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PRINCIPAL LHCC DELIBERATIONS

25TH MEETING OF THE LHCC RESOURCES REVIEW BOARD

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GENERAL

This document summarizes the principal LHCC deliberations concerning LHCb at the Committee's sessions in May, July and September 2010.

The LHCC considers that LHCb has made excellent progress in all aspects of the experiment and the Committee congratulates the LHCb Collaboration on its achievements.

CONCERNS FROM THE PREVIOUS LHCb RESOURCES REVIEW BOARD

SUB-SYSTEM	CONCERN	STATUS
Ring Image Cherenkov (RICH)	Failure of some Hybrid Photon Detectors (HPDs).	The repair procedure for the HPDs is advancing well and the problematic HPDs are being replaced as planned.

STATUS OF EXPERIMENT

SUB-SYSTEMS

Most of the sub-systems have an operation efficiency higher than 99% and are performing without any major problems. The Cherenkov aerogel radiators of the Ring Imaging Cherenkov (RICH) detectors, which were contaminated with freon gas, still show a lower light yield. However, a better alignment and improved calibration of the aerogel tile refractive indices have resulted in a significantly better angular resolution. The LHCb Collaboration is currently evaluating ways to improve the RICH performance in view of this issue, possibly forming a gas enclosure around the aerogel which can be flushed with neutral gas.

A failure rate that is higher than specified has been observed in a particular type of the optical transmitters used in several sub-systems. Some of these transmitters are easily accessible and can be replaced during short technical stops. The number of failed devices is not significant but the situation should be carefully monitored. The servicing of noisy Hybrid Photon Detectors (HPDs) has become a routine operation which does not affect the data quality.

OPERATIONS

LHCb has an efficient shift model with only two people – the Shift Leader and the Data Manager - on shift in the control room at any one time around the clock. This arrangement works well due to advanced training of the people on shift and good support from sub-system experts. An effective shift recruitment process has been put in place based on institutional shift quotas as opposed to quotas for individuals. The LHCb Collaboration aims to benefit from the best LEP practices in the organization of shifts.

The LHCb experiment ran successfully at $\beta^* = 3.5$ m, although it resulted in a considerable pile-up with the average number of interactions per beam crossing reaching up to 1.5, whereas the nominal value in the present configuration is 0.4. This strained the LHCb trigger system and processing capabilities due to the higher number of tracks in the detector and due also to only 20% of the online CPUs having being available at this time. The present running conditions also stretch the capabilities of the offline CPU farm, including the available disk space. On the other hand, it was an important

opportunity to study the trigger performance and define trigger strategies for the 40 MHz upgrades. The current trigger strategy has been adjusted to move as much of the decision-making processes as possible to the High Level Trigger (HLT). This required much effort from many people and the LHCb Collaboration should be congratulated for pulling it off successfully.

PHYSICS ANALYSIS

With the currently-available statistics the experiment has accumulated large samples of charm and bottom data and can make reliable projections of the respective particle yields. The vertex separation algorithm works well and allows data with multiple interactions per beam crossing to be analyzed. An improved version of the Silicon Tracker alignment is available; the detector has been realigned with the J/ψ mass constraint, which considerably improves the previous disagreement between data and Monte Carlo in track resolution parameters. The first physics papers have been submitted and accepted by journals.

For the immediate running plan, LHCb favours as much data as possible in 2010, since an integrated luminosity of 50 pb^{-1} would allow very interesting results by the spring conferences in 2011 for the $B_s \rightarrow \mu\mu$ channel, for the measurement of the B-meson CP Violation phase and constraints on CP Violation in charm mixing and decay.

Due to the high importance of the 2011 data-taking period, which may bring major physics results from LHCb, the LHCC will hold a detailed mini-review of the experiment during its November 2010 session.

FUTURE PLANS

Activities during the upcoming 2010-2011 technical stop will have a limited scope and will include the replacement of some HPDs and transmitters, together with other minor maintenance of the sub-systems.

The main activities planned for the 2012 shutdown are the replacement of a beampipe section, installation of the optical cable required for the 40 MHz trigger upgrade, significant extension of the CPU farm and possibly the aerogel intervention.

The Letter of Intent for the LHCb upgrade is in the final phase of preparation with a draft planned to be submitted to the LHCC for its November 2010 session. The Committee took note of the LHCb upgrade plans and encourages the LHCb Collaboration to further their studies and continue developing their experimental design. The LHCC will discuss extensively the LHCb upgrade plans with a recommendation expected in the upcoming sessions of the Committee and also encourages preliminary discussions with the funding agencies on possible commitments to be addressed in detail at the April 2011 session of the Resources Review Boards.