

LHCb Technical Board 23 May 2003

Agenda

1. **Approval of last TB summary**
 2. **Report on the Muon MPWC EDR** **H.J. Hilke**
 3. **Report on the Muon FE Architecture Review** **J. Christiansen**
 4. **Summary of the L1 Trigger Review** **H. Dijkstra**
 5. **Discussion and decision on the combined DAQ/L1 architecture** **B. Jost**
 6. **Status of common L1 Board** **J. Christiansen**
 7. **Offline Computing Resources Review, collaboration matters** **T. Nakada**
 8. **Budget and Safety matters** **A. Smith**
 9. **Photon detector: review conclusions, status and plans** **D. Websdale**
 10. **Review/preview of milestones** **W. Witzeling**
 11. **Presentation and approval of schedules** **R. Lindner**
 12. **AOB**
- Outcome of the Installation Review** **W. Witzeling**
- PRR for the RICH2 mirror support** **W. Witzeling**
- Beetle 1.3 Submission Readiness Review** **T. Ruf**

Participants: N. Brook, G. Carboni, Ph. Charpentier, J. Christiansen, H. Dijkstra, R. Forty, H.J. Hilke (for point 2), B. Jost, D. Lacarrere, J. Lefrançois, R. Lindner, C. Matteuzzi, T. Nakada, T. Ruf, B. Schmidt, O. Schneider, A. Schopper, A. Smith, O. Ullaland, D. Websdale, W. Witzeling

Excused: W. Flegel, A. Pellegrino, U. Straumann,

1. **Approval of last TB summary:** The summary of the TB on 20th March 2003 was approved without any comment.
2. **Report on the Muon MWPC EDR:** An Engineering Design Review for the LHCb Muon Chambers was held on the 16th April 2003 at CERN. H.J. Hilke summarized the unanimous conclusion of the three referees (H.J. Hilke, R. Nania, O. Prokofiev). The design of the Multi-Wire-Proportional-Chamber in general is viable and well adapted to the trigger requirements of LHCb. Test beam results on prototypes gave confidence in the chosen design. Nevertheless, information from radiation hardness tests does not seem to be sufficient at present. The reviewers were impressed by the systematic investigation on materials and components to be used in the chamber construction. Although the reviewers consider common constructional details like wiring procedure and closing with O-rings as advantageous, they accepted that different chamber requirements might justify design differences.

Before embarking on the mass production, a few issues should still be clarified further before the PRR. A small 'pre-production' series should be constructed and tested for each chamber type considering the final design and materials, as only this gives confidence in the adequacy of construction for 'mass production'. Another concern is the opening of chambers for repair as two out of the three designs foresee closing by gluing. Only a construction of at least a small series of chambers would give an indication on faults after 'final' chamber closing. The pre-production of chambers prior to the PRR should not delay the final production, as major items can already be ordered now.

The TB encouraged the muon group to start with the pre-production series and to continue their efforts towards the PRR.

3. **Report on the Muon FE Architecture Review:** J. Christiansen gave a summary report on the Front-End architecture of the muon system. The architecture in general seems sound and well optimized at minimal cost. Major critical items are the production of three different ASICs in the same production run and the use of power supplies in the radiation shielded area, in particular the ones close to station M1. The planning for the combined production of the three chips end 2003 seems far too optimistic. The development of the CARIOCA chip is the most crucial as in the case of substantial changes to the design are necessary after the June production run, sufficient manpower is not guaranteed.
4. **Summary of the L1 Trigger Review:** A review on the LHCb combined L1&DAQ implementation has been held on the 16th April 2003. H. Dijkstra summarized the recommendations given by the reviewers. The proposal of an alternative solution to the Network Processors (NP) has already been implemented in the newest version of L1/DAQ architecture. Furthermore, the reviewers recommended setting up a test procedure including all components, which should be realized in time to allow alternatives to be employed. Although the project is evolving fast, the project schedule should be adapted as soon as possible. The safety factor on the scale of the system should be evaluated, also in terms of possible biases introduced when discarding large multiplicity events to keep event size and execution time within present limits. The reviewer stated that the available manpower of the group is not sufficient and it will be necessary to attract more groups to join.
5. **Discussion and decision on the combined DAQ/L1 architecture:** B. Jost presented the combined DAQ/L1 architecture, based on the outcome of the DAQ/L1 review in April 2003. The Network Processors as readout units have been eliminated and as a consequence, their functionality has to be moved into the Front-End board. This clearly increases the necessity of a common L1-board for all sub detectors. Although a system with the use of NPs satisfy the LHCb requirements, the latest proposal seems more attractive as no NP-based modules have to be designed and built. The system uses only commercial components and can be upgraded just by adding switch ports and SFCs.
The Technical Board agreed on the new baseline of the combined L1/DAQ implementation.
6. **Status of common L1 Board:** With the new baseline of L1/DAQ architecture, the common L1-Board becomes a central vital issue within LHCb. After a brief report on the evolution of the L1-board, J. Christiansen pointed out that such a project needs a clear definition of responsibilities and a realistic schedule has to be worked out. A Common L1 workshop is scheduled for the 3rd June 2003 to progress on these items.

7. Offline Computing Resources Review, collaboration matters: In the context of the new combined L1/DAQ implementation, Bologna, Marseilles and ITEP have indicated their interest to join this project.

8. Budget and Safety matters:

Safety: A. Smith reminded all project leaders to provide all information on non-metallic materials integrated in each sub detector.

Mechanical safety aspects are largely covered by presently agreed studies. All handling devices entering CERN sites have to be tested and certified before usage. Concerning the installation and maintenance, the method of mounting and access to detector parts has to be defined. This information is needed also for the installation review in September 2003. The electrical power distribution and fusing will be discussed for each detector with TIS. The first hearing with TIS on electrical safety has been performed with the Vertex Locator and the following general considerations may be drawn from the discussion:

- Power distribution needs not to be fused, if the maximum power that can be accidentally dissipated is less than 60 W.
- Personnel protection is needed for stored energy of 10 joules or larger. For safe low voltage certain things can be unprotected up to 120V DC.

Further safety hearings for all detectors will follow individually.

Finance: A. Smith informed the TB that he will continue to contact project leaders to collect the spending profile of each individual project. This will reveal possible cash flow problems.

9. Photon detector: review conclusions, status and plans: The Mid-Term RICH Photon detector review has been held on 14th May 2003. In total, three prototype 10MHz HPDs have been produced so far by DEP and tested at CERN. The first tube produced with relaxed bump bonds has more than 99% bonds intact with more than 95% pixels working with threshold and noise well below specified limits and a photoelectron detection efficiency of 85%. The very first tube (stretched bump bonds) and the second tube with relaxed bump bonds had a large fraction of detached bonds. Aging tests have begun and assessment procedures have been demonstrated. Ten LHCB assemblies with the high-Pb solder bump bonds have been dispatched to CERN on the 13th May with a delay of 2 months with respect to the schedule due to a problem of the sputtering machine at VTT. The preparation for the readout of 8-dynode 64-anode MaPMT using the Beetle 1.2 progressed and signals have been observed on the analogue pipeline showing large common mode, but this has not been fully understood and should be considered as very preliminary. New readout boards, equipped to run 128 MaPMT channels, and for use in the August/September '03 test beam run will be produced.

With the present status of the HPD and MaPMT project the review panel felt that the decision on the Photon detector could not be made on the 14th May, since neither the 40MHz HPD technology nor the readout of the MaPMT with the Beetle chip have been demonstrated yet. A decision tree on the HPD progress has been defined (see Appendix 1), which has to be followed closely. The panel feels strongly that the team currently working in Edinburgh needs to be strengthened immediately and the work needs to proceed with electronics engineering effort and DAQ expertise. Progress should be reviewed every fortnight on both technologies.

10. Review/preview of milestones: W. Witzeling informed the TB on the status of milestones achieved so far and asked the project leaders to provide comments on the coming milestones for the 3rd quarter 2003.

11. Presentation and approval of schedules: Rolf Lindner presented the status of the project schedules and the installation schedule. Project schedules are consistent with the installation schedule. The Calorimeter and Muon project schedules have been uploaded to EDMS. Schedules for RICH-1, Tracker Trigger, Trigger and DAQ are planned for September 2003 (TDR submission). The remaining project schedules for RICH-2, Inner Tracker, Outer Tracker and Vertex Locator are expected for August 2003.

12. A.o.B.

Outcome of the Installation Review: The review committee was impressed by the amount of work which has already gone into the installation plan of the LHCb experiment, but also had to draw attention to the remaining work to be done. W. Witzeling summarized the concerns of the review committee, which will be addressed in the forthcoming months. The review report ends with the phrase: "*...there is every reason to believe that LHCb will have a complete and working detector ready for first collisions in Spring 2007.*" The full report can be found at <https://edms.cern.ch/document/380802/1>

PRR for the RICH2 mirror support: W. Witzeling summarized the Production Readiness Review for the RICH2 mirror support system. As a conclusion of the review, all components for the mirror supports are ready to go into production. The full report can be found at <https://edms.cern.ch/document/382780/1>.

Beetle 1.3 Submission Readiness Review: The Beetle submission review has been held on the 20th May 2003. Known problems from the Beetle 1.2 have been gathered and their possible corrections discussed. The four main malfunctions (sticky charge effect, 80 MHz cross talk, sagging baseline and the large variance in the comparator thresholds) have been fully understood and the corrections will be implemented for the coming submission of Beetle 1.3 in June 23rd. The complete list of modification to Beetle 1.2 can be found at: [Beetle 1.3](#)

Next Technical board:

Thursday 19th June 2003 at 14:00 in room 1-1-025

Appendix 1

