

The New and Complete Belle II DEPFET Pixel Detector: Commissioning and Previous Operational Experience

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The Belle II experiment at the SuperKEKB collider in Tsukuba, Japan, has collected e^+e^- collision data between 2019 and 2022. After reaching a record-breaking instantaneous luminosity of $4.7 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$ and recording a dataset corresponding to 424 fb^{-1} , it is currently in its first planned long shutdown phase (LS1) until December 2023. Aside from upgrades of the collider and detector maintenance, the shutdown is used for the installation of the two-layer Pixel Vertex Detector (PXD) which forms the Belle II Vertex Detector (VXD) together with four layers of double-sided silicon strips (SVD). The VXD is essential for precisely reconstructing primary and decay vertices. As the innermost sub-detector, multiple scattering effects need to be reduced. PXD utilizes the depleted P-channel Field Effect Transistor (DEPFET) technology, allowing for a $75 \mu\text{m}$ -thin sensitive detector area and a low material budget of $0.21 \% X_0$ per layer. Each of the tracker's 40 modules consists of an array of 256×768 pixels with a pitch ranging from $(50 \times 55) \mu\text{m}^2$ for the inner to $(85 \times 55) \mu\text{m}^2$ for the outer layer yielding high gain and high signal-to-noise ratio while retaining about 99 % hit efficiency. This talk will discuss the experience of the 4-year operation of the previous single-layer PXD in harsh background conditions as well as commissioning and testing of the fully-populated PXD2 during LS1.

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