

UCG Report on the CMS Phase II Upgrades

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Preamble: As the CMS and ATLAS Phase II upgrades evolve from conceptual to final designs toward production of TDR's, it is important for the experiments, LHCC and UCG to recognize the following:

- o As stated in the Step 1 approval from the RRB, the experiments are to design to “**a scale of funding** between the full funding and the intermediate scenario.” It is especially important to keep this in mind for the tracker TDR's, as they are high-cost, and are likely to be the first to be submitted.
- o Where major risks exist, fallback positions should be developed if possible.
- o Authoritative technical evaluations of the TDR's are essential, and to accomplish this the LHCC and UCG will need to be augmented with additional expertise. As the best expertise likely resides in ATLAS and CMS it would be very helpful if the experiments and committees could work together to find a way for experts from one of the experiments to contribute their comments and advice to the other experiment. We welcome suggestions from the experiments!

Observations:

R&D toward preparing the several TDR's shows good progress. The schedule shows the TDR's being submitted during calendar 2017. The TDR's will contain complete cost/schedule information, with technical details placed in appendices to improve readability. The experiment has formed a new “Upgrade Performance Studies Group” to produce coherent performance simulations with 200 pileup as the baseline. Complete simulation results will be included in the TDR's, with the caveat that combined tracker/calorimeter performance simulations will be deferred to the EC TDR, which will be submitted 2-3 months after the Tracker TDR. We noticed that some of the milestones leading up to the EC TDR have slipped since the Technical Proposal. However, these changes are largely because of reorganization of tasks, and should not delay the submission date for the EC TDR..

Comments:

To enable the LHCC and UCG to measure progress, it is important for CMS to define and stand by a set of fixed milestones for each TDR, including milestones for individual R&D projects.

Strong R&D efforts are needed to understand and mitigate uncertainties and risks. (For example, the CALICE experience has been very valuable for the EC effort, but R&D now must address larger scales. The criteria for deciding when to launch production of a TDR were not clear from the presentation.

Between now and the TDR's, developments could change the framework of the TP configuration. CMS must make sure this doesn't have unacceptable implications.

We were pleased to learn that CMS will conduct comprehensive reviews of all TDR projects in June, and look forward to hearing the results at our September meeting.

The ECFA workshop scheduled for Oct 3-6 is an important opportunity for the LHC community to provide input.

TDR's should be submitted only when they are mature, and when risks are understood at an acceptable level.

- o The instructions for submitting information for the Upgrade Cost Group, developed during the Phase-1 process, will be updated and used as a guideline.
- o We expect a self-contained description of the physics performance of the actual detector, using the most recent simulation available
- o CMS should provide a summary of any differences in the parameters and performance between the actual detector and the Technical Proposal detector.

We noted that the TDAQ TDR schedule was not included in the presentation.

Recommendations:

1. CMS should explain the criteria that constitute the trigger point for transitioning from R&D/design development to producing the TDR.
2. For each TDR, a fixed set of milestones should be produced and then tracked throughout the project.
3. Cost estimates for each subsystem should be updated regularly, so that the overall cost of the project remains understood as TDRs are submitted.
4. CMS should provide more information on the TDAQ TDR at the next meeting.