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JUNO's Water Cherenkov Detector

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The Jiangmen Underground Neutrino Observatory (JUNO) is a state-of-the-art neutrino physics experiment located in South China. With 20 ktons of ultra-pure Liquid Scintillator, JUNO aims to achieve groundbreaking measurements, including the determination of Neutrino Mass Ordering and the precise measurement of three neutrino oscillation parameters with sub-percent precision. The central detector is immersed in a Water Cherenkov Detector (WCD), which contains 40 ktons of ultrapure water and 2,400 microchannel plate photomultipliers (MCP-PMTs), serving dual purposes of radioactive background suppression from surrounding rock and cosmic muon tagging. The inner surface of the water pool's wall is covered by 5 mm HDPE to prevent the rock emanated radon from diffusing into the water. Tyvek reflectors cover both the HDPE surface and the stainless lattice steel structure to enhance the light collection efficiency. A 100t/h ultra-pure water system, which could reduce radon to mBq/m³ level and radium to μ Bq/m³ level, maintains high water quality and ensures optimal detector performance. The 32-coil magnetic shielding system effectively mitigates geomagnetic field effects on PMT operation. The WCD demonstrates exceptional cosmic muon detection efficiency, exceeding 99% while suppressing muon-induced fast neutron backgrounds to ~ 0.1 events per day. This talk will provide an overview of the design and current status of JUNO's Water Cherenkov detector.

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