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The DEPFET pixel vertex detector for the Belle II experiment at SuperKEKB

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The luminosity upgrade of the KEKB accelerator towards SuperKEKB opens up new possibilities for physics at the intensity frontier. SuperKEKB will provide an instantaneous luminosity of 8x10^35 1/cm2/s which allows to increase the integrated luminosity of 1ab-1 achieved at the BELLE detector towards 50 ab-1 at BELLE II.

The increased luminosity poses challenges to all subsystems like DAQ, trigger and sub detectors. Especially the innermost detector will be faced with a significant background due to two-photon pair production, synchrotron radiation, and intra-beam scattering.

For precise vertex reconstruction, this requires using pixel detector technologies capable to deal with these issues while maintaining physics performance adequate for a precision detector.

The DEPFET technology offers a unique set of advantages as low power dissipation in the active area, large device size, radiation tolerance and a thinning procedure which allows tailoring the thickness of the device over a wide range. Using this technology the impact parameter resolution of the combined silicon detector of Belle II can be improved significantly compared to the previous experiment even in the challenging high luminosity environment.

The DEPFET pixel detector (PXD) will offer a granularity of 8MPix and a frame time of 20µs, this requires a sophisticated scheme to handle the data flow. I will give an overview how the data is processed from the zero suppression on the module till the online pattern recognition to reject background.

As the first physics runs of SuperKEKB are foreseen for 2015 the PXD project currently moves from the R&D- into the construction phase. This means that many engineering tasks are close to finalization. I will present an overview of the electro-mechanical integration of the DEPFET PXD into the BELLE II experiment, as well as the cooling scheme and the power distribution.

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