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Design and status of the JUNO detector

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JUNO (Jiangmen Underground Neutrino Observatory) will be the largest liquid scintillator detector for neutrino physics. It will employ 20 000 tons of linear alkyl benzene (LAB), 2.5 g/L of PPO and 3 mg/L of bis-MSB. The main goal of JUNO is to determine the neutrino mass ordering in six years of data taking at 3 σ level.
The main detector of JUNO is a gigantic (35.4 meter of diameter) acrylic sphere surrounded by more than 45 000 PMTs (divided into small 3" and large 20" sizes) obtaining an excellent optical coverage ~ 78 %. The sphere will be filled with purified liquid scintillator, to reduce the content of Uranium and Thorium (but also other contaminants), five purification plants will be employed. An ancillary detector, OSIRIS will be deputed to check the radiopurity of the scintillator during filling. The five purification plants are commissioned and the results on the purification efficiency are promising. OSIRIS started the commission in March 2024, and now it is still under commissioning. The construction of the JUNO detector is expected to be completed by the end of 2024, with data-taking scheduled to start in 2025.
The most relevant features will be discussed in this talk, which will enable JUNO to reach the required 3% energy resolution for determining the neutrino mass ordering. Additionally, the purification plants will be described, which are essential for reducing the contamination of Uranium and Thorium below the 10^{-15} g/g level. Finally, I will show some results on the commissioning of the purification plants and tests of the PMTs dark noises.

Working Group

WG 6: Detectors

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