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Operational experience and performance of the Belle II Silicon Vertex Detector after the first SuperKEKB Long Shut down

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At the beginning of 2024 data taking of the Belle II experiment resumed after the Long Shutdown 1 (LS1), primarily required to install a new two-layer DEPFET detector (PXD) and upgrade components of the accelerator. The whole silicon tracker (VXD) was extracted from Belle II, and the outer strip detector (SVD) was split into its two halves to allow access for the PXD installation. Then a new VXD was commissioned for the start of the new run.

In a higher luminosity regime, it is crucial to prevent the SVD maximum occupancy exceeding the limit for acceptable tracking performance. The excellent hit-time resolution in SVD can be exploited for background rejection. We describe the implementation of a novel procedure to group SVD hits event-by-event, based on their time. By using the grouping information during reconstruction, off-time tracks are efficiently rejected so that the fake rate is significantly reduced while preserving the tracking efficiency. The SVD hit-time is also used to estimate the collision time (event-T0) with a much faster online reconstruction with respect to the estimate provided by the drift chamber, which is crucial in a high luminosity regime.

Studies on the radiation damage have shown that, although the sensor current and the strip noise have shown a moderate increase due to radiation, the performance will not be seriously degraded during the lifespan of the detector.

Collaboration

the Belle II SVD collaboration

Role of Submitter

The presenter will be selected later by the Collaboration

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