Muon CSC Readout Upgrade

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The ATLAS muon Cathode Strip Chamber on the small wheel endcap provide precision muon tracking at high eta region. The present Readout Driver (ROD) can take data up to 70KHz of L1 trigger but it is at the limit of the technology used for the present ROD. An upgrade program was launched in 2012 to take advantage of the generic DAQ R&D Reconfigurable Cluster Element (RCE) concept originated from SLAC. This is as an integrated entity of electronics hardware and software support implemented on the high bandwidth modern ATCA (Advanced Telecommunication Computing Architecture) platform with I/O capacity at several hundred times faster than the more commonly used VME systems in HEP and a prime candidate technology for wide range of future experiments including ATLAS upgrade. The upgrade RCE readout for muon CSC is based on the modern XILINX ZYNQ System on Chip technology integrated with and embedded compact network switch on a Cluster on Board (COB) ATCA carrier board. The upgrade CSC readout is scheduled to be installed in Fall 2014. The production quality COB is being fabricated during May/2014 and summer 2014 will be an intensive period for CSC readout application implementation and testing.

Potential activities for students include preparing test software and running tests for some components of this complex new system to debug the application firmware/software and to assess/improve the performance of the design implementation. The tasks will involve online software programming on both the RCEs and UNIX sides to gain experience in real time programming and insight in the algorithms in firmware and software. The testing activities will help to acquire hands on knowledge of the design principles and behavior of cutting edge digital electronics and associated data communication technologies.

Literature and documentations:

Public info:

- RCE/ATCA talk by Mike Huffer at ACES 2011 (this is somewhat outdated as we bypassed Gen-2, moved on to Gen-3 - but no later public talk)

ATLAS internal:

- CSC Readout Upgrade Conceptual Design Review (Oct/2012) - still based on Gen-2
- nCSC readout report at muon week (Feb/2014) - this is latest
- RCE readout test stand Twiki at CERN
- Collection of CSC readout documentations

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