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The Belle II Silicon Vertex Detector

The KEK-B factory (Tsukuba, Japan) has been shut down in mid-2010 after reaching a total integrated luminosity of 1 ab^{-1} . Recently, the work on an upgrade of the collider (SuperKEKB), aiming a peak luminosity of $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$, has started. This is 40 times the peak value of the previous system and thus also requires a redesign of the Belle detector (leading to Belle II), especially its Silicon Vertex Detector (SVD), which surrounds the beam pipe.

Similar to its predecessor, the future Belle II SVD will again consist of four layers of double-sided silicon strip sensors (DSSD), but at higher radii. Moreover, a double-layer pixel detector will complement the SVD as the innermost sensing device. All DSSDs will be made from 6" silicon wafers and read out by APV25 chips, which were originally developed for the CMS experiment. That system was proven to meet the requirements for Belle II in matters of occupancy and dead time. Since the KEK B-factory operates at relatively low energy, material inside the active volume has to be minimized in order to reduce multiple scattering. This can be achieved by the Origami chip-on-sensor concept, and a very light-weight mechanical support structure made from carbon fiber reinforced Airex foam. Moreover, CO₂ cooling for the front-end chips will ensure high efficiency at minimum material budget.

We will give an overview of the design, the sensors, the mechanics, the readout electronics as well as the cooling system of the future Belle II Silicon Vertex Detector.

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