

The Long-Time Performance of MANAS Chip

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Introduction

MANAS is the front end readout chip of the five tracking stations of MUON Spectrometer in ALICE. A total of ~ 1.1 million cathode pads are readout by ~ 17000 MANAS NUMERIC (MANU) cards. Each MANU card is equipped with 4 MANAS chips, two 32 channels 12-bit ADCs to digitize the signals from 64 channels and a Muon Arm Readout Chip (MARC) to perform zero-suppression and transfer data to upper level. All the chambers of five tracking stations had been successfully installed at the experimental site at Point 2 of LHC during June-December, 2007 [1].

During March 2009, the MUON Spectrometer took Cosmic Muon data continuously for 15 days in Standalone mode. The Low Voltage (LV) power for the readout electronics was kept on throughout this whole period. Thus, this data provide information on the long-time stability of MANAS chips.

In order to investigate the performance, three parameters namely Pedestal, Noise and Gain were monitored during this period.

The Data Taking

The Pedestal run was taken in every four hours at a trigger rate of 100 Hz. The Noise estimation was done using the Pedestal data. Thus, everyday about 6 Pedestal runs were recorded. One Calibration run was taken everyday with the same trigger rate for 10 different input charges in the step of 50 fC through the calibration input of MANAS chip. The

HV of the chambers were kept at 1200 V during the Pedestal and Gain measurements. This was done to ensure that the chambers were passive. Fig. (1) shows the plot of Pedestal and Gain measurements.

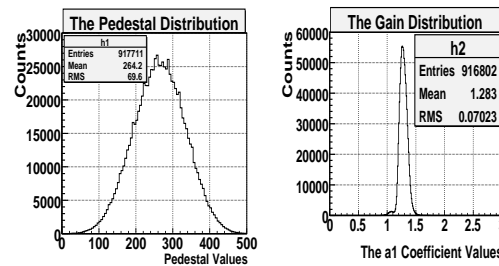


FIG. 1: The Pedestal and Gain Measurements

The Pedestal and Noise Measurement

We have evaluated the performance of MANAS chip, comparing the pedestal, noise and gain values of each electronic channel of each day (i) with respect to the first day (ref) i.e. 20th March, 2009. Each Pedestal run comprises of 450 events where the output voltage of all the 1.1 million channels are recorded with no input charge. The mean of these 450 values for a given channel is referred as Pedestal value for that channel. Fig. (2) shows the variation of mean of the Pedestals taken everyday and the RMS values of the distribution obtained by subtracting the individual Pedestal values from those observed on the first day. The electronic noise is defined as the sigma value of the Gaussian distribution fitted to the 450 Pedestal values for every channel. The plots in Fig. (3) are obtained in the same way as described for Fig. 1.

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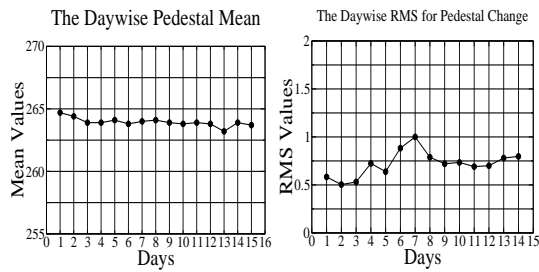


FIG. 2: The Distribution of Pedestal Level

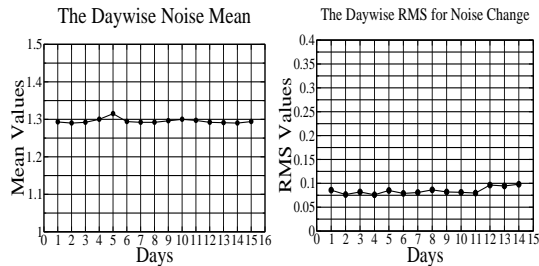


FIG. 3: The Distribution of Noise Level

The Electronics Gain Measurement

The gain calibration was done by fitting every electronic channel with a second order polynomial of the form $a_1x + a_2x^2$ where x is

the ADC channel. Fig. (4) shows the RMS value of the variation of individual a_1 and a_2 coefficients with respect to first day.

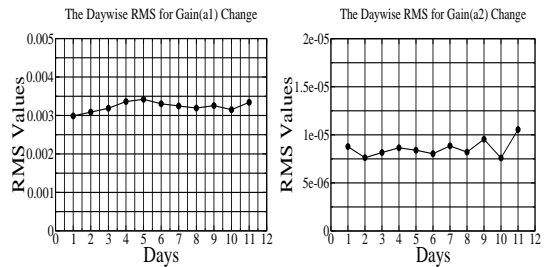


FIG. 4: The Distribution of Electronic Gain

Observations

The variation of plots clearly demonstrates a stable operation of 68000 MANAS chips over a period of two weeks. This behaviour is critical for long time data taking during LHC operation.

During August-September, 2009, another standalone Cosmic Run has been successfully completed which spanned over 30 days. The analysis of this data is being carried out.

References

[1] DAE-BRNS Symp. on Nucl. Phys. **53**, 685 (2008).