Contribution ID: **133** Type: **Oral**

The ATLAS Beam Condition Monitor Commissioning

Wednesday 17 September 2008 11:25 (25 minutes)

The ATLAS Beam Condition Monitor (BCM) based on radiation hard pCVD diamond sensors and event-by-event measurements of environment close to interaction point (z=+/-184 cm, r=5.5 cm) has been installed in the Pixel detector since early 2008 and together with the Pixel detector in the ATLAS cavern since June 2007. The sensors and front end electronics was shown to withstand 0.5 Mrad and 10ˆ15 particles/cmˆ2 expected in LHC lifetime. Recently the full readout chain, partly made of radiation tolerant electronics, still inside of the ATLAS spectrometer and partly in the electronics room, was completed and the system is now ready for the first LHC single beams as well as first collisions this summer.

Summary

The ATLAS Beam Condition Monitor (BCM) is based on radiation hard polycrystalline chemical vapor deposition (pCVD) diamond sensors and off the shelf monolithic amplifiers both tested to withstand the harsh radiation environment in ATLAS close to interaction point. They were proven to be operational after large dose of 0.5Mrad and flux of 10ˆ15 particles/cmˆ2 which is expected for the LHC lifetime. Eight modules were installed symmetric around the interaction point four on each side at z=+/-184cm and at r=5.5cm equally spaced in polar angle around the beam-pipe at phi=0, 90, 180 and 270 degrees. It has been installed in the Pixel detector since early 2008 and together with the Pixel detector in the ATLAS cavern since June 2007.

The amplified signal from diamond sensors of sub ns rise-time and width of order of 2 ns is transformed into time-over-threshold measurement in electronic board based on NINO chip originally developed for ALICE experiment. The chip preserves the excellent timing characteristics of the input signal and encodes input signal amplitude into the output signal width. The signals are then taken over optical fibers to FPGA based readout board for further processing.

The ATLAS BCM primary goal is measurement of environment close to the interaction point in ATLAS spectrometer. It will distinguish normal interactions from background events caused by beam particles hitting collimators or beam gas on the basis of timing measurement and absolute rate measurement. The background events coming from one side will cause signals of different arrival times on one side of interaction point than on the other. One type will precede the other for 12ns, about half of bunch to bunch time spacing, due to position of the modules chosen.

In addition ATLAS BCM will be able to trigger interesting events that will happen in ATLAS at pseudo-rapidity of approximately 4. It fits its trigger information into 9 bits in the central trigger processor. Furthermore, each of triggered events in ATLAS will have also full record of eight BCM modules including the time of arrival of the particle at the sensor as well as the amplitude encoded in the width of the signal.

The noise performance of the full system was tested in situ and compared with reference results from test-beams and laboratory measurements. Parts of the system were previously tested successfully in various test-beams and trough comprehensive QA procedures. The system is ready for the fort single LHC beam measurements as well as for the first proton-proton collisions.

Primary author: Dr GORISEK, Andrej (J. Stefan Institute, Ljubljana, Slovenia)

Presenter: Dr GORISEK, Andrej (J. Stefan Institute, Ljubljana, Slovenia)

Session Classification: Parallel Session B3 - Machine-Experiment, BCM