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Directionality measurement of CNO neutrinos with Borexino detector

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Borexino was a solar neutrino detector based on 280 tons of ultrapure liquid scintillator, located at the Laboratori Nazionali del Gran Sasso, Italy. Over fourteen years of data taking, Borexino completed the spectroscopy of solar neutrinos emitted from the pp chain reactions and measured the flux from the Carbon-Nitrogen-Oxygen (CNO) cycle. These spectroscopy analysis relied on a multivariate fit to disentangle the neutrino signal from the backgrounds, based on the events energy and radial position. For the CNO signal search, an additional constraint to the annoying ^{210}Bi background rate, independent of the spectral fit, was necessary to gain enough sensitivity. Recently, Borexino has demonstrated the use of the directional Cherenkov information for a sub-MeV solar neutrinos measurement, in a liquid scintillator detector. This “Correlation and Integrated Directionality” (CID) technique correlates the individual photon hits of events to the position of the Sun.

This talk covers the Borexino search for CNO signal by exploiting the CID technique.

Exploiting this method only we achieved, for the first time, a CNO flux measurement without imposing any independent constraint to the ^{210}Bi rate. In addition, we have combined an improved two-dimensional multivariate analysis with the information on pep+CNO number of events obtained from the CID analysis, leading to the most precise CNO measurement ever obtained by Borexino.

Submitted on behalf of a Collaboration?

Yes

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