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CFA LECTURES

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Searches for solar axions using axioelectric effect in atoms and resonant absorption by nuclei

- Abstract -

Recent results of searches for solar axions using the axioelectric effect in Bi atoms and the resonant absorption by ^{169}Tm nuclei are presented. The search for axioelectric absorption of 5.5 MeV solar axions produced in the $p(d, ^3\text{He})\alpha$ reactions has been performed with a BGO-detectors placed in a low-background setup. A model-independent limit on an axion-nucleon and axion-electron coupling constants has been obtained: $|g_{\text{Ae}} \times g_{\text{AN}}^3| \leq 1.9 \times 10^{-10}$ for 90 % c. l..

The search for resonant absorption of solar axions by ^{169}Tm nuclei have been performed. Such an absorption should lead to the excitation of low-lying nuclear energy level: $A^{169}\text{Tm} \rightarrow A^{169}\text{Tm}^* \rightarrow A^{169}\text{Tm} + \gamma$ (8.41 keV). The Si(Li) detector and ^{169}Tm target placed inside the low-background setup were used for that purpose. As a result, a new model independent restrictions on the axion-nucleon, axion-photon and axion-electron couplings were obtained: $g_{\text{A}\gamma} \times |g_{\text{AN}}^0 + g_{\text{AN}}^3| \leq 9.2 \times 10^{-13}$ and $g_{\text{Ae}} \times |g_{\text{AN}}^0 + g_{\text{AN}}^3| \leq 2.1 \times 10^{-14}$ (90% c.l.).

Perspectives of using the BGO scintillator bolometer and the Tm-containing bolometer are discussed.

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