connections were completed. Temperature monitoring sensors were installed at many places, completing connections to ELMBs for monitoring temperature, LV and to provide RESET functions. The Low Voltage distribution boards (LVDB) have been fixed on the side patch-panel of the SS plates and all the LV connections have been checked by applying low voltages to LVDB's. The HV cables were tested and connected to all the 40 modules. Fig 1 shows the view of PMD (CPV side) with 20 modules mounted with FEE, LVDBS, and patch bus cables LV, HV cables connected.

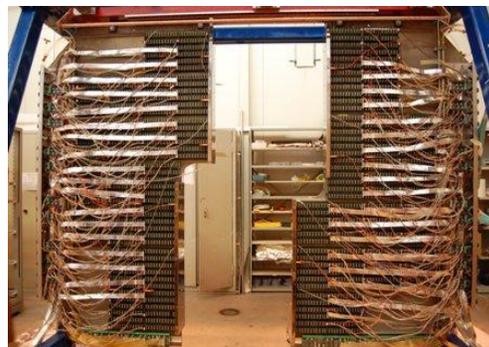


Fig1. Installation of PMD with all the electronics at surface area at CERN, Geneva (June 2009)

### Installation in the ALICE-cavern:

The readout for ALICE PMD involves reading of 154K channels from 40 detector modules organized over 200 chains requiring both high and low voltages. The low voltages required are for readout electronics to process both analog and digital signals, while high voltage is required for detector operation. We have used SY1527 a multi channel low voltage and high voltage system to distribute low and high voltages for the entire detector. All 48 modules needs 48 high voltage channels and the 288 readout channels need  $\pm 2.5V$  (VDD and VSS) for analog and  $+3.3V$  for digital circuits, along with  $3.3V$  for DAQ i.e. CROCUS.

The 200 readout channels are powered by 40 nos of LVDB taking low voltage from low voltage modules/boards (A3009B/A3025B) housed in EASY 3000 crates. The main frame i.e. SY 1527 houses a branch Controller- A1676 which acts as interface between the main frame and the remote EASY boards/modules. Each EASY 3000 is powered by 48V external DC (A3486) which is powered by 3 phase supply through a filter circuit. The main frame also houses the high voltage boards i.e. 1821N with each unit having 12 high voltage channels.

We have installed 4 such units to give HV to all the 48 detector modules. The A3486 has an output capacity of 48V with 40A and maximum power of 2KWatts on both channels and a total capacity 4Kwatts. The low voltage modules are DC to DC converters with an output adjustable in the range of 2 to 8V with a current rating of 9A for A3009B and 25Amps for A3025B. We have installed 12nos of A3009B modules in 4 EASY crates and another A3025B in one EASY crate for giving  $3.3V$  to DAQ. Each A3009B modules consists of 12 independent LV channels powering LVDB's.

### Commissioning of PMD in ALICE-cavern:

After pre-installation at surface area and other sub-system installation of PMD in ALICE-cavern, detector was taken to cavern and installed on the mini frame as shown in fig.2. During the commissioning of the detector, testing of FEE was done looking at pedestals for

all modules individually and then plane wise. During the DAQ tests it was seen that the temperature inside the detector with covers is rising to 40deg C. The cooling was not sufficient and so forced air cooling arrangement was made.

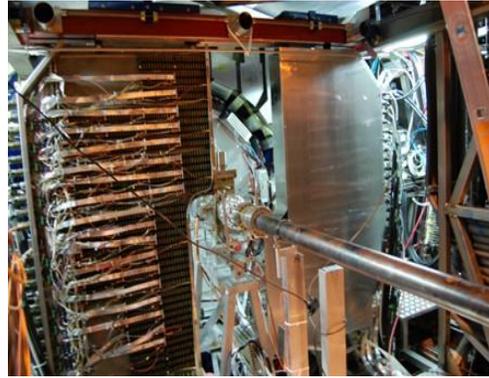


Fig 2. Final Commissioning photograph of PMD in ALICE along with all service lines at ALICE-cavern at CERN, Geneva.

After all these installation the detector was commissioned in by the end of 2009 as shown in fig. 2. This detector is working successfully and taking data for last one year. Details of installation with and experience of running of detector will be presented.

### References

- [1] Photon Multiplicity Detector Technical Design Report CERN/LHCC 99-32 (1999)
- [2] M.M. Aggarwal et al., Nucl. Instr. and Methods, A499 (2003) 751.