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Performance of the Belle II Silicon Vertex Detector

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The Belle II experiment at the SuperKEKB collider of KEK (Japan) started recording physics data in spring 2019 with all its subdetectors installed and with the goal of accumulating 50 ab^{-1} of e^+e^- collision events at the unprecedented instantaneous luminosity of $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$, about 40 times larger than its predecessor. The Belle II vertex detector plays a crucial role in the broad Belle II physics program, especially for time-dependent CP measurements. It consists of two layers of DEPFET-based pixels and four layers of double-sided silicon strip detectors (SVD).

The experience gained from first period of SVD operation can be summarized as smooth and reliable running of the detector, with high stability of noise levels and calibration parameters obtained from local calibration runs. No major problem has been experienced. The detector even survived without any notable damage to few serious radiation accidents in which the beam was lost due to failure in the machine focusing quadrupoles. This first period of physics data taking delivered enough data to determine the SVD performance. Despite a machine background, which is significantly higher than expected for the so far achieved luminosity, SVD shows excellent hit and tracking efficiency. Moreover, cluster energy and signal to noise ratio as well the hit time and spatial resolutions measured on data showed a fair agreement with the expected performance.

Submission declaration

Original and unpublished

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