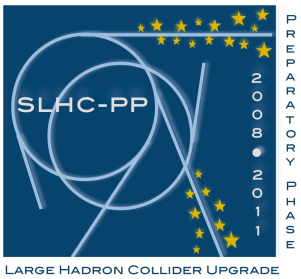

SLHC-PP

MILESTONE REPORT

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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.

SLHC-PP Milestone: 4.1, Upgrade Project Scope defined
Due: M18 (before September 30, 2009)

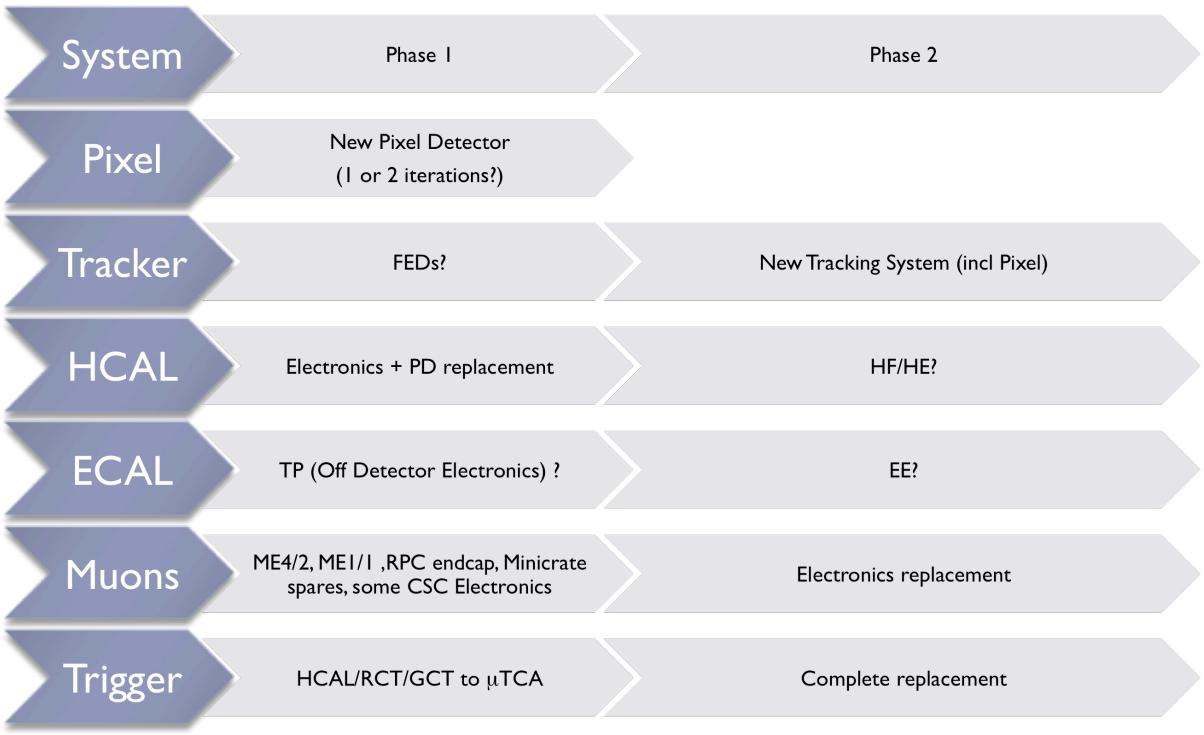

Figure 1 – High level outline of Upgrade Scope for CMS detectors

The CMS Upgrade scope was initially discussed during the CMS upgrade workshop in May 2008 [1]. At this workshop, each detector presented its ideas for early upgrades able to cope with up to 700/fb of integrated luminosity, as well as longer-term upgrades for up to 5000/fb of integrated luminosity.

At the CMS upgrade workshop in November 2008 [2], a work plan for refining each of the early (Phase 1) upgrade options was agreed. In addition, a task force was created to study the issues relating to using the tracking system in the level 1 trigger. Reports at the May 2009 Workshop [3] gave a clear picture of the readiness for construction and required additional R/D for phase 1 upgrades, as well as allowing a clear work plan for phase 2 R/D to be developed. An additional task force was created during the summer of 2009 to study the issues which will be required in order to upgrade the forward regions of the calorimeter for high luminosity running (ECAL/HCAL on the roadmap).

Figure 1 shows the roadmap of detector system components that will need to be upgraded for the two phases of high luminosity running. For each of the components in phase 1, detailed planning is now underway. For the phase 2 upgrades – a full plan of R/D is now in preparation for choosing between potential options for longer term upgrades to CMS.

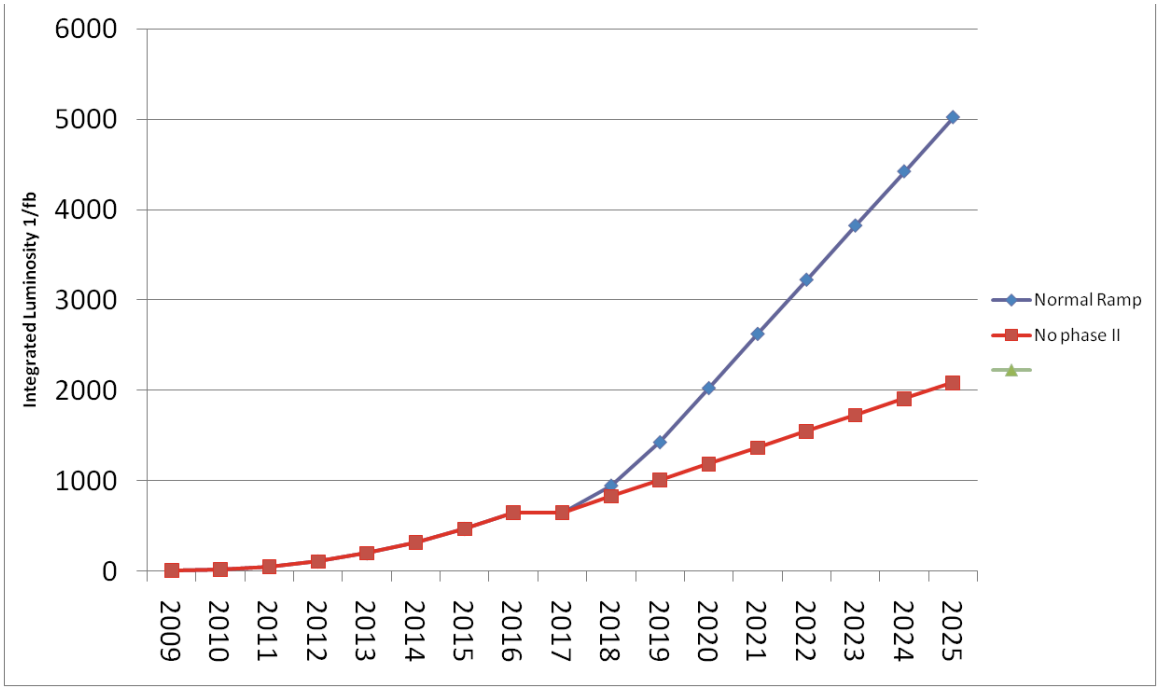

Figure 2. Integrated luminosity scenarios for the two phases of the upgrades. Phase 1 is the period up until 2017 in this graph. Phase 2 is shown by blue curve and takes place after a long shutdown to replace the central tracker of CMS.

The integrated luminosity delivered by the LHC project will determine when the two phases of the upgrade will take place. Phase 1 upgrades can be installed at any time after the initial operation of the LHC, until approximately 700/fb of data are delivered. Phase 2 upgrades will not be installed until a long shutdown takes place at the completion of phase 1. Figure 2 shows a scenario for the evolution of the integrated luminosity of the LHC, the years are only for guidance on the relative timescales, and the ultimate dates will depend on how the LHC machine performs during its first years of operation.

[1] CMS May 2008 Upgrade Workshop – CERN.
http://indico.cern.ch/conferenceDisplay.py?confId=28746

[2] CMS November 2008 Upgrade Workshop – FNAL.

http://indico.cern.ch/conferenceDisplay.py?confId=41832

[3] CMS May 2009 Upgrade Workshop – CERN.

http://indico.cern.ch/conferenceDisplay.py?confId=56210