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R&D of MCP-PMTs in XIOPM

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Because of its superior timing resolution, low dark noise, and stability in magnetic fields, the Microchannel Plate Photomultiplier Tube (MCP-PMT) is an essential component of particle identification detectors like PANDA, LHCb and Belle II, as well as fast neutron or x-ray detections in nuclear inertial confinement fusion (ICF) experiments and laser communication. However, there is more work to be done to develop the MCP-PMT with a low after pulse, high dynamic range, robust output, and high spatial resolution. Since 2011, we have meticulously examined the properties of the MCP-PMT through simulations and tests, and we have created many sorts of prototypes for investigations in nuclear physics and high energy physics. Understanding the behavior of these devices and developing better versions is aided by tracking the electron process inside MCP-PMT using 3D simulations. In the Double Cone Ignition (DCI) experiment conducted in China, tens of gated MCP-PMTs with a gating response time of 5 ns and a gating noise amplitude of ±2mV were utilized. These MCP-PMTs successfully captured the fast neutron signals amidst a strong gamma ray background. For the purpose of severe radiation detection, a high dynamic range MCP-PMT with a linear output up to 250mA@100ns was created. Additionally, we are dveloping a long-lasting, position-sensitive MCP-PMT for China's Super Tam Charm Facility (STCF). Jiangmen Underground Neutrino Experiment (JUNO) has mounted about twenty thousand 20-inch MCP-PMTs. We would like to demonstrate the research and development of the fast, gated, high dynamic range, and multi-anode MCP-PMTs in this presentation.

Collaboration

Role of Submitter

I am the presenter

Primary authors: Mr LIU, Hulin (Xi'an Institute of Optics and Precision Mechanics of Chinese Academy of Sciences); Prof. TIAN, Jinshou (Xi'an Institute of Optics and Precision Mechanics of Chinese Academy of Sciences); Mr LI, Kuinian (Xi'an Institute of Optics and Precision Mechanics of Chinese Academy of Sciences); CHEN, Ping (Chinese Academy of Sciences); Mr WEI, Yonglin (Xi'an Institute of Optics and Precision Mechanics of Chinese Academy of Sciences)

Presenter: CHEN, Ping (Chinese Academy of Sciences)

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