

Development of high resolution low power silicon pixel sensors for the CEPC vertex detector

Thursday 30 July 2020 09:15 (15 minutes)

The Circular Electron Positron Collider (CEPC) has been proposed as a Higgs/Z0 (flavor) factory, which would allow precision measurements of the Higgs boson properties, as well as of W^\pm/Z^0 bosons. The baseline design of CEPC vertex system consists of three concentric double-sided pixel layers, to reach the unprecedented impact parameter resolution. Driven by physics studies and experimental conditions, the silicon pixel sensor of vertex system has similar performance requirements to that of ILC detectors, such as a single point resolution of around $3\mu\text{m}$, very low material budget of $0.15\%X_0$ per single layer and power consumption of below $50\text{mW}/\text{cm}^2$, but without power-pulsing, which leads to significantly additional constraints on detector specifications, especially for the case of machine operating at Z-pole energy region with high luminosity. In this presentation, I will give an overview of the conceptual design, the requirements and challenges for the CEPC vertex system. The on-going R&D activities will be mainly reported, based on monolithic CMOS pixel sensor (CPS) and Silicon on Insulator (SOI) pixel sensor technologies, for the purpose of development of high resolution and low power consumption pixel sensors. To reach the target, several CMOS and SOI pixel prototypes with small pitch ($\sim 20\mu\text{m}$) and digital readout are explored. Recent R&D achievements will be presented, and the prospects of future R&D with novel stitching and 3D sensor technologies will also be shown.

Secondary track (number)

Author: Prof. OUYANG, Qun (Institute of High Energy Physics, Chinese Academy of Sciences)

Co-authors: Dr ZHOU, Yang (Institute of High Energy Physics, Chinese Academy of Sciences); Dr ZHANG, Ying (Institute of High Energy Physics, Chinese Academy of Sciences); Dr YANG, Ping (Central Chinese Normal University); Dr LU, Yunpeng (Institute of High Energy Physics, Chinese Academy of Sciences)

Presenter: Prof. OUYANG, Qun (Institute of High Energy Physics, Chinese Academy of Sciences)

Session Classification: Detectors for Future Facilities (incl. HL-LHC), R&D, Novel Techniques

Track Classification: 13. Detectors for Future Facilities (incl. HL-LHC), R&D, Novel Techniques