

Opportunities of Gallium experiments with artificial neutrino sources for investigation of transition to sterile states

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The search for sterile neutrinos, as well as for CP and CPT violation in the neutrino sector is now a field of most active investigation. The unexpectedly low capture rate of neutrinos in Ga source experiments in SAGE as well as in GALLEX can be explained by assuming transitions from active to sterile neutrinos occur with mass-squared difference Δm^2 about 1 eV^2 . This interpretation agrees with the results of reactor experiments Bugey, Chooz, and Goesgen and the accelerator experiments LSND and MiniBooNE. We propose to place a very intense source of ^{51}Cr at the center of a 50-tonne target of gallium metal that is divided into two zones and to measure the neutrino capture rate in each zone. The proposed experiment has the potential to test neutrino oscillation transitions with mass-squared difference $\Delta m^2 > 0.5 \text{ eV}^2$. This capability exists because the experiment uses a compact nearly monochromatic neutrino source with well-known activity, the dense target of Ga metal provides a high interaction rate, and the special target geometry makes it possible to study the dependence of the rate on the distance to the source. The sensitivity to disappearance of electron neutrinos is expected to be a few percent.

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