

Mass Characterization of SiPM Tiles for the TAO Experiment at JUNO

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The Jiangmen Underground Neutrino Observatory (JUNO) is a cutting-edge reactor neutrino experiment located in China, consisting of two key detectors: the primary JUNO detector and the auxiliary TAO satellite detector. The TAO detector, a vital component of the experiment, comprises a spherical vessel filled with liquid scintillator and is equipped with approximately 4,000 Silicon Photomultiplier (SiPM) 32-channel arrays.

This presentation focuses on the precise testing and characterization of all SiPM arrays for the TAO experiment. Achieving the experiment's stringent energy resolution goals necessitates SiPMs with outstanding performance characteristics, including high Photon Detection Efficiency (PDE), minimal cross-talk, and low dark count rates (DCR). Additionally, maintaining the SiPMs at the negative temperature of -50 C is essential to meet the required DCR levels.

Our research outlines the setup and methodologies used for the comprehensive characterization of SiPMs across all 4,000 tiles required for the TAO detector. This rigorous testing process ensures that each SiPM array meets the stringent performance criteria crucial for achieving precise energy resolution, approximately 2% at 1 MeV.

Primary author: CHETVERIKOV, Aleksei (JINR)

Co-authors: Dr ANFIMOV, Nikolay (JINR); RYBNIKOV, Arseny (JINR); Mr FEDOSEEV, Dmitry (JINR); Mr KOZHUKALOV, Vladimir (JINR); SHAROV, Vladislav (Laboratory of nuclear problems. V. P. Dzhelepova)

Presenter: CHETVERIKOV, Aleksei (JINR)

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