

The 3-inch PMT system of JUNO experiment

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A 20 kton liquid scintillator (LS) detector was designed in the Jiangmen Underground Neutrino Observatory (JUNO) for multiple physical purpose. In order to determine the neutrino mass ordering, JUNO needs an excellent energy resolution [$3\%/\sqrt{E(\text{MeV})}$] and an accurate energy scale determination [better than 1%]. The JUNO experiment will install 25k 3-inch PMTs (SPMTs) in the gaps between 18k closely packed 20-inch PMTs (LPMTs). Both systems will detect the same IBD signals, but the SPMTs will almost always work in single photoelectron mode. As a result, they will help constrain some of the systematics in the LPMT energy reconstruction, improving the energy resolution and the sensitivity of neutrino mass hierarchy measurement. They will also improve the performance of muon reconstruction, help reduce muon-related isotope backgrounds, provide an independent measurement of the θ_{12} and Δm_{21}^2 solar parameters with unprecedented precision, and it also has the potential to improve measurements of supernova neutrinos and proton decay.

All 25k 3-inch PMTs have been produced by the Hainan Zhanchuang Photonics Technology Co., Ltd (HZC) company in China and passed all acceptance tests. Electronics, high voltage divider, SPMT potting, cabling, connector and underwater box are all making good progress. Integration testing is underway. After potting, all PMTs will be tested again in Guangxi University before deliver to JUNO onsite. Until now, about 8k PMTs were measured and they shown good performances after potting. This talk will provide an overview of the design, status and performance testing of the 3-inch PMTs of JUNO.

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