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Sensitivity Enhancement for the Searches of Neutrino Magnetic Moments through Atomic Ionization

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A new detection channel on atomic ionization for possible neutrino electromagnetic interactions was identified and studied. Orders of magnitude enhancement in sensitivities can be expected when the energy transfer to the target is of the atomic-transition scale.

Interaction cross-section induced by neutrino magnetic moments (μ_{ν}) was evaluated. New upper limit of $\mu_{\nu} < 1.3 \times 10^{-11} \mu_B$ at 90% confidence level was derived using current data with reactor neutrinos. Potential reaches of future experiments are discussed. Experiments with sub-keV sensitivities can probe μ_{ν} to $10^{-13} \mu_B$.

Positive observations of μ_{ν} in this range would imply that neutrinos are Majorana particles. Analysis with new data will be presented.

Reference :

H.T. Wong, H.B. Li and S.T. Lin, arXiv:1001.2074 (2010).

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