# LHCb Technical Board 23 January 2003

## Agenda

1. **Approval of last TB summary**
2. **Report on the VELO Design Review** — **T.Ruf**
3. **The decision on the VELO front-end chip** — **T.Ruf**
4. **Technical Coordination matters** — **W. Witzeling**
5. **Report on the Photon Detector Review** — **D.Websdale**
6. **Discussion on the Photon Detector**

***Participants:*** G. Carboni, J. Christiansen, H. Dijkstra, W. Flegel, R. Forty, J. Harvey, R. Lindner, C. Matteuzzi, T. Nakada, T. Ruf, B. Schmidt, O. Schneider, A. Schopper, A. Smith, O. Ullaland, H. Voss, D. Websdale , W. Witzeling

***Invited:*** C. Fabjan, T. Gys, N. Harnew (telephone), B. Jean-Marie, F. Muheim, K. Wyllie, all for point 5

***Excused:*** D. Lacarrere, J. Lefrançois, U. Straumann

1. **Approval of last TB summary:** The Summary of the TB on 11th December 2002 was approved after some corrections concerning point 4.

2. **Report on the VELO Design Review**: T. Ruf summarized the VELO Engineering Design Review held on the 16-17 December 2002. The reviewers recommended demonstrating the vacuum tightness of the RF shield before the coating and only after successful tests to coat the shield from the outside. The RF foil thickness of 300 um was considered acceptable; nevertheless NIKHEF will work on a further reduction and inform LHC/VAC on the status. The value used in the simulation will be kept at 250um. As the vacuum brazing of the rectangular bellows is considered to be difficult, the welding of the convolutions is recommended. The installation of the first part of the beam pipe with the exit foil will be rather difficult. A meeting with the detector groups involved in the installation of this part has been scheduled for the 13th February 2003.
   The vacuum system for the Vertex Locator and the LHC machine must have tightly connected control system to avoid accidents due to interface problems. The installation of fast valves is recommended to protect the inner triplets. This will be examined for the other three LHC experimental areas as well.
   The review panel congratulated NIKHEF VELO group for their excellent work for answering the open questions identified in the previous review.

3. **The decision on the VELO front-end chip**: The VELO group had three meetings focused on the Front-end chip in the last five-month. Two options were available: the Beetle and the SCTA_VELO chips. After the conclusion in

November 2002 that both chips fulfill the basic requirements and that the SCTA_VELO performance is not superior to the Beetle chip, the decision has been made for the Beetle as it is radiation hard and has a high yield. In the front-end electronics meeting in January 2003 the VELO group held a Beetle design review with external reviewers. Results from the Beetle 1.2 tests were presented and a list of modifications for the next version was collected. The so called 'sticky charge effect' where in the subsequent event some charge of the previous event remains can be solved by adding 12.5 ns to the delay. A more serious problem is the destruction of the front-end chip in case the bias voltage exceeds 2.7 V. A change of the comparator from 3 to 5 bit is under study but implies a major design change. The next submission for the Beetle chip is scheduled for May/June 2003. However, for schedule reasons this must be the last iteration. The presentation of the Beetle design review report will be given in the next TB.

4. **Technical Coordination matters**: W. Witzeling informed the TB members that the LHCb installation review by the LHCC has been fixed for the 13th March 2003. He presented the provisional agenda as discussed at the regular TC meetings and listed the different items that have to be covered in each sub detector presentation.
   A master schedule has been produced for the LHCC comprehensive review. H. Dijkstra requested to add the installation phase of the trigger to this schedule.

5. **Report on the Photon Detector Review:** D. Websdale reminded the TB of the purpose of the Photon Detector Review (transparencies can be found at http://agenda.cern.ch/age?a0315). The aim was to monitor the RICH photon detector project, to Review the status of the HPD/MAPMT as baseline/backup solution and to prepare the final decision for the technology choice. Dave concentrated his report on items referred to in the referee report and presented the recommendations by the RICH Group that are in line with the referee report. The referee panel came to the conclusion that neither the HPD nor MaPMT are ready to justify a decision today, but a decision by September 2003 is mandatory. A list of milestones for the HPD and MaPMT has been set for September 2003 and 'mid-term milestone' for May 2003. The main concern identified for the HPD is the bump-bonding problem while for the MaPMT the binary readout has not yet been proven. The milestone list as it is today is only indicative; several milestones need to be defined quantitatively before the next meeting in February and for some milestones more input is needed (e.g. from the metallurgy and mechanical adhesion of bump-bonding).

6. **Discussion on the Photon Detector:** An extensive discussion on the situation of the Photon Detector and on the next steps towards the final decision took place. In the light of the conclusions of the Review several areas of major concern need to be addressed.
   The schedule as it is envisaged today is already very tight; any further slip may compromise the timely commissioning and readiness of the RICH Detectors. W. Witzeling presented a transparency showing the complex production process for the HPD that requires six different companies and also test activities at CERN to

interact in a coherent way to ensure smooth production. Consequently, this interdependence of production processes makes it difficult to predict reliably the actual manufacturing time, thus it requires a sufficient schedule contingency.

**The Technical Board agreed that September 2003 is the last moment where a decision on the Photon Detector has to be made in order to ensure timely commissioning of the RICH detectors.**

HPD: As was underlined by the Review, the bump bonding process as used for the current prototype tube cannot be considered as reliable, consequently cannot be used for the series production. Setting-up and qualification of a new process as proposed by VTT is mandatory, however it is time critical and the first dates (dummy assemblies and final assemblies) set by VTT in the meetings in November 02 and beginning January 03 were not met so far. A further step is to go from the present 10MHz assemblies to the final 40 MHz assemblies, which represents a 50% increase in chip area.

**In line with the Review recommendations, the Technical Board urges to define in advance clear qualification criteria that can serve as the basis for a decision on the Photon Detector. In particular, a sufficient number (absolute minimum 3) of HPDs produced with the final processes have to be tested for sufficiently long time and proven to work, before a positive decision can be taken. T.Gys is invited to define a date by which the HPDs have to be available to allow for proper testing time.**

MaPMT: A conclusion of the Review is that the viability of the MaPMT solution has not been demonstrated, the most crucial issue being read-out. As underlined by F. Muheim despite personal engagement of the few persons involved, progress on the MaPMT has been slowed by the fact that sufficient resources to pursue the required development work cannot be found due to the label ‘back-up solution’ of this project. The modified Beetle version (Beetle MA) has been submitted in time and 8 stage tubes that could match to the unmodified Beetle chip have become available recently. However, the full chain of the readout has to be tested. In particular for the binary read-out option, one has to establish more precisely what the effect on physics would be. **The RICH Group has to find urgently more resources to pursue these activities.**

J.Cristiansen reminded that the review of the RICH electronics architecture is outstanding; it was concluded that this review should take place after the decision on the photon detector has been made.

**Next Technical Board: Thursday 27$^{th}$ February 2003 at 9:00 in Room 160-1-009**