

CERN-RRB-2006-096
3 OCTOBER 2006

PRINCIPAL LHCC DELIBERATIONS

23RD MEETING OF THE CMS RESOURCES REVIEW BOARD

24 OCTOBER 2006

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GENERAL

This document summarises the principal LHCC deliberations concerning CMS at the Committee's sessions in May, June and September 2006.

The LHCC took note of the submitted CMS Physics Technical Design Report Vol. II.

CONCERNS FROM THE PREVIOUS CMS RESOURCES REVIEW BOARD

SUB-SYSTEM	CONCERN	STATUS
Silicon Strip Tracker (SST)	The SST continues to be on the critical path for completion of CMS.	Excellent progress was reported on the SST with the integration of the SST expected to be complete by the end of 2006. However, the overall schedule of the SST remains tight.
Electromagnetic Calorimeter (ECAL)	Crystal production for the ECAL Barrel and ECAL End-cap is on the critical path.	Production of crystals has improved. However, the overall ECAL schedule is still driven by the crystal delivery rate, resulting in a very tight time-line for the installation of the detector in CMS.
Muon Spectrometer	The critical path items goes through the cabling of the detectors.	Significant progress is being made on the detector cabling.

LHCC COMPREHENSIVE REVIEW

EXECUTIVE SUMMARY

The seventh annual LHCC Comprehensive Review of CMS took place on 26-27 June, 2006. The LHCC referees addressed the following areas: Tracker, Electromagnetic and Hadronic Calorimetry, Muon Spectrometer, Trigger/DAQ, Computing/Software, and the topics of Management, Technical Coordination, Integration, Schedules and Costs.

Since the previous LHCC Comprehensive Review a year ago, the CMS Collaboration has made very good progress towards producing a detector ready for LHC operation in the fall of 2007. The past year saw all sub-detector groups successfully produce high-quality components and modules, and integrate them into the final objects to be installed into the CMS magnet. At least as important, the magnet coil has successfully been cooled and tested, and at time of writing is being prepared on the surface for a full test and field map, during which time CMS will take cosmic-ray data to commission the detector systems and data acquisition. *Since the Comprehensive Review, the Solenoid Magnet full test and the Cosmic Challenge (MTCC) have been completed successfully and the LHCC congratulated the CMS Collaboration on the excellent results obtained. The successful MTCC also gave an extensive proof that the detectors, electronics and trigger and data acquisition system can function as an integrated experiment.*

The LHCC is pleased to note that all sub-detectors have kept on schedule, but caution that the general infrastructure in the underground areas has fallen significantly behind, and must not be allowed to slip further. *Since the Comprehensive Review, the LHCC noted the excellent progress through the summer of the work in the underground service and experiment caverns of CMS. Preparations are now underway for the lowering of the first CMS detector units.* Technical Coordination must be greatly expanded to meet the demands of the “end game” in which multiple tasks must be performed in parallel to the difficult environment of the UXC55 and USC55 caverns. The Committee has special concerns for the cabling and piping of the Tracker and Electromagnetic Calorimeter (ECAL) following the lowering of YB0, and again after the Tracker has been installed into CMS. The CMS management has requested additional resources from their Resource Review Board (RRB) to help them meet the schedule for the LHC engineering run, and for completing the End-Cap ECAL (EE) for 2008. The Committee is persuaded that these resources are essential, and hope the RRB can secure them.

The conclusions and concerns of the LHCC are given below. They will help the Committee to follow up outstanding issues and to monitor future progress of this project in forthcoming sessions of the LHCC prior to the next CMS Comprehensive Review one year hence.

OVERVIEW

- The new draft schedule v35.0 shows the detector complete and ready for final closing on August 31, 2007, with no contingency. Additional resources have been requested to the CMS RRB to consolidate the CMS schedule. It is realistic to expect CMS to have installed an initial working detector, without the EE and Pixel Detector, suitable for the first operation of the LHC starting in the fall 2007.
- Excellent progress has been presented on the CMS Tracker Project, although the overall schedule remains very tight. Production of components is complete, as is the integration of Tracker Inner Barrel TIB+. The Tracker Inner Barrel TIB- is nearing completion and will be shipped to CERN in August 2006. The Tracker End-Cap TEC+ integration is half-complete in Aachen, and the Trigger Outer Barrel TOB and TEC- are well underway in the Tracker Integration Facility at CERN. The schedule for the installation of a fully integrated Tracker system at P5 is very tight and critically relies on no delays on the YB0 installation. The LHCC will review the Beam Conditions Monitor (BCM), and also the plans for luminosity monitoring, at an appropriate time in the early fall. *Since the Comprehensive Review, the progress on the CMS Tracker has been excellent.*

The integration of the Tracker is expected to be complete by the end of 2006 and the LHCC considers that the overall schedule remains credible.

- The ECAL is progressing well. The schedule is tight, but the end dates for both the ECAL Barrel (EB) and EE are driven by the crystal procurements, the rate of which has been stable for some time. There are currently no other major concerns. The EE and Preshower (ES) assembly is in a very early stage and must be closely followed. Even a modest increase in the rate of EB and/or EE crystal production would be extremely valuable.
- The Hadron Calorimeter (HCAL) is complete, with no major concerns. The HCAL Barrel (HB) has been successfully installed into YB0 in preparation for the MTCC. The problem with the source appears to have been solved, but bears continued watching.
- Since the previous Comprehensive Review significant progress has been made in all areas of the Muon project. Preparations for the MTCC are going very well and a lot of important information can be expected from the data to be taken with magnetic field. *Since the Comprehensive Review, a significant amount of data were collected during the MTCC and is being currently analysed.* There is some concern that installation and commissioning of the remaining detectors will interfere with work ongoing on other subsystems. It must be ensured that the necessary manpower is available for completion of installation and cabling of detectors before the wheels are lowered to UXC55. Studies of the recently observed correlation of filter regeneration and dark currents in some of the Resistive Plate Chambers (RPCs) have to be performed with highest priority.
- The LHCC notes continued progress for the Trigger and DAQ projects. These systems are on track to be operative in an initial configuration for the 2007 run. The Global Calorimeter Trigger (which is not required till 2008) has been redesigned. The schedule is very aggressive, but is not on the critical path.
- Good progress was reported on Computing and Software, marked by the submission of the Computing Technical Design Report and two volumes of Physics Technical Design Report. Computing and Software are ready for the MTCC and preparations for Computing, Software and Analysis Challenge 2006 (CSA06) are essentially on track. A first instance of the CMS Tier-0 center at CERN is being set up, which will be used for CSA06. Performance of reconstruction and High Level Trigger (HLT) code under the new software framework should be quantitatively assessed.