THE JUNO EXPERIMENT: CURRENT STATUS AND PROSPECTS

N. Anfimov
Joint Institute for Nuclear Research
E-mail: anphimov@jinr.ru

The Jiangmen Underground Neutrino Observatory (JUNO) represents a groundbreaking experiment currently under construction in China. Featuring a central detector with a diameter of 35.4 meters and containing 20 kilotons of liquid scintillator, which is read out by 17,612 large and 25,600 small Photomultiplier Tubes (PMTs), JUNO promises to deliver unprecedented statistics, high-energy resolution ($\sigma = 3\%$ @ 1 MeV), and a remarkably low energy threshold (approximately 0.2 MeV), thereby enabling a diverse physics program.

The primary objective of JUNO is to determine the neutrino mass ordering and precisely measure neutrino oscillation parameters. This will be achieved through the observation of over 100,000 reactor electron antineutrinos emitted from the Yangjiang and Taishan nuclear power plants over 6 years. Additionally, JUNO will provide high-statistics data on solar neutrinos, including those from ^{7}Be, and ^{8}B sources, as well as geo-neutrinos with a measurement uncertainty of 8% over a data-taking period of 10 years with a known Th/U ratio. Furthermore, JUNO will capture atmospheric neutrinos in both sub-GeV and GeV ranges, detect the diffuse supernovae neutrino background with a significance of 3σ over a 3-year period, and observe neutrinos from core-collapse supernovae.

In tandem with the central detector, JUNO will be supported by the Taishan Antineutrino Observatory (TAO) detector. TAO's main function will be to measure the antineutrino spectrum from the Taishan nuclear power plant with an energy resolution of $\sigma < 2\%$ @ 1 MeV and a statistical uncertainty of 1%. This satellite detector will aid in mitigating systematic uncertainties associated with the primary antineutrino spectrum from the reactor and facilitate measurements of short-baseline sterile neutrino oscillation, up to differences in squared masses of $\sim$ 8 eV^2. To achieve its unparalleled energy resolution, TAO will utilize Silicon Photomultipliers with a High Photon Detection Efficiency of approximately 50%, operating at a temperature of -50°C.

This presentation will provide an overview of the current status of the JUNO experiment, highlighting its groundbreaking capabilities and prospects.