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First direct evidence of the CNO fusion cycle in the Sun with Borexino

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The Borexino experiment has recently provided the first direct experimental evidence of the sub-dominant CNO-cycle in the Sun, which is assumed to be the main energy production mechanism in heavier stars. Borexino is a liquid scintillator detector located at the Laboratori Nazionali del Gran Sasso, Italy with the main goal to measure solar neutrinos. The extreme radiopurity of the scintillator and the successful thermal stabilisation of the detector have proven to be valuable assets in the quest for CNO neutrinos.
The low abundance of CNO neutrinos and the similarity of its spectral shape to that of *pep* solar neutrinos and the intrinsic ^{210}Bi background, make CNO neutrino detection challenging. Therefore, it is necessary to constrain these backgrounds independently. The energy and radial distribution of the events can then be exploited to perform a multivariate fit, which requires a careful evaluation of the systematic uncertainty associated with the Monte-Carlo spectral shapes used. Borexino has successfully rejected the null hypothesis of CNO-cycle neutrinos in the Sun at greater than 5.0σ with 99% C.L. This talk will present the overview of the strategy and methods used to achieve this result and the consequence of this result for solar and stellar physics.

Keywords

Borexino; CNO neutrinos; Sun; Liquid scintillator detectors; solar metallicity; solar fusion reaction;

Collaboration

Borexino

other Collaboration

Subcategory

Experimental Results

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