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Production and radiative decay of heavy neutrinos at the Booster Neutrino Beam

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The MiniBooNE experiment reported results from the analysis of ν_e and $\bar{\nu}_e$ appearance searches, which showed an excess of signal-like events at low reconstructed neutrino energies with respect to the expected background. A proposed explanation for this anomaly is based on the existence of a heavy (~ 50 MeV) sterile neutrino. These ν_h would be produced by ν_μ electromagnetic interactions, through a transition magnetic dipole moment, and by neutral current interactions [1,2] on nuclei. A fraction of them decays radiatively inside the detector. The emitted photons are misidentified as electrons or positrons in MiniBooNE.

We have investigated the ν_h production by coherent and incoherent electroweak interactions on CH_2 and Ar targets, present in the MiniBooNE and the Short Baseline Neutrino (SBN) detectors (MicroBooNE, SBND and ICARUS) at Fermilab [3]. Following the ν_h propagation inside the detector we are able to obtain the energy and angular distributions of the final photons. Within the valid range of model parameters, we have obtained the best-fit parameters to describe the MiniBooNE excess of events. To further investigate this scenario, we have obtained the expected signal at the SBN detectors. The distinctive shape and total number of photon events from this mechanism makes its experimental investigation feasible.

- [1] S. N. Gninenko, Phys. Rev. D **83** (2011) 015015.
- [2] M. Masip, P. Masjuan and D. Meloni JHEP **1301** (2013) 106.
- [3] L. Alvarez-Ruso, E. Saúl-Sala, manuscript in preparation.

Experimental Collaboration

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