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Overview of the Insertable B-Layer (IBL) Project of the ATLAS Experiment at the LHC

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For the enhancement of the current ATLAS Pixel Detector, During the shutdown 2013/14, 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 of radius 3.3 cm. A new read out chip (FEI4B)
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

Several upgrades are foreseen for the high luminosity LHC. During the current LHC shutdown, one of the major upgrade programs for the ATLAS experiment is an upgarde of the inner detector. A new fourth layer of pixels, the Insertable B-Layer (IBL), is planned to be installed by mid 2014 between the existing pixel system and a new beam pipe with a reduced diameter (29 mm outer diameter).
The principal motivation of the IBL is to provide an increased tracking robustness allowing to maintain an excellent vertex detector performance and to compensate possible inefficiencies of the current b-layers of Pixel Detector. The IBL requires the development of several new technologies to cope with increased radiation and pixel occupancy and improve the physics performance by reduction of the pixel size.
The IBL presents several modifications with respect to the current pixel detector in terms of pixel technology used and the read out electronics. Before the loading of the modules to the staves and mounting staves to the beam pipe, the functionality of these components has to be tested, verified and detailed quality assurance procedure is considered.

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