

# B-factory Programme Advisory Committee

## Short report of the Annual Review Meeting

9 February to 11 February 2026, at KEK

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& Remote participation

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## Short Summary

An annual review meeting of the B-Factory Programme Advisory Committee (BPAC) was held at KEK from 9th to 11th February 2026, during which the status of SuperKEKB and Belle II was presented. Progress on the Belle II detector and on machine–detector interface work for the upgrade planned during the two-year shutdown envisaged from 2032 to 2034 was also reported. On the afternoon of 10th February, a special review session dedicated to the upgrade programme was held, with particular emphasis on accelerator-related issues. The BPAC members participated in this session as observers.

Here are the charges given by the Director of the Institute for Particle and Nuclear Studies (IPNS) and the committee’s responses:

### **1. Physics Exploitation of the 1/ab Dataset**

*Review the physics activities and progress. Provide advice on areas requiring focus to fully exploit the anticipated 1/ab data.*

The analysis activities of the Belle II collaboration are well organised, with appropriate emphasis on topical subjects where Belle II can make significant impact, particularly through the development of novel analysis techniques. The consideration of an energy scan programme is scientifically interesting and should be pursued at an appropriate

stage. However, the first priority should remain the accumulation of  $1 \text{ ab}^{-1}$  of data and the achievement of peak luminosities of  $1 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and above.

## **2. Readiness for Rapid Physics Output in 2026ab**

*Review and suggest the procedures to deliver physics results promptly using the data recorded in 2026ab.*

Preparation for rapid data processing and physics analysis is progressing well. Efforts to improve reconstruction software in order to maintain detector performance under increasing luminosity are appreciated and should be further encouraged.

## **3. Beam Background, Stability, and Detector Protection**

*Review the strategy and coordination among each subgroup for addressing the issues related to the beam background and sudden beam loss from the perspectives of the detector damage, lifetime, operation stability, performance and luminosity.*

While background arising from beam–gas interactions is still significant, it is expected to decrease as the vacuum quality improves over time through beam scrubbing. Injection background remains a concern and could limit further increases in beam currents, particularly with respect to potential radiation damage to the Central Drift Chamber (CDC). The CDC background level is currently estimated to be at the detector limit, both in terms of particle rates and the projected total accumulated charge on wires. A deeper understanding of the causes of low injection efficiency is essential. Consolidation of ageing infrastructure and further improvements in beam-diagnostics systems are strongly encouraged. Progress in simulation studies, carried out in collaboration with laboratories such as CERN and DESY, is encouraging and should be further strengthened.

Although the number of sudden beam loss (SBL) events has been drastically reduced following the removal of Vacseal from the beam pipes, SBL remains a concern for the safe operation of both Belle II and the SuperKEKB rings. As it has been successfully demonstrated in the machine detector interface work, continued close collaboration between the Belle II and accelerator teams is essential to mitigate this risk. Stronger coordination among all elements of the SuperKEKB complex and the Belle II detector will be necessary to achieve the project’s goals.

## **4. Upgrade R&D Readiness toward the 2026 Baseline and 2027 TDR**

*The upgrade baseline configuration is planned to be finalized in July 2026 and to be documented in a TDR by 2027. Review the progress and plan for each subsystem upgrade R&D, and provide advice on matters requiring adjustment.*

The committee is impressed by the substantial progress made on the vertex detector system (VTX), particularly regarding technology choices and design studies. Reaching a well-defined baseline by July 2026 appears realistic. The committee also welcomes the decision to construct a new central drift chamber for the upgrade.

It is noted that the collaboration is considering the introduction of an intermediate tracking and timing system (ITT) between the VTX and the drift chamber. Based on experience with the current CDC, the committee considers the ITT to be mandatory in order to ensure sustainable operation of the drift chamber in the radiation environment

expected after LS2. The collaboration is encouraged to optimise the ITT design promptly for the baseline decision, taking into account particle identification capabilities for low transverse momentum tracks.

For the definition of the new tracking system, careful consideration of space constraints in the interaction region is required. The design of the interaction region is crucial for SuperKEKB performance, and a comprehensive evaluation, including the design of new final focusing quadrupole magnets (QCS), should be performed. A strong management structure covering both the accelerator complex and the Belle II detector should oversee overall optimisation and priority setting of the upgrade project.

Given the number of decisions still to be made, completion of the TDR by 2027 represents a tight schedule and carries schedule risk. The schedule must be made taking into account the available resources and with some buffer. The progress should be carefully monitored so that any delays can be dealt with in a timely manner.

## **5. Adequacy of Computing Resource Projections**

*Point out any concerns regarding the computing resource estimates if any.*

The adequacy of computing resources will be reviewed by a separate committee once the formal request for 2027 is finalised. In parallel with GRID computing, LHC experiments have increasingly adopted High Performance Computing (HPC) resources, whose availability continues to grow. Although additional development effort will be required to exploit HPC efficiently, the Belle II collaboration is encouraged to explore this option proactively as part of its long-term computing strategy.

A more detailed report will be issued in a separate document currently under preparation.