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PPRP
Peer Review

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Open (none)

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Applicant Details

Applicant	Professor Geoffrey Hall	Organisation	Imperial College London
Applicant	Professor Peter Robert Hobson	Organisation	Brunel University
Applicant	Dr David Michael Newbold	Organisation	University of Bristol

Title of Research Project

Upgrades of the Tracker and Trigger of the CMS experiment at the CERN LHC

Review Information

Response Due Date	03/08/2012	Reviewer Reference:	1-YGYCX

Research Council Contact Details

STFC Administration Contact:	Email:	Telephone:

Leadership

How would you rate the UK activity in this area and its international standing and how would you rate the achievement of the team and their leadership in the field, both nationally and internationally?

The UK CMS community have built an excellent reputation for innovation and reliability based on their substantial contributions to the existing detector: RAL TD and IC within the Tracker project for providing much of the readout system and the Bristol and IC groups for providing the Global Calorimeter Trigger (part of the Level-1 trigger system). Since then, the UK groups have embarked on a programme of R&D which has realised solutions to aspects of future CMS tracking and triggering that are crucial to the future running plans of the experiment. It is clear that these developments are much appreciated within the international CMS collaboration and have put the UK groups in an excellent position to make telling contributions to the upgrade.

Advancement

How would you rate any potential advancement in the field, and their impact resulting from the proposed project?

The areas in which UK-CMS are proposing to contribute are key to ensuring that the CMS experiment is able to (a) benefit from the projected increases in LHC luminosity and (b) handle the large pile-up issues expected and performance degradation due to radiation damage, which would impact on physics capability if left unaddressed. The project's impact on the field is therefore rather large and the visibility guaranteed to be high.

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International Context

How does the project fit within the international standing?

The proposed programme seems to, for the most part, occupy an R&D niche within CMS with minimal direct competition from international collaborators. A possible exception to this concerns the trigger architecture choice between a time-multiplexed system, favoured by the UK, and a conventional trigger pushed by the US groups. Although the choice between the two options is still to be formally made within the collaboration, the MP7 module developed by the UK groups is capable of supporting both architectures and therefore it is very likely that the UK will take the lead role in hardware/firmware for the upgraded system. Close collaborative links with international partners appear to be already in place to support the Tracker upgrade work in WP2 (CERN, Lyon and Strasbourg), trigger upgrade in conjunction with Wisconsin and the Strasbourg group will also collaborate on pixel DAQ development in WP4.

Highlights

How would you rate the past achievements of the team and impact on the field, both nationally and internationally?

The team has gained substantial credibility for delivering substantial components of the CMS detector in the Tracker and L1-trigger. This earlier work together with impressive R&D progress since, on the SS-Pt and MP7 modules, has strategically placed them to be lead players in the CMS upgrades for LS2 and beyond.

Goals

Do you consider the major goals proposed over the period are appropriate and deliverable?

The goals and deliverables of WP2,3,4 are well motivated in that they are all crucial to the future physics programme of the experiment. The breakdown in time of the work for each work-package looks realistic e.g.
planning two further runs of the CBC chip in WP2 should reliably produce a system ready for full-scale production on the time-scale proposed. A programme based on three-main fronts (SS-Pt modules, upgraded calorimeter trigger and pixel-readout) is not as overly ambitious as it first appears when one realises the considerable overlap between the work-packages in both hardware and software. There is reasonable confidence that all of the main work-package goals can be delivered by the team within the schedule presented.

Aims

Can the applicant(s) deliver the stated aims

Confidence is high that personnel involved can deliver the stated outputs of the work-packages as described. The main players have proven track records from the first phase of CMS and have overseen a successful programme of upgrade R&D. The UK-leadership overall, and in the proposed work-packages, is strong.

Justification

Has the level of requested resources been justified?

Pixel FED (WP4) is a recent addition to the R&D programme approved in 2008 and constitutes the most expensive work-package of the proposed project. Although the physics case for a pixel detector upgrade is strong, the main justification behind a UK involvement seems to be to come to the aid of the collaboration - after the group initially responsible for the pixel DAQ pulled out. Although the proposed work-plan for WP4 fits rather well with the rest of the project (since it is based on the MP7), in an environment of austerity, WP4 is perhaps an area where other CMS collaborators should step forward or the UK involvement become scaled down to e.g. just providing MP7 know-how.

From the information available, it is not clear enough exactly what the function of all the new PDRA posts will be and it is advised that further detailed justification is sort.

Does the £300k reserved for the involvement of the private company, Iceberg Technologies, represent value for money compared to in-house firmware capability?

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Level of Resources

How would you rate the level of resources available to support the credibility of the proposal?

This point is addressed in answers to the following points.

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