

The development of radiation-resistant SiPM at IHEP

Silicon Photomultipliers (SiPM) has advantages such as low operating voltage, high gain, high photon detection efficiency, and resistance to magnetic field interference, making it a high-performance device for photon counting. SiPM is also a key component in major scientific projects such as Circular Electron Positron Collider (CEPC), Large Area Cosmic-ray Telescope (LACT), and High Energy cosmic-Radiation Detection (HERD). Self-developed SiPM can reduce the construction cost of detectors, conduct personalized customization, achieve high yield, high consistency, and sufficient production capacity.

Institute of High Energy Physics (IHEP)'s self-developed radiation-resistant SiPM, based on Low Gain Avalanche Diode (LGAD)'s existing excellent technologies and structural design, will be used for collider experiments and space experiments. After preliminary testing, the structural design and some technologies of IHEP-SiPM have been verified, and the energy resolution and leakage current need to be optimized. Under the same irradiation conditions and operating voltage, the leakage current of SiPM is $0.1094 \mu\text{A}/\text{cm}^2$, which is lower than that of the Hamamatsu S13360 series at $0.2778 \mu\text{A}/\text{cm}^2$. At an irradiation dose of $1.09 \times 10^{10} \text{ n}_{\text{eq}}/\text{cm}^2$, the breakdown voltage of the SiPM was reduced by 5V compared to before irradiation. The official wafer layout has been designed and SiPM wafers are planned to be completed by the end of this year for further testing and optimization to develop SiPM with radiation resistance and large dynamic range.

Primary authors: 梁, 志均 (中国科学院高能物理研究所); 张, 田园; 赵, 梅 (中国科学院高能物理研究所); 李, 梦朝 (中国科学院高能物理研究所); 孙, 维益 (中国科学院高能物理研究所)

Presenter: 张, 田园

Session Classification: MDI + Accelerator

Track Classification: Detector and System: 15: PID and other detection technologies