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The Borexino Monte Carlo simulations for the CNO neutrino detection

Borexino is a solar neutrino detector based on 280 tons of ultrapure liquid scintillator, located at the Laboratori Nazionali del Gran Sasso, Italy. Its latest primary goal (2016-2020) was the observation of neutrinos emitted from the CNO cycle, undetected so far. An accurate Monte Carlo simulation is essential to achieve this goal: the Borexino simulation package reproduces the detector energy and position response, within the analysis volume, at 1% precision level, in the 100 keV – MeV range. From 2016, an energy scale discrepancy between simulations and data emerged, preventing to perform the Monte Carlo fit on recent data. An upgrade of the effective photomultipliers quantum efficiencies calculation, followed by a re-tuning of Monte Carlo input parameters, allowed to solve the issue. This improvement restored the simulation performances to the required precision, allowing to perform the Monte Carlo fit on 2016-2020 data, leading to the CNO neutrino detection.

Mini-abstract

Improvements of Borexino simulations crucial to detect the CNO neutrinos based on 2016-2020 data.

Experiment/Collaboration

Borexino Collaboration

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