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Limits on Sterile Neutrino Mixing from a Joint Analysis of the MINOS/MINOS+, Daya Bay, and Bugey-3 Experiments

Modern neutrino physics contains a few anomalies that can not be described by the three-neutrino mixing and oscillation framework. Reactor neutrino experiments observed a deficit of the anti-neutrino flux at 2.6σ level with respect to the prediction. Gallium detectors for solar neutrinos observed a deficit of events from radioactive calibration sources of neutrino (^{37}Ar and ^{51}Cr) at 2.3σ level.

The LSND experiment has registered a 3.8σ excess of the expected number of electron anti-neutrino events in a muon anti-neutrino beam. Similar effects were observed by the MiniBooNE: a 4.7σ excess in a total number of electron neutrino and anti-neutrino events.

These anomalies could be explained with one or more sterile neutrinos, which interact only gravitationally.

The Daya Bay experiment is sensitive to sterile neutrino parameters θ_{14} mixing angle in a region of $10^{-1} < \Delta m^2_{41} < 10^{-1}$ eV^2. Since no significant signal was observed, it enables us to exclude a large region of sterile neutrino parameter space. The most stringent limits to data were set on the $\theta_{\mu e}$ mixing angle in the sterile mass-squared difference Δm^2_{41} in the combined analysis with Bugey-3 and MINOS/MINOS+. The latest results show that the allowed region of the LSND and MiniBooNE experiments is excluded at 99% CLs for $\Delta m^2_{41} < 1.2$ eV^2 by the joint analysis.

The results of the joint Daya Bay, MINOS, MINOS+ and Bugey-3 search along with a brief overview of the searches done will be presented in this poster.

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