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The silicon vertex detector for the super B factory

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Abstract

The present B factories, running at the luminosity of $\sim 1 \times 10^{34}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$, have established a large time-dependent CP asymmetry in B decays. Upgrade of the KEKB accelerator to a luminosity of $5 \times 10^{35}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$, designated Super KEKB, has been proposed to extend physics reach beyond the standard model. Since measurement of time evolution of B mesons is essential, the silicon vertex detector, SVD, should be redesigned to meet the data rates and radiation backgrounds expected in this Super KEKB environment. The detector configuration, sensor options and read out electronics are discussed.

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Keywords: Silicon strip detector; B factory; Striplet configuration

The present B factories at KEK and SLAC have established a large time-dependent CP asymmetry in B meson decays based on data sets corresponding to an accumulated luminosity of $\sim 100\,\mathrm{fb}^{-1}$ and the results strongly support the standard model of particle physics [1]. An upgrade to the Belle silicon vertex detector, SVD2, was successfully installed in 2003, Summer and has since been recording data with improved system performance [2]. However, in order to test rigorously the standard model, the Kobayashi–Maskawa mixing angles should be measured precisely through various rare B decay channels. Furthermore, "beyond the standard model" effects could appear in these rare decay processes. To reach this sensitivity level, simulation studies indicate that 100 times or more luminosity is required. The Super KEKB factory, running at the luminosity of $5 \times 10^{35}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$, has been proposed to meet these physics requirements [3]. At such a high luminosity, however, not only the physics event rates but also the radiation backgrounds are huge.

In this report, the conceptual design of a third generation silicon vertex detector, SVD3, for an upgraded detector (SuperBelle) is presented.

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