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Key technologies in the design and construction of the JUNO central detector

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The Jiangmen Underground Neutrino Observatory (JUNO) is a multipurpose neutrino experiment designed to determine neutrino mass hierarchy and precisely measure oscillation parameters by detecting reactor neutrinos from nuclear power plants, observe supernova neutrinos, study the atmospheric, solar neutrinos and geo-neutrinos, and perform exotic searches. The experiment is designed to use the liquid scintillator detector with large scale to have huge target mass and with the critical performance of the precise energy resolution. The central detector(CD) is designed to have the relative energy resolution of 3% at 1 MeV with 20 ktons of liquid scintillator. The liquid scintillator is contained by an acrylic spherical vessel with a diameter of 35.4 m, and the acrylic vessel is supported by a stainless steel latticed shell that also holds about 17600 pieces of 20 inch PMTs and 25600 pieces of 3 inch PMTs to detect the light from the liquid scintillator. The detector is immersed in pure water, so the acrylic vessel needs to bear more than 3000 tons of buoyancy.
At present, the detector is under construction, and many challenges have been encountered in the design and construction of the detector. For example, the acrylic ball needs to bear thousands of tons of buoyancy, the acrylic bonding face cracks during annealing, the stainless steel latticed shell adopts ring-groove rivets to ensure the installation size, PMT is densely installed inside the shell, and so on. This talk will introduce the recent status of the detector and key technologies in its design and construction.

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