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Search for solar axions using resonant absorption by 83Kr nuclei

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A search for resonant absorption of the solar axion by ^{83}Kr nuclei is continued with the krypton proportional counter at the Baksan Neutrino Observatory. Such an absorption should lead to the excitation of low-lying nuclear energy level of ^{83}Kr: $A + {}^{83}\mathrm{Kr} \rightarrow {}^{83}\mathrm{Kr}^{*} \rightarrow {}^{83}\mathrm{Kr} + \gamma\,(8.41\mathrm{keV})$. The obtained model independent upper limit on the combination of isoscalar and isovector axion-nucleon couplings $|g_3 - g_0| \leq 8.4 \times 10^{-7}$ leads to a new upper limit on the hadronic (KSVZ) axion mass of $m_A \leq 65$ eV (95\% C.L.) with the generally accepted values S=0.5 and z=0.56. The resonant absorption of the Primakoff solar axions leads to constraint on the axion–photon coupling and axion mass $g_{A\gamma} \times m_A \leq 6.3 \times 10^{-17}$ that corresponds to the upper limit on KSVZ axion mass $m_A \leq 14.3$ eV. For solar axions produced by Compton and bremsstrahlung like processes the limit on axion-electron coupling and KSVZ axion mass are $g_{Ae} \times m_A \leq 1.8 \times 10^{-9}$~eV and $m_A \leq 98$ eV, correspondingly (all at 95\% C.L.).

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