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DAQ of MARTA RPCs

MARTA, which stands for Muon Array with RPCs for Tagging Air showers, uses Resistive Plate Chamber detectors, a well known and established charge particles detector, to detect the muons that are produced in the cosmic ray air showers.

The front-end electronics and readout of this system is based on the MAROC ASIC, developed by OMEGA. This system presents a hybrid approach since it works in counting mode and is also able to read the charge that the incoming particles deposit in the detector. It is also expected that this system works with the minimum power consumption possible since this system is to be deployed in the field where there are power limitations. A prototype has been developed and is composed mainly by the ASIC, that will amplify the input signal as well as convert it to digital to then be fed to an FPGA that will perform all the digital electronics and finally a USB port to send the data to a computer.

The integration of the MAROC with the RPCs is not trivial since the ASIC was not created for the type of pulses that are outputted by this detectors. For this reason several test benches were created to assess the performance of this system. These benches go from a simple signal generator to simulate the output of a RPC, and is used mostly to develop firmware and software, to a bench where the detector being tested is placed in between a RPC telescope and is connected to our DAQ and another well established DAQ system, in order to compare the performance of the systems, and even a test bench that uses two RPCs and two DAQ prototype working in coincidence mode.

The system is already installed in several places around the globe, from Portugal to Brazil and in the near future will also be installed in the Pierre Auger Observatory in Argentina.

This work will focus on presenting this DAQ system as well as all the tests already performed to ensure that the system is optimized.

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