Contribution ID: **189** Type: **Poster**

Characterization of 3-inch Photomultiplier Tubes for the JUNO Central Detector

Jiangmen Underground Neutrino Observation (JUNO) is one of the largest experimental facilities for neutrino detecting. As its main structure, the central detector (CD) contains 20 kiloton liquid scintillator filled in an acrylic shell, and there are 18,000 20-inch photomultiplier tubes (PMTs) and 36,000 3-inch PMTs covering the shell. As an independent photon detection system, 3-inch PMTs have been required to have excellent resolution for the single photoelectron (SPE) detection, high quantum efficiency, small transit time spread and low dark rate. Three kinds of 3-inch PMT from HZC Photonics and Hamamatsu have been investigated as candidates. A dedicated test system for 3-inch PMTs has been designed and various characterization parameters have been measured. The preliminary results show these PMTs can meet the requirements of JUNO.

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Track Classification: Neutrino Detectors