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The track finding algorithm of the Belle II vertex detectors

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Belle II is a multipurpose detector which will be operated at the asymmetric B-Factor SuperKEKB (Japan). The unprecedented instantaneous luminosity of up to $8 \times 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$ provided by the accelerator together with the level 1 trigger rate in the range of 30kHz will pose extreme requirements on the sub-detectors of Belle II and the track finding algorithms. Track position information close to the interaction point is provided by the vertex detector (VXD) which consists of 2 layers of pixel detectors (PXD) and 4 layers of double sided silicon strip vertex detectors (SVD).

The track finding code for the VXD of Belle II implements in an efficient way the Sector Map concept originally proposed by Rudolf Frühwirth. The typical event recorded by the VXD will be dominated by random hits produced by beam background (order of 500 pixels hit per event per sensor on the inner layer of the PXD, 20 GByte/s required to readout the whole PXD.) In this harsh environment the pattern recognition algorithm for the VXD has to be capable to efficiently and quickly recognize the 11 tracks of a typical Y4S event.

The track finding algorithm I will present will be used both for the final reconstruction of the event and at the High Level Trigger stage for the definition of the Regions Of Interest on the PXD sensors used to reduce the PXD data stream to a manageable level. This latter task put further constraints on the reliability and time consumption of the track finding algorithm. I will present the main concepts of the algorithm, some details of its implementation together with its current performances.

Authors: PAOLONI, Eugenio (INFN Pisa); Mr METZNER, Felix (Karlsruhe Institute of Technology); WAGNER, Jonas Ferdinand (KIT - Karlsruhe Institute of Technology (DE)); LUECK, THOMAS (University of Pisa)

Co-author: HECK, Martin (KIT)

Presenter: LUECK, THOMAS (University of Pisa)

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