

SCT and TRT Performance from Cosmic Ray Runs

Wednesday, 5 September 2007 15:05 (25 minutes)

The Barrel and Endcap SCT detectors have been integrated into the barrel and Endcap TRT detectors. There have been cosmic ray runs for the Barrel and Endcaps in the surface building (SR1) and after installation in the ATLAS cavern. This talk will focus on the most recent results. The procedure for timing in the SCT and TRT for Cosmic runs will be described as well as the procedures to ensure that the readout of the two detectors remained synchronous. Several tests were performed to see if the operation of the SCT (TRT) induced any noise in the TRT (SCT). The cosmic ray data are used to evaluate the SCT module and TRT straw efficiencies for MIPs and to verify that the noise occupancies are as low as expected from the calibration scans and from similar measurements in a controlled environment. This provides a critical test of the large-scale system performance of the integrated barrel SCT/TRT and end-cap SCT/TRT detectors. The cosmic ray data also provide key data for initial alignment studies with tracks, and the most recent results are summarised.

Summary

The Barrel and Endcap SCT detectors have been integrated into the barrel and Endcap TRT detectors in the CERN SR1 building. A large sample of cosmic ray data was acquired in SR1 and this was invaluable for understanding the system performance of these detectors. This also provided the opportunity for synchronous operation of the SCT and TRT and was therefore a critical test of the ATLAS DAQ system. A brief summary of the analysis of the SR1 cosmic ray data will be presented.

This talk will focus on the results of the first noise tests and cosmic ray data from the combined SCT and TRT runs after installation in the ATLAS cavern. These results provide the first determination for the noise performance of the SCT and TRT in-situ with the final electrical grounding scheme implemented. These results will be compared with data taken at earlier stages of detector integration. Several tests of the grounding scheme will also be discussed. Some tests were also performed to see if the SCT (TRT) operation induced any excess noise in the TRT(SCT).

The best indication of the performance of the SCT and TRT during ATLAS operation will come from the cosmic ray runs in the ATLAS cavern. A cosmic ray trigger will be provided by the ATLAS muon trigger system. A critical issue in a pipelined system is to time all the detectors in correctly. The procedures used for the SCT and the TRT will be reviewed and the results of timing scans used to verify the calculations will be discussed. Another critical issue for a pipelined system is to ensure that different detectors remain synchronized during a run and the tests used to check this will be presented. The cosmic ray muons will allow for the determination of the SCT module and the TRT straw efficiency for MIPs. At the same time this data will check that the noise occupancies in real operation is as low as that expected from the electronic calibration runs. This will therefore provide a critical system test for the operation of the full SCT/TRT systems.

The cosmic ray data will also be invaluable for the first alignment of the SCT and TRT detectors. The analysis of the SR1 cosmic ray data gave very encouraging results. More detailed studies will be possible with the new cavern cosmic ray data and since the detector is installed in its final location, any distortions measured will be representative of the operational system. As the muons will traverse the full SCT and TRT detectors, the alignment analysis will allow for the determination of some low frequency spatial modes of the detector which will not be constrained by pp data, such as sagitta distortions.

Primary author: Dr SANDAKER, Heidi (CERN)

Presenter: Dr SANDAKER, Heidi (CERN)

Session Classification: Parallel session A5 - Systems, Installation and Commissioning 3 (TK and Pix, Lumi)