

3D Silicon Sensors for High Energy Physics



Speaker: Dr. Jixing Ye
Host: Prof. Yunyun Fan
Time: 28th Nov, Friday, 10:00
Location: Multi discipline Building 122
Indico: <https://indico.ihep.ac.cn/event/27992>
Zoom: <https://zoom.us/j/94538656129?pwd=CY3ovpIP0bEE2pOaKEAa3GNXcM07jV.1>
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Abstract:

Thanks to their small inter-electrode distance, 3D sensors are by far the most radiation-hard silicon detector technology available today. In addition to their exceptional radiation tolerance, they are intrinsically fast. Studies on various designs show that columnar-electrode 3D sensors can achieve timing resolutions of around 30 ps, while 3D trench-electrode sensors can reach approximately 10 ps, even after exposure to extremely high radiation damage. Despite these excellent performances, several underlying challenges remain, such as increasing the breakdown voltage and improving fabrication yield through optimized layout design.

This talk will focus on the fundamentals of 3D sensors, spanning from small-pitch 3D pixel sensors for the innermost layer of the ATLAS ITk, to 3D trench-electrode sensors developed for 4D tracking at FCC. It also covers different simulation platforms used to study the breakdown behavior and transient performance of 3D sensors, which play a crucial role in guiding future detector designs.

About the speaker:

Jixing Ye received his Ph.D. in Industrial Engineering from the University of Trento, Italy, in 2025, where he specialized in 3D silicon radiation sensors for high-energy physics experiments. After completing his doctorate, he joined the same research group as a postdoctoral fellow, focusing on monolithic active pixel sensors (MAPS) for medical imaging applications. In addition to his work on the simulation and characterization of 3D silicon radiation sensors, his expertise also includes the design of guarding rings for planar sensors to mitigate performance degradation caused by dicing-edge effects.