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The measurement of the geo-neutrino flux with the Borexino detector and its geophysical implications

The new Borexino geo-neutrino analysis includes the well-optimized cuts and increased dataset. Consequently, the exposure is doubled providing $(1.29 \pm 0.05) \times 10^{32}$ protons·year. The geo-neutrino signal equals $47.0^{+8.4}_{-7.7}$ (stat) $^{+2.4}_{-1.9}$ (sys) TNU corresponding to $^{+18.3}_{-17.2}\%$ total precision. The mantle signal of $21.2^{+9.6}_{-9.0}$ (stat) $^{+1.1}_{-0.9}$ (sys) TNU is derived using the geological knowledge of the local and far field lithosphere. The null-hypothesis is excluded at 99.0% C.L. The total radiogenic heat of $38.2^{+13.6}_{-12.7}$ TW is obtained. The predictions of the lowest concentration of heat-producing elements in the mantle are slightly disfavored ($\sim 2.4\sigma$). The constraint on the hypothetical georeactor power is 2.4 TW at 95% C.L. if located at the Earth's center.

Mini-abstract

Borexino sees geo-neutrinos with ~18% error and excludes the mantle signal absence at 99.0% C.L.

Experiment/Collaboration

on behalf of the Borexino Collaboration

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