Contribution to the construction of the CMS Tracker Endcaps

O.Bouhali, B.Clerbaux, J.-P.Dewulf, J.D'Hondt, R.Goorens, J.Heyninck, S.Lowette, L.Neukermans, S.Tavernier, F.Udo, C.Vander Velde, P.Vanlaer, L.Van Lancker, C.Wastiels, J.Wickens, C.Yu

Inter-University Institute for High Energies (IIHE)
ULB-VUB (Brussels),Belgium

Abstract

The Compact Muon Solenoid or CMS detector has been designed as a multipurpose detector to study proton collisions at the Large Hadron Collider. The experiment will allow to extend our understanding of contemporary elementary particle physics, via precise measurements to test the consistency of the Standard Model, the possible discovery of the Brout-Englert-Higgs boson and via searches for new physics beyond the Standard Model. Essential ingredients in obtaining these objectives are the measurement and identification of muons, electrons, photons and jets over a large energy range. Experience has shown that robust tracking and detailed vertex reconstruction within a strong magnetic field are powerful tools to reach these objectives.

The IIHE is involved in the construction of the forward (backward) silicon Tracker. This forward detector consists of about 10000 carbon fibre support frames onto which the silicon sensors of typically 100 cm^2 surface with 512 channels and the readout hybrids are glued. The large number of modules requires an automated procedure which is obtained with a high-precision robotic positioning machine. The accuracy needed for component placement is at the level of 10 μm. The individual detectors are hereafter tested electronically at room temperature for proper functioning before they are integrated onto sectors. As the effective working temperature of the CMS Tracker will be about -10^{o}C, studies are performed to estimate the influence of the temperature on the deformation of the silicon sensors. The subsequent step is to mount the modules on larger detector sectors, azimuthal around the beampipe. Integration tests are in turn peformed, comprising tests of the complete readout chain of the sector, as well as monitoring of the gain, noise and temperature of each silicon detector. An overview of the full forward Tracker construction procedure will be presented.

(Contribution for the BPS International Scientific Meeting 2004)