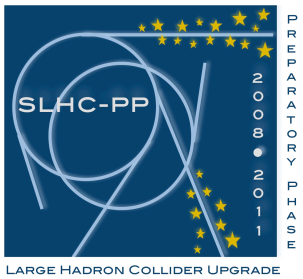

SLHC-PP

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The Preparatory Phase of the Large Hadron Collider upgrade (SLHC-PP) is a project co-funded by the European Commission in its 7th Framework Programme under the Grant Agreement n° 212114. SLHC-PP began in April 2008 and will run for 3 years.

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1. EXECUTIVE SUMMARY

The upgrade of the CMS detector for sLHC is organized as one project inside the organization of the experiment. The project structure mirrors the experiment organization with a technical coordination unit and subdetector structures. Details of the project structure will be reported in the deliverable report 4.1.1.

The technical coordination organizes all technical aspects of any upgrade. This includes a complete review and approval process, allocation and administration of lab space, for components to be assembled at CERN, the integration of any new or upgraded component into CMS, and integration of any necessary changes in the experiment infrastructure. The responsibility of technical coordination ends when the data is delivered to the central data acquisition system.

The organizational structure and the reporting lines of technical coordination for the upgrade are the same as for the construction of the original detector. With that all structures are in place and have proven to work efficiently. All changes of the CMS detector after the end of the current shutdown are regarded as upgrades and will be part of the upgrade project.

2. INTRODUCTION

According to the current planning, the LHC will be upgraded in at least two steps in between which it will be operated. Therefore also the detector upgrade will be spread out over several shutdowns. The upgrades must be organized such that the detector can take high quality data with high efficiency in between the upgrade steps. The following components will be upgraded in the first phase, the forth layer of the CSC muon endcap detectors, some layers of the RPC endcap detectors and the Si-Pixel vertex detector. The hadron calorimeter group plans an upgrade of its electronics and a change of the photo detectors, the CSC will need new electronics and the trigger will need some upgrade to cope with higher luminosity. For the final upgrade the largest project will be a replacement of the entire central tracker. In this phase the muon detectors will require new electronics and the trigger system has to be replaced. Whether or not the endcap detectors of the calorimeters can be operated at the full luminosity of SLHC is still under study.

These tasks define the scope of the technical coordination for the CMS upgrade.

3. ORGANIZATION OF TECHNICAL COORDINATION FOR THE CMS UPGRADE

The planning for the CMS upgrade is a project within the CMS experiment organization. The project organization mirrors the experiment structures. Very early on in the project it was decided not to set up a new Technical Coordination organization in parallel to the existing one but to use the existing and well proven structures to manage the upgrade. Therefore the Upgrade-Technical Coordinator interacts with the Technical Coordinators of the subdetectors and they will report in regular meetings as they do currently for the final assembly of the original detector.

Also the review and approval process has been taken over from the construction of the original detector. Usually a Letter of Intend is followed by a Technical Proposal, an Engineering Design Review and Production Readiness Review. All steps have to be approved by the CMS management.

Particularly important for any upgrade are all aspects of integrating new components into a running detector. A key role plays here the Integration Office responsible for the mechanical integration and the assembly procedures. During the entire approval process the Integration Office together with the Technical Coordination has regular engineering meetings with the proponents to assure a smooth integration of any upgraded component. Of similar importance are the integration of new electronics and new infrastructure into the running experiment. The Electronics Coordination will take care that old and new components work together. A lesson learnt from the assembly of CMS is that close communication and collaboration of the Integration Office and the Electronics Coordination will avoid conflicts and problems with space allocation. Therefore the electronics integration will be regularly on the agenda of the integration meetings. The Integration Office is able to provide engineering support for necessary infrastructure changes and for assembly tools.

A very important starting point for any upgrade of an existing detector is a valid as build model. The Integration Office has therefore a section that collects, verifies and validates models of all components. They will be integrated into the large CMS equipment data base that contains all pieces of the detector. The work of this section provides the infrastructure necessary to upgrade CMS.

4. CONCLUSIONS

Using its existing structures CMS will be able to perform the upgrade of the detector in several steps. In between the different upgrade steps the detector will be able to take high quality data with high efficiency.