THE CMS COMPACT MUON SOLENOID

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Summary

The CMS Collaboration consists of more than 1600 members from 138 institutes and 31 countries.

The detector will be built around a long (13m), large bore (ϕ=5.9m) and high-field superconducting solenoid (4 T). The central tracking system consists of pixel detectors, placed close to the interaction region. The electronic readout is focusing on an analogue design with staggered 125 µm square yielding a good position resolution of ˜ 15 µm in both coordinates. Next come the silicon microstrip detectors which are able to withstand the radiation fluences expected over ten years in CMS. The first prototypes of a support structures with silicon detectors were constructed in 1997 using low mass composite material. Pixel and Silicon detectors will be operated at -5°C. Several layers of microstrip gas chambers (MSGC) form the outer part of the Central Tracker. Full size prototype modules (25cmx10cm) of MSGCs have been constructed with a light mechanical structure.

For the electromagnetic calorimetry CMS has chosen scintillating crystals, namely lead tungstate ($PbWO_4$) which offer the best energy resolution for electrons and photons. Crystal parameters such as light yield, scintillation speed and mechanical tolerances as well as sufficient radiation tolerance have been significantly improved in 1997. Avalanche Photo-Diodes (APD) detect the scintillation light. A preshower detector consisting of two lead/silicon detector layers will be placed just in front of the endcap crystal calorimeter. It will be operated at -5°C.

The last detector in front of the coil is the Hadron Calorimeter which consists of a copper/scintillator sandwich.

Inside the magnet yoke 4 layers of muon chambers are inserted. Each muon station consists of twelve planes of aluminum drift tubes (DT). Each of the four endcap stations consists of six planes of Cathode Strip Chambers (CSC). A second, fast and redundant, Level-1 trigger is provided by Resistive Plate Chambers (RPC).

The total cost of the CMS detector is ˜ 475 MCHF and it should be completely installed in point 5 in summer 2005. For this installation the handling and transport provided by the ST division will play an important role and requires a large amount of manpower.

Contrary to LEP detectors the LHC detectors have a high power dissipation due to their fine granularity mainly in the Central Tracker. In fact, the heat load in CMS is expected to be 3628 kW. As a consequence a complicated and heavy low voltage system and large cooling systems are required. Therefore, the ST CV group has to provide a considerable support to design and install these large cooling systems.