Low Energy Excess and New Physics Searches with MicroBooNE

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First Full Dataset Search for a $\nu_e$ Low Energy Excess

For the first time, the full set of $1.11 \times 10^{21}$ POT is used to search for the low-energy excess (LEE) observed in MiniBooNE. This search tests whether the excess is due to an increase in the number of electron neutrinos. Two models are tested: one that models the excess as a function of the neutrino energy and one that preserves the distribution of the shower kinematics in MiniBooNE. Results using the first $6.86 \times 10^{20}$ POT of this dataset were published in [1].

**Single Photon Searches**

To search the whole photon phase-space for signs of an excess, an inclusive single photon analysis has been developed. The analysis targets any final state consistent with what would be observed as a single photon in MiniBooNE, rather than testing a particular model. A selection using Wire-Cell reconstruction tools and targeted BDTs achieves an efficiency of 70% and a purity of 40.2%.

**Dark-Sector $e^+e^-$ Solutions**

In one class of such models neutrons act as a portal to the dark sector. Active neutrinos upscatter via a dark photon ($Z'$) off an Argon nucleus to produce an unstable heavy sterile neutrino ($\nu$). This heavy sterile neutrino then decays back to a visible $e^+$ and $e^-$ pair which can be detected.

**MicroBooNE Preliminary, 1.11 x 10^{21} POT**

The LEE ratio model unfolded from MicroBooNE shower 2D kinematic variables.