Schlagworte:

LHC,
ATLAS,
Vertexdetektor,
vertex detector,
Pixel,Sensor,
pixelsensor,
particle detector
test beam,
Teilchendetektor,
radiation damage,
production,
performance,
system test,
readout,
DAQ,
noise occupancy,
depletion voltage,
optical communication,
online monitoring,
bytestream converter

Abstract:

The ATLAS Pixel Detector, the innermost sub-detector of the ATLAS experiment at the Large Hadron Collider, CERN, is an 80 million channel silicon pixel tracking detector designed for high-precision charged particle tracking and secondary vertex reconstruction. It was installed in the ATLAS experiment and commissioning for the first proton-proton collision data taking in 2008 has begun. Due to the complex layout and limited accessibility, quality assurance measurements were continuously performed during production and assembly to ensure that no problematic components are integrated. The assembly of the detector at CERN and related quality assurance measurement results, including comparison to previous production measurements, will be presented. In order to verify that the integrated detector, its data acquisition readout chain, the ancillary services and cooling system as well as the detector control and data acquisition software perform together as expected approximately 8% of the detector system was progressively assembled as close to the final layout as possible. The so-called System Test laboratory setup was operated for several months under experiment-like environment conditions. The interplay between different detector components was studied with a focus on the performance and tunability of the optical data transmission system. Operation and optical tuning procedures were developed and qualified for the upcoming commissioning. The front-end electronics preamplifier threshold tuning and noise performance were studied and noise occupancy of the detector with low sensor bias voltages was investigated. Data taking with cosmic muons was performed to test the data acquisition and trigger system as well as the offline reconstruction and analysis software. The data quality was verified with an extended version of the pixel online monitoring package which was implemented for the ATLAS Combined Testbeam. The detector raw data of the Combined Testbeam and of the System Test cosmic run was converted for offline data analysis with the Pixel bytestream converter which was continuously extended and adapted according to the offline analysis software needs.