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Explaining the MiniBooNE Excess Through a Mixed Model of Oscillation and Decay

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This talk presents a model of the electron-like excess observed by the MiniBooNE experiment comprised of oscillations involving a new mass state, ν_4, at $\mathcal{O}(1)$ eV and a high mass state, $\mathcal{N}$, at $\mathcal{O}(100)$ MeV that decays to $\nu + \gamma$ via a dipole interaction.
Short baseline oscillation data sets (omitting MiniBooNE appearance data) are used to predict the oscillation parameters. We simulate the production of $\mathcal{N}$ along the Booster Neutrino Beamline via both Primakoff up-scattering ($\nu A \to \mathcal{N} A$) and Dalitz-like neutral pion decays ($\pi^0 \to \mathcal{N}\nu\gamma$).
The simulated events are fit to the MiniBooNE neutrino energy and visible scattering angle data separately to find a joint allowed region at 95\% CL.
An example point in this region with coupling of 3.6×10^{-7} GeV^{-1}, $\mathcal{N}$ mass of 394 MeV, oscillation mixing angle of 6×10^{-4} and mass splitting of 1.3 eV^2 has $\Delta\chi^2/dof$ for the energy and angular fit of 15.23/2 and 37.80/2, respectively.

Summary

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