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The Belle II Pixel Detector: How to deal with high occupancy

The innermost Pixel Detector (PXD) of the Belle II experiment makes use of the DEPFET (Depleted P-channel Field Effect Transistor) technology to provide the accurate position measurements that are needed for the reconstruction of B meson decay vertices. It has to work in very challenging conditions: The instantaneous luminosity of $8 \times 10^{35} \text{ cm}^{-2} \text{s}^{-1}$ expected at SuperKEKB causes a high event rate and a large background, the resulting sensor occupancy is furthermore increased by the PXD's close proximity to the interaction point.

A general introduction of the PXD can be found in talk 396 "Inner tracking devices at the Belle II experiment". As a complement, this poster presents the strategies of how to deal with the aforementioned challenging conditions in terms of sensor layout and electronic readout. Highlights include the four-fold rolling shutter readout (making readout four times as fast), segmenting the sensor to allow different operating voltages (to deal with inhomogeneous irradiation), zero-suppressed readout focussed on small "Regions of Interest" (to suppress background hits), and a fast electronic shutter, the so-called "Gated Mode" (to make the sensor blind during short periods of increased background particle flow).

additional information

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