



Contribution ID: 87

Type: **Oral contribution**

First Results of the JUNO-TAO Detector

The Taishan Antineutrino Observatory (JUNO-TAO) is a satellite detector of the Jiangmen Underground Neutrino Observatory (JUNO), located 44 m from the 4.6 GW_{th} core of Unit 1 of the Taishan Nuclear Power Plant. Its primary goal is a precision measurement of the reactor electron-antineutrino ($\bar{\nu}_e$) spectrum with unprecedented energy resolution, providing a model-independent reference crucial to JUNO's determination of the neutrino mass ordering. Additional physics goals include testing nuclear databases, studying the 5 MeV spectral excess, measuring isotope-specific IBD rates, and searching for light sterile neutrinos. The Central Detector employs 2.8 tonnes of Gd-doped liquid scintillator read out by 4024 SiPM tiles covering $\sim 95\%$ of the inner surface, operated at -50°C to suppress the dark count rate, yielding ~ 4500 photoelectrons per MeV. Detector installation was completed in January 2025, commissioning concluded at the end of 2025, and physics data-taking began in early 2026 with an expected rate of ~ 1200 IBD events per day in the fiducial volume ($R < 650$ mm). We report on detector commissioning and early performance, together with first physics results from the initial data-taking period.

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Track Classification: WG6: Detector Physics