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Silicon Interposer for nEXO Experiment: An Ultra-Low-Radioactivity Solution for the SiPM Photo-detector

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The nEXO experiment aims to study neutrinoless double-beta decay, requiring stringent control of radioactive backgrounds. Traditional printed circuit boards (PCBs) used for mounting Silicon Photomultipliers (SiPMs) can introduce unacceptable levels of radioactivity. To overcome this challenge, we have developed a novel Silicon Interposer technology utilizing cutting-edge Through-Silicon Via (TSV) fabrication.

Manufactured from high-purity silicon wafers, the Silicon Interposer provides a low-radioactivity platform for mounting SiPMs while enabling high-density interconnections. We have produced three generations of prototypes, iteratively refining the design and manufacturing process.

The silicon interposers have undergone rigorous testing, including electrical characterization, mechanical assessments, temperature cycling, and signal integrity evaluation with mounted SiPMs. The results demonstrate successful integration, meeting the stringent radioactivity and performance requirements for the nEXO experiment.

This poster presents the innovative Silicon Interposer technology, detailing the design, fabrication process, and comprehensive test results. The Silicon Interposer offers a compelling low-radioactivity solution for SiPM mounting, enabling enhanced sensitivity in rare-event search experiments like nEXO.

Poster prize

Yes

Given name

Hanwen

Surname

Wang

First affiliation

Institute of High Energy Physics, Chinese Academy of Sciences

Second affiliation

Institutional email

wanghanwen@ihep.ac.cn

Gender

Male

Collaboration (if any)

JUNO, nEXO

Primary author: WANG, Hanwen (Institute of High Energy Physics (IHEP))

Co-author: Mr CAO, Guofu (Institute of High Energy Physics)

Presenters: Mr CAO, Guofu (Institute of High Energy Physics); WANG, Hanwen (Institute of High Energy Physics (IHEP))

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