Evidence of large potassium abundance in the Earth following from new Borexino data

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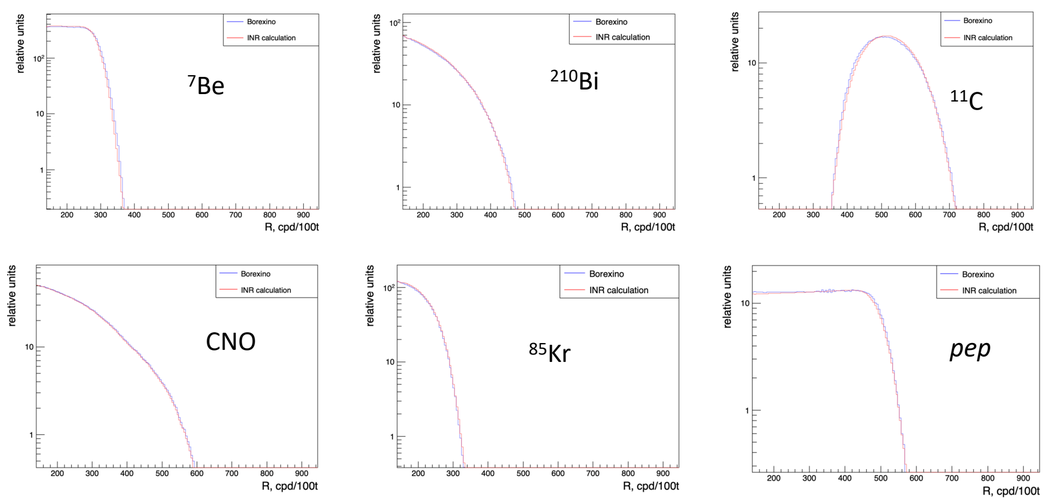
Borexino detector and its results

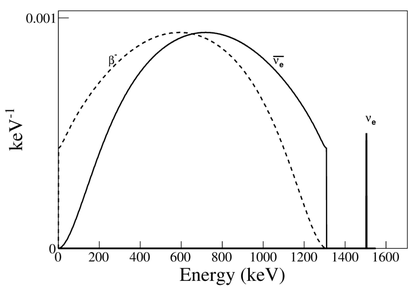
There were measured fluxes of ^{7}Be, ^{8}B, *pep* and *pp* neutrinos from the Sun. The fluxes appeared the same as ones predicted by Standard solar model (SSM). Last result was performed at Neutrino-2020 and Neutrino-2022 – measurement of CNO cycle neutrinos. This flux is > 1σ larger than predicted for high metallicity (HM) 5.0 cpd/100t and > 2σ for low metallicity (LM) 3.9 cpd/100t.

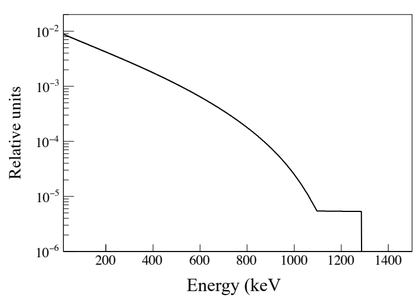
The detector is also sensitive for antineutrinos as well as for neutrinos. It makes possible to estimate the ^{40}K geoneutrino flux.

Borexino and INR pdf-s for the experimental spectrum analysis



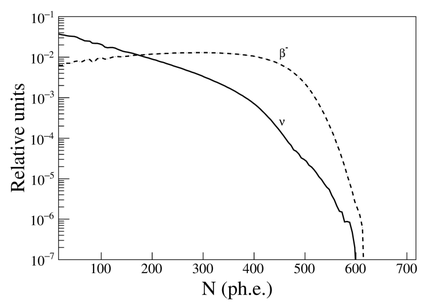
Transformation of ^{40}K neutrino spectrum to pdf





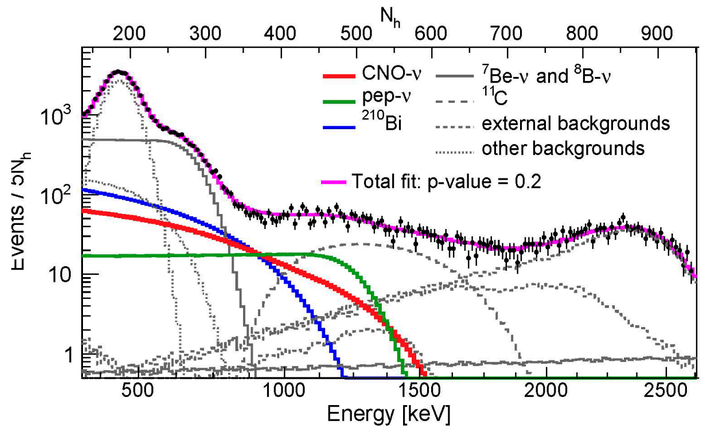
Antineutrino, beta and neutrino ^{40}K spectra.

Recoil electron spectrum produced by antineutrinos and neutrinos from ^{40}K.



Pdf for beta and neutrino ^{40}K.

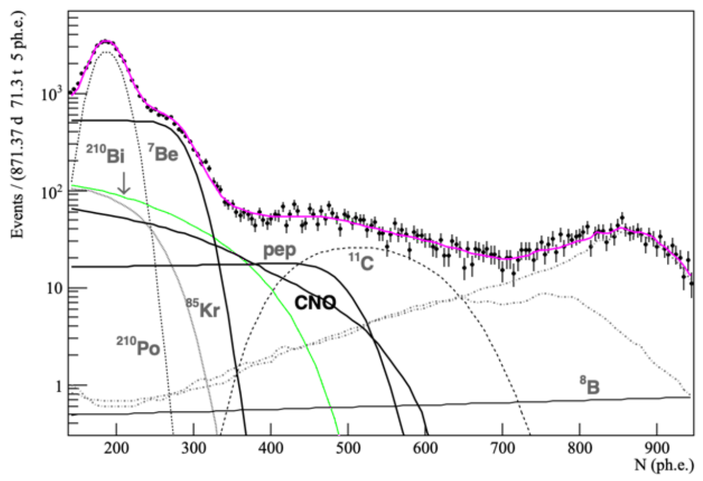
Experimental spectrum analysis



Borexino collaboration analysis without ^{40}K account.

R(CNO) = $6.6^{+2.0}_{-0.8}$ cpd/100t

R(^{40}K) = 0 cpd/100t



INR analysis without ^{40}K account.

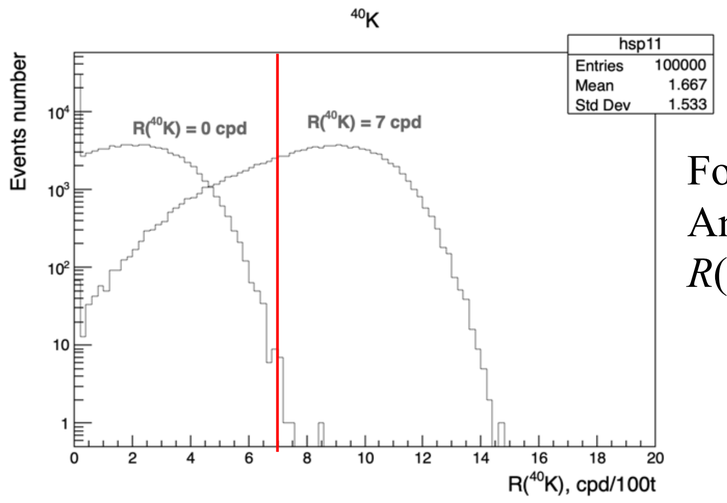
R(CNO) = 6.7±1.6 cpd/100t

R(^{40}K) = 0 cpd/100t

χ^2 = 200

Conclusion

INR analysis of Borexino experimental spectrum was done. It was found that ^{40}K counting rate is high (11cpd) compare with prediction of BSE model (0.05 cpd).

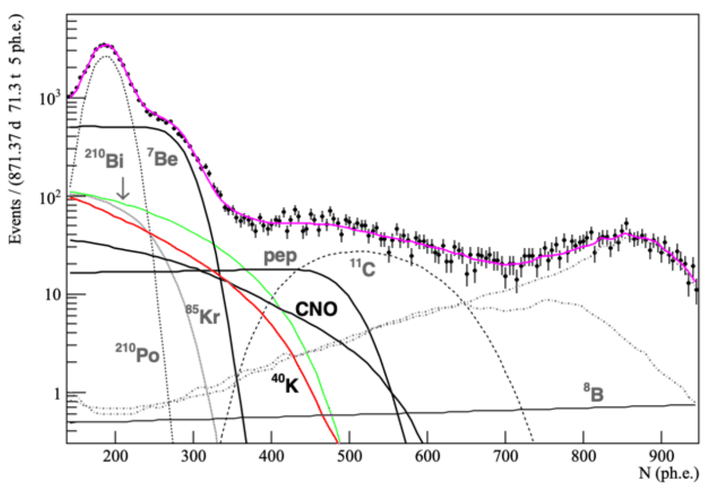


Found from the Analysis

R(^{40}K) = **11** cpd/100t

Monte Carlo ^{40}K counting rate distribution in case of ^{40}K absence (R(^{40}K) = 0) and in presence (R(^{40}K) = 7). Red line marks R(^{40}K) = 7 cpd. The probability to find the value of R(^{40}K) >= 7 at zero hypothesis is 3×10^{-5}

At level 6σ zero hypothesis rejected



INR analysis with ^{40}K account.

Red line – ^{40}K spectrum.

R(CNO) = 3.9±1.6 cpd/100t

R(^{40}K) = 11 ± 2 cpd/100t

χ^2 = 175