

Short Summary
B-Factory Programme Advisory Committee
Focused Review on Particle Identification System

27 – 28 June 2015 at KEK

D. Cassel (Cornell), M. Demarteau (ANL), M. Ishino (Kyoto),
H. Lacker (HU Berlin), N. Neufeld (CERN) B. Ratcliff* (SLAC),
J. Schwiening* (GSI), M. Sullivan (SLAC), H. Tajima (Nagoya),
and chaired by T. Nakada (EPFL)

* Expert members

7 June 2015

Short Summary of the Focused Review Meeting

A focused review meeting of the Belle Programme Advisory Committee (BPAC) for the Belle II particle identification system was held on the 27th and 28th of June at KEK. On the 27th after the presentation of the status of the End-cap Aerogel Ring Imaging Cherenkov Counter (ARICH), the committee was guided through the assembly hall of the Barrel Time of Propagation Cherenkov Counter (TOP) and the Belle II experimental hall. The status of the TOP was then presented on the 28th. This is a short summary reporting only the most essential conclusions of the review with a comprehensive detailed report to follow separately.

The BPAC was impressed by the achievements of the ARICH and TOP groups. In particular, the steady progress in TOP quartz bar-box fabrication and electronics production is very encouraging. The committee wholeheartedly applauds these groups.

ARICH

The current understanding of the observed discharging phenomena exhibited by the Hybrid Avalanche Photo Diode (HAPD), which may destroy ASICs, was presented. A full understanding of this phenomenon is not yet known. However, from the conditions for it to occur, it appears to be possible to prevent the discharge during detector operation using a magnetic field interlock on the high voltage system. Furthermore, other protection methods, including the introduction of a diode protection system for the ASICs, can also be implemented. The committee recommends that a clear plan for implementing those must be established and executed in a timely manner. The operation procedure of the HAPD should now be established and well documented.

The committee noticed that several tasks, such as the construction of the support structure and procurement of the power supplies, are behind schedule. The ARICH group should digest those delays and produce a new plan, and a list of actions to deal with the delays if needed.

TOP

Production of the quartz bar-box and procurement of all the components are advancing well. No major problem has been discovered so far. Although continuing to carefully monitor long-term stability of the mechanics and optical performance of the quartz bar-boxes is mandatory, the committee thinks that the production group has gathered enough experience (with six quartz bar-box at various stages) to establish a reliable production schedule for the quartz bar-boxes.

Production of various electronics boards is in progress and assembly of readout boxes has started. Although all components of the electronics seem to work, the full functionality of a complete TOP module, with its camera system (photon detectors and electronics in their readout box) attached to the quartz bar-box, has never been demonstrated. The committee understands that this has been partly due to difficulties with interfacing to the final Belle II readout system. These difficulties seem to have been resolved now, however long-term tests under full load of all data paths are recommended. Production of a fully functioning TOP module, i.e. quartz bar-box attached to the readout box, is now required to demonstrate the viability of the overall TOP module design. The committee thinks that this must be the highest priority of the group now. Until several fully functioning TOP modules are fabricated and tested, the overall schedule of the TOP project remains uncertain.

The presented plan for the TOP module transportation and installation appears plausible. It should be refined through close discussion with the people concerned with transportation and work in the experimental hall. The committee noted that the detector infrastructure, such as cooling and gas supplies and cables, has to be installed before the transportation can begin.

The TOP combined cosmic ray test with the Central Drift Chamber (CDC) must be seen as an opportunity not only to test the individual TOP and CDC detectors, but also to validate the Belle II detector operation system including DAQ. This would allow early discovery of possible problems at system level. For this, the test must be done with the final configuration for the DAQ and detector control, or systems as close as possible, and with a reasonable complexity for the participating detectors. Required expertise and resources for executing this test go beyond the detector groups. The committee recommends that the Belle II management ensures that proper organisation and planning are in place and that the required resources are available.