

Pixel IBL Stave Testing

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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 the current pixel detector during 2013 shutdown. 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. The first IBL stave is still being assembled while the summer is expecting the first batch of production staves to be tested. SLAC has been a primary contributor in establishing the stave testing system at CERN Point 1 SR1 building. The stave test 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 ATLAS upgrade needs.

The tasks of this project will center on carrying out the IBL stave tests which include suite of calibrations, debugging specific failure issues, cosmic and source hit tests etc. With the test system being at the early phase of operation still, we expect continued effort to improve the test system that the rotation student(s) can contribute to. In particular the calibrations and DAQ tests are expecting improved algorithms/interface/monitoring on the way that involve online software programming on both the RCEs and UNIX sides. Other areas such as the cosmic trigger system can also use student contributions. The stave testing activities have no specific skill requirement other than good sense for experimental setups in general. The online programming part of the project can benefit from prior experience in C++. This project can take several students at the same time.

Literature and documentations:

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

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