

Pixel/IBL detector commissioning and readout development

Pixel/IBL detector commissioning and readout development

The ATLAS pixel detector is expected to be upgraded by stage to meet the challenge of high occupancy and radiation dose at high luminosities. The first stage includes the installation of another inner-most pixel layer (Insertable B-Layer: IBL) on a smaller beam pipe within a refurbished current pixel detector. The IBL staves consist of both traditional planar sensors and the very radiation hard new 3D sensors bump-bonded to the new large FE-I4 readout ASICs in conjunction of various other new electrical and mechanical features. Following the installation of IBL in May/2014, a gradual reconnection and commissioning will commence towards the cosmic data taking with ATLAS by the end of summer. The commissioning tasks include calibrations and associated analysis to optimize the detector operational configuration and debugging any issues on detector component and service chain. Cosmic ray tests towards late summer will further probe the detector performance in finer details.

SLAC has provided the readout system for most of the IBL stave and system testing at CERN Point 1 SR1 building. This readout system is in particular using the first generation prototype 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 RCE readout at CERN for test stands and test beam are expected to be upgraded to Generation-III based on the modern XILINX ZYNQ System on Chip technology during Summer 2014. Potential activities for students include pixel calibration implementation and debugging on the new RCE platform and improving algorithms/interface/monitoring on the way that involve online software programming on both the RCEs and UNIX sides. The online programming part of the project can benefit from prior experience in C++.

Literature and documentations:

- [IBL Technical Design Report \(PDF 27MB\)](#)
- [IBL stave test setup at SR1 building at Point 1](#)
- [RCE readout system](#)

Contact: [Martin Kocian](#), [Michael Kagan](#)