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DEPFET pixels as a vertex detector for the Belle II experiment

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The successful heavy flavour factory KEKB, operating between 1999 and 2010 at KEK, Tsukuba, Japan, is currently being upgraded and is foreseen to start commissioning in the fall of 2014. The new e^+e^- collider (SuperKEKB) will provide an instantaneous luminosity of $8 \times 10^{35} \text{ cm}^{-2}/\text{s}$, 40 times higher than the current world record set by KEKB.

In order to handle the increased event rate and the higher background and to provide high data quality, the Belle detector is upgraded to Belle II. The increased particle rate requires a new vertex pixel detector with high granularity. This silicon detector will be based on the DEPFET technology and will consist of two layers of active pixel sensors. By integrating a field effect transistor into every pixel on top of a fully depleted bulk, the DEPFET technology combines detection as well as in-pixel amplification. This technology allows excellent signal to noise performance, complemented by a very low material budget by thinning down the sensors to 75 microns.

The sensors will be operated with the dedicated chain of steering and readout ASICs. In this presentation the key parameters of the sensor design will be presented, together with the individual ASICs. Furthermore, supplemental systems like cooling, powering, mechanics, etc. will be described. Results of the prototypes tested in various particle beams will be shown as well as the expected performance at SuperKEKB.

quote your primary experiment

Belle II

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