

Work Package 4

Text taken from "description of work" (Annex 1 of the proposal)

Substantial changes to the CMS experiment will be necessary to upgrade the apparatus for exploitation of the physics opportunities at SLHC. The improved apparatus (CMS2) will be able to handle a factor 10 more luminosity and will incorporate experience from several years of operation at LHC. Changes are needed to most of the detector systems and it may be necessary to radically re-design the forward regions, depending on the choice of the final focusing scheme to achieve high luminosity at SLHC. Large parts of the central tracking system and its services will need to be replaced to cope with higher luminosity and the resulting radiation dose. In addition, readout and trigger electronics and the data acquisition system will need to be modified or replaced to deal with higher collision rates and a possible different bunch spacing in the accelerator. Since CMS is a highly complex, compact apparatus, designed for rapid maintenance and implemented by a large number of institutes worldwide, the technical challenges of replacing major parts requires very careful technical planning and a sophisticated co-ordination effort.

The current CMS experiment is a collaboration of over 2000 scientists and engineers involving 130 institutes worldwide, and represents a material investment of 350 M€. The changes needed to accomplish the CMS2 apparatus, compatible with the SLHC physics program, have been estimated to cost around 130 M€ in materials, and could include up to half the institutes and personnel involved in developing the current systems. Once approved, the timescales for constructing the new parts and installing them are estimated to be approximately 5 years.

Objectives

- the preparation of the management/organisation/scientific structures needed to plan, cost and implement the experiment upgrades; including the preparation of agreements defining the sharing of responsibilities among the participating institutes and funding agencies (FA)
- the technical planning and coordination studies needed to allow the changes to be efficiently and safely implemented in large complicated existing experimental facilities
- the organisation of scientific exchange and dissemination of information to the potential participants in R&D activities targeted to future SLHC implementation

Description of work

Task 4.1 Coordination and organisation of CMS2

Overall coordination task for managing the upgrade of the experiment for SLHC; identification of participating institutes and their contribution, including activities related to seeking and integrating new partners; definition of the organisational project structure needed to manage the consortium of institutes participating in the construction and modification work; negotiation with institutes and funding agencies to establish collaboration agreements, cost books and reporting methods; exchange and dissemination of scientific and technical information (CERN, Imperial)

Task 4.2 CMS2 Technical Coordination Unit

Creation of a CMS2 Technical Coordination Unit, responsible for providing the framework necessary for proper coordination of all aspects of the upgrade and modification work. The structure will incorporate experience from the Engineering Integration Centre and Electronics Steering Group successfully used for mechanical and electronics integration of the existing CMS experiment. Key structural requirements are: accurate and continually updated central information repositories with change control procedures, encompassing the as-built structure and evolving upgrade design and the inventory of existing equipment; agreed tools for design of modifications; frameworks for coordinating and reviewing conceptual and subsequent detailed design; a quality management system; provision for safety oversight; an office charged with ensuring coherent integration, resolving integration conflicts and studying installation scenarios and tooling requirements. The unit will also define a scheduling and reporting mechanism, including milestone definition, progress reporting, transparent connection to the CMS run operations structure in order to fully incorporate experience with the existing experiment and to minimise the impact of upgrade work on the physics programme. (CERN, DESY, ETH Zürich).