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[P02] A Study for Hit-time Reconstruction of Belle II Silicon Vertex Detector

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The Belle II experiment, with a vertex detector installed, started operation in the spring of 2019. The experiment aims to probe new physics beyond the Standard Model by analyzing a large number of generated $B\bar{B}$ -pairs in high-luminosity e^+e^- collisions at SuperKEKB (KEK, Japan). The Silicon Vertex Detector (SVD) is a part of the vertex detector and is composed of four layers of Double-sided Silicon Strip Detectors (DSSDs), which provide two-dimensional hit position information for the track reconstruction. SVD is crucial for the precise measurement of $B\bar{B}$ decay vertices and the track reconstruction of low-momentum charged particles. During the first year of data taking, SVD has demonstrated very stable and excellent performance. One of the next operational challenges will be the large amount of beam-related background caused by the future high-luminosity operation of SuperKEKB. High hit occupancy from this background decreases the track-finding efficiency and increases the fake-track rate. To reject such background hits, we can use a selection based on hit-time information. We study the hit-time estimation of SVD and achieve 2.4 ns hit-time resolution for $B\bar{B}$ -like events using the signal waveform information of the readout ASIC (APV25) configured to have a shaping-time constant of around 50 ns and a sampling period of 31 ns. This excellent hit-time resolution will be exploited in the future to improve tracking performance in the high-luminosity operation.

In this presentation, we explain the algorithm to estimate the hit-time and summarize the results of the performance study.

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