

Detecting SBN Oscillations Through Reconstruction of Energies

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Background

Short Baseline Neutrino (SBN) Program main goal is to measure how neutrinos change into different flavors throughout the universe. Experiments within the SBN Program have seen **oscillations** beyond expected. This begs the question, are some oscillations anomalies or show something concrete?

Ultimately, studying oscillations can help us determine if sterile neutrinos, the potential fourth neutrino, are present.

Purpose

Identifying and analyzing different variables that will aid in the most precise **energy reconstruction** within the **SBND & ICARUS** detectors can allow us to have **improved searches** for detecting and understanding neutrino oscillations.

Materials and Methods

With the use of SBND and ICARUS monte carlo and the Common Analysis Framework, total energy plots, total shower energy plots, and total calorimetric track energy plots were created to complete precise reconstructed energies to help detect oscillations.

Results

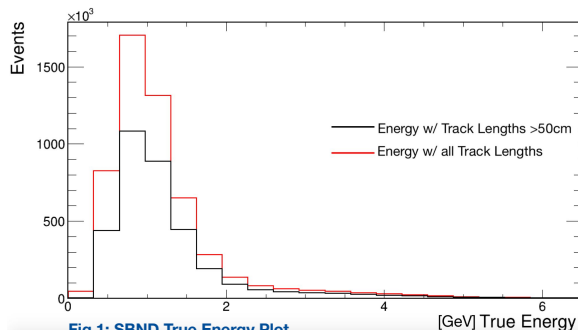


Fig.1: SBND True Energy Plot

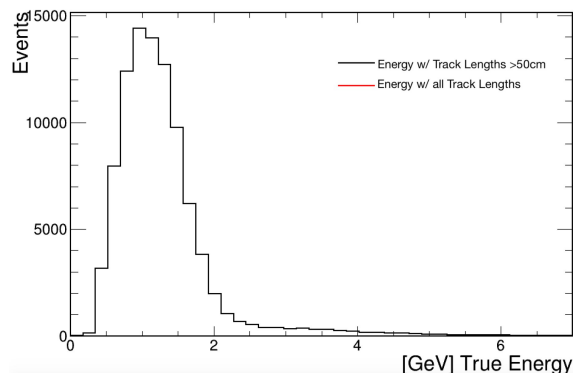


Fig.2: ICARUS True Energy Plot

Results (cont'd)

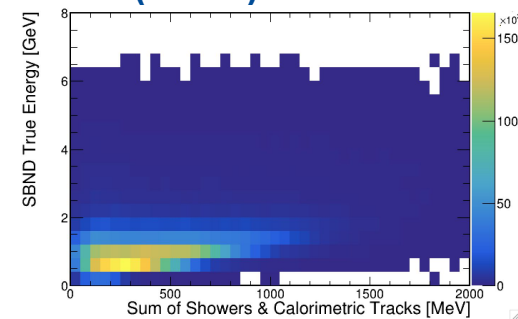


Fig.3: SBND Sum Energy vs Total Energy Plot

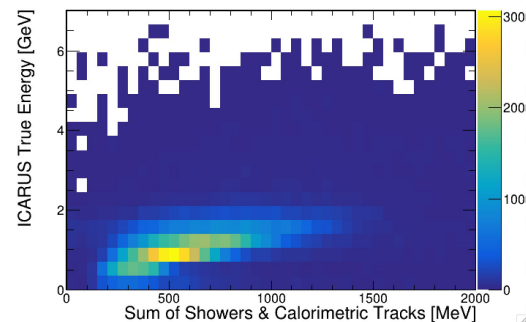


Fig.4: ICARUS Sum Energy vs Total Energy Plot

Conclusion

The 2D plots show there is some correlation between the energy reconstruction variables and the true energy plots for both detectors. Thus, selecting the shower energy and calorimetric track variables are a suitable energies for reconstructing energies to detect oscillations.

