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Measurement of geo-neutrinos detected in the Borexino experiment at the Laboratory Nazionali del Gran Sasso

This work presents a measurement of geo-neutrinos detected in the Borexino experiment at the Laboratory Nazionali del Gran Sasso in central Italy. Geo-neutrinos are electron anti-neutrinos produced in our planet by beta decays of naturally occurring radioactive isotopes; they provide a new tool to directly probe the interior of the Earth. The present measurement, obtained from 1353 days of data, corresponds to an exposure of (3.69 +/-0.16) x 10^31 proton x year. After all selection cuts and background subtraction made in the analysis, the number of detected geo-neutrino (assuming a fixed chondritic Th/U mass ratio of 3.9), is of (14.3 +/- 4.4 events). The corresponding geo-neutrino signal is S_geo = (38.8 +/-12.0) TNU. If U and Th contributions are left as free parameters in the fit, central values of S_Th = (10.6 +/-12.7) TNU and S_U = (26.5 +/- 19.5) TNU are obtained. The Borexino data are compatible with a mantle geo-neutrino signal of (15.4 +/- 12.3) TNU. The combination of the Borexino and the KamLAND data allows to extract a geo-neutrino mantle signal of (14.1 +/-8.1) TNU.

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