Contribution ID: **60** Type: **Poster**

Advanced Automatic Testing and Calibration System for ATLAS CSC on Detector Electronics.

The ATLAS muon spectrometer will employ Cathode Strip Chambers (CSC) to measure high momentum muons in the extreme forward regions [1]. The on-detector electronics for the ATLAS CSCs performs amplification, analog buffering, and digitization of the charge signals from individual cathode strips. We present production test architecture for on chamber electronics comprising of custom highly programmable 192 channels pulse generator, and a PCI technology based advanced data acquisition and control system: Read out and Test Amplifier Shaper Module (ASM), PCI Acquisition and Control (RATPAC). We also report progress on production and testing of the electronics.

Summary

I. Introduction:
The CSC system is designed to measure high momentum muons in the extreme forward regions (pseudorapidity 2.1 < |⊠| < 2.7) of the ATLAS detector [1]. Its principle of measurement is to determine the hit coordinates by interpolating charge deposited on adjacent strips. Those strips are coupled to the preamplifier and shaper ASIC designed in Agilent Technologies 0.5 μm CMOS technology. Second set of on detector signal processing electronics module, called Amplifier Shaper Module II (ASM-II) is responsible for analog storage, digitization of AC-coupled preamplifier outputs and transmission of the digitized data to off detector Readout Device (ROD). Those modules are currently under production and testing phase. Production testing involves functional testing and calibration of 30720 channels on each type of modules, effectively 61440 channels in total. An automatic testing and electronics calibration system is developed at BNL. The system has two main hardware components and LabView based Data Acquisition and Control Software (DACS). Hardware includes a Highly Programmable 192-channel Charge Injector (HPCI) and Peripheral Component Interconnect (PCI) Acquisition and Control, Read out ASM and Test (PACRAT) custom designed printed circuit boards (PCB).

II. HPCI

HPCI is programmable via parallel port on a Windows PC to configure any random combination of 192 channels. Programmability is incorporated in the DACS. Amount of injected charge is controlled by on board 12 bit Digital to Analog Converters (DAC), programmable via DACS. HPCI fits in a standard 19”test rack and the pack of ASM-I and ASM-II modules can be easily plugged into the front panel for testing.

III. PACRAT
PACRAT is a PCI Version 2.1 compliant data acquisition and control PCB. It supports PCI to and from local data transfers up to 70 Mb/sec. It has two independent DMA channels with scatter-gather capability. It is supported by low level PCI drivers for MS Windows and Linux. PACRAT contains two high speed 4MB Static Random Access Memories (SRAM) banks. It has two HDMP-1024 Giga bit link (G-link) receivers to receive data from and one HDMP-1022 G-link Transmitter to send readout control signals to the ASM-pack under test.

IV. DACS
DACS is a Lab View based interface program developed to control and acquire data from PACRAT, and also send signals to HPCI. The program also runs real time display and statistical analysis on ASM-Pack outputs. It records calibration data for every ASM-Pack into the production database.

V. Status
Complete setup for testing ASM-packs is functional and being currently used for

production testing and production test results will be available by the time of the conference.

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