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Status and prospects of the Jiangmen Underground Neutrino Observatory (JUNO)

The Jiangmen Underground Neutrino Observatory (JUNO) is a neutrino experiment aiming to detect antineutrinos emitted from nuclear reactors and coming from the interior of the Earth, as well as neutrinos from galactic and extragalactic sources. It comprises an active target mass made of 20 kton organic liquid scintillator, monitored by more than 40,000 photosensors. JUNO will shed light on several open questions in fundamental particle physics and astrophysics, such as to determine the neutrino mass ordering with a significance greater than 3 σ, to measure three of the neutrino oscillation parameters with sub-percent precision, to improve the current limits on the proton lifetime, to help addressing the solar metallicity problem, to detect the diffuse supernova neutrino background and to be ready for the detection of a core-collapse supernova neutrino burst, and to investigate several theories predicting physics beyond the Standard Model.

This talk will provide new insights into the JUNO physics program, by showing the latest sensitivity studies based on the most up-to-date detector parameters. It will provide an overview of the most demanding experimental challenges, with a focus on how these challenges are being addressed, and what is their expected impact on the aforementioned physics goals. The talk will also cover some of the major milestones recently achieved by the collaboration, such as procuring and testing all the photosensors, publishing a comprehensive calibration strategy meant to achieve the unprecedented 3% energy resolution at 1 MeV, and completing a background budget assessment based on measuring the radioactive contaminants embedded in all the detector components.

Primary author: GRASSI, Marco (Padua University)

Presenter: GRASSI, Marco (Padua University)

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