Contribution ID: **45** Type: **Poster**

Quality Assurance and Functionality Tests on Electrical Components during the ATLAS IBL Production

Tuesday 24 September 2013 17:52 (1 minute)

During the shutdown 2013/14, for the enhancement of the current ATLAS Pixel Detector a fourth layer (Insertable B Layer, IBL) consisting of 14 staves is being built and will be installed between the innermost layer and a new beam pipe. A new read out chip
generation has been developed and two different sensor designs, a rather conventional planar
and a 3D design, have been flip chipped to these front ends. New staves
and module flex circuits have been developed as well. Therefore, a production QA test bench has
been established to test all production staves before integration with the new beam pipe.
Quality assurance measurements under cleanroom conditions, including temperature and humidity control, are performed on the individual components during the various production steps of the IBL, namely connectivity as well as electrical tests and signal probing on individual parts and assembled subsystems.
The pre-assembly QC procedures, the capabilities of the stave qualification setup, and recent
results from stave testing are presented and discussed.

Summary

The Large Hadron Collider (LHC) is the largest and highest-energy particle accelerator in the world. The Pixel Detector is a subsystem of the ATLAS detector. It has 80 million channels and provides a lot of data to be used for identification and reconstruction of primary and secondary vertices.
During the shutdown 2013/14, for the enhancement of the current ATLAS Pixel Detector a fourth layer (Insertable B Layer, IBL) consisting of 14 staves is being built and will be installed between the innermost layer and a new beam pipe. A new read out chip
generation has been developed and two different sensor designs, a rather conventional planar
and a 3D design, have been flip chipped to these front ends. New staves
and module flex circuits have been developed as well. Therefore, a production QA test bench has
been established to test all production staves before integration with the new beam pipe.
With this setup all production staves will be tested to ensure the installation of only those staves which fulfill the IBL criteria. Quality assurance measurements under cleanroom conditions, including temperature and humidity control, are performed on the individual components during the various production steps of the IBL, namely connectivity as well as electrical tests and signal probing on individual parts and assembled subsystems.
The pre-assembly QC procedures, the capabilities of the stave qualification setup, and recent
results from stave testing are presented and discussed.

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Session Classification: Poster