

Development of a Detector Control System for the RD51 cosmic ray test stand and for the GIF++ facility.

E. Gorini^{1 2}, L. Longo^{1 2}, M. Primavera², A. Ventura^{1 2},

¹Dipartimento di Matematica e Fisica "Ennio De Giorgi", Università del Salento, Italy

²Istituto Nazionale di Fisica Nucleare, sezione di Lecce, Italy

1. Introduction

The Large Hadron Collider (LHC) will be upgraded in several phases. After the second long shutdown (LS2) in 2018, the accelerator luminosity will be increased to $\sim 2 \times 10^{34} \text{cm}^{-2} \text{s}^{-1}$, allowing ATLAS to collect approximately $100 \text{fb}^{-1}/\text{year}$. A subsequent upgrade step is planned and will result in the luminosity increasing to $5 \times 10^{34} \text{cm}^{-2} \text{s}^{-1}$. The integrated luminosity with this ultimate upgrade will be 3000fb^{-1} after about 10 years of operation.

In order to take advantage of the improved LHC operation the ATLAS detector must be upgraded to have better performance at higher luminosity. The Phase-I upgrade of the ATLAS muon spectrometer focuses on the end-cap region to let the trigger work to the desired efficiency. ATLAS proposes to replace the present muon End-cap Small Wheels with the New Small Wheels (NSW). The NSW is a set of precision tracking and trigger detectors able to work at high rates with excellent real-time spatial and time resolution. These detectors can provide the muon Level-1 trigger system with online track segments of good angular resolution to confirm that muon tracks originate from the IP. The NSW consists of 16 detector planes in two multilayers. Each multilayer comprises four small-strip Thin Gap Chambers (sTGC) and four MicroMegas (MM) detector planes.

In order to achieve good performances for the MM detectors, the MicroMegas community has decided to carry out different tests about the detector aging and the performance under stress-conditions. As consequence a Detector Control System (DCS) has been developed, which is able to handle the currents and the voltages applied and to monitor the main variables involved in the stress-tests. In particular this DCS is currently used at CERN GIF++ facility and at the cosmic ray test stand at RD51.

2. Detector Control System

The aim of the DCS is to give the user a friendly interface to control any kind of CAEN power sup-

ply that it could be used during the MicroMegas tests. It has been developed using the *Wincc Open Architecture* software[1] integrated with the *JCOP framework*[2] to allow an easy configuration of the boards plugged into the power supply (Fig. 1). The CAEN *OPC server*[3] has been used for the communication between the CAEN module and the Detector Control System. Furthermore, in order to be able to monitor all the GIF++ facility information (Fig. 2), the DCS has been put in communication with the *DIP system*[4].

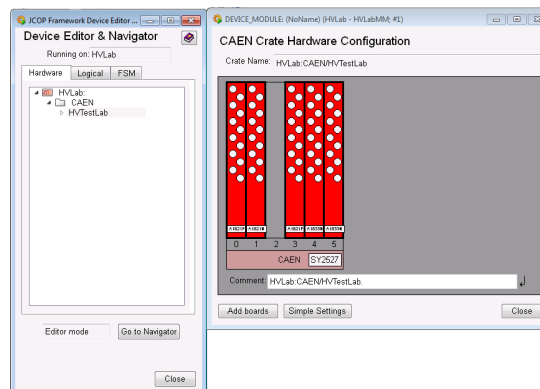


Figure 1. JCOP framework interface.

From the main panel of the Detector Control System, the user has the possibility to manage up to 10 Micromegas chambers; it is in fact possible to organize the channels in 10 groups, everyone dedicated to a specific detector, and to identify for each group the ones used to supply the resistive strips and the other used for the drift panels. Moreover, always on the main panel, for each channels group there is the possibility to select the dedicated page where the corresponding voltage and current instantaneous values are shown, together with their trend over the time (Fig. 3). It also present a dedicated page for some scintillators if they are supposed to be used in the test.



Figure 2. GIF++ bunker layout. An energetic beam of charged particle (mainly muons) is overlapped to a photon flux of 662 KeV produced by ^{137}Cs source of 13.9TBq. A filter system is also present to attenuate the photon rate. All the information about ambient variables, beam and source status, attenuation used are provided by DIP system.

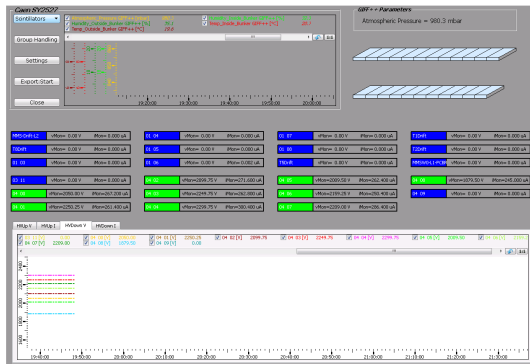


Figure 3. Typical layout of the main DCS panel. In the top left area the buttons used to call all the sub-panels needed to organize the channels, to set all the main CAEN parameters and to start the data-acquisition. In the top-center region the trend area dedicated to the ambient variables. In the middle and bottom part the region dedicated respectively to the instantaneous values and to the trend over the time of currents and voltages of the selected channels group.

In addition, while the main ambient variables are monitored in the top part of the main panel, the full set of GIF++ information, provided by DIP system, has a dedicated panel as shown in Fig. 4.

It has also been given the user the possibility

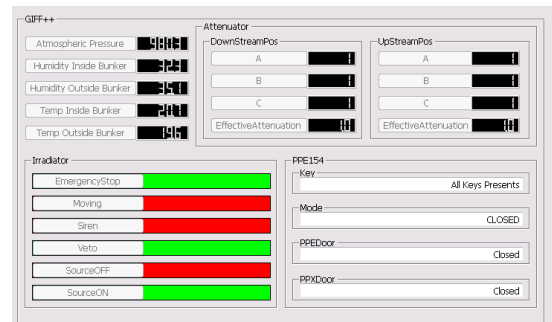


Figure 4. GIF++ panel.

to store in a root file the monitored data that are considered important for the analysis (Fig. 5); in particular the data acquisition is done every time that a parameter has had a variation higher than the one defined by the user or, in the case of no variation, after a chosen time interval.

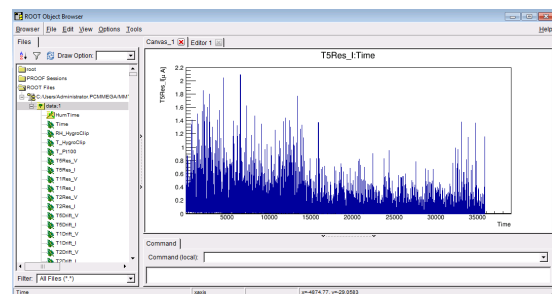


Figure 5. Example of the root file produce by the DCS. In the histogram the behavior of the current read by the resistive strip as function of the time.

REFERENCES

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