

MicroBooNE is a short-baseline neutrino-scattering experiment currently taking data at Fermilab. The major physics goal of MicroBooNE is to address the excess of events at low energies observed by MiniBooNE—an observation that may provide evidence of sterile neutrinos, which would have far-reaching implications for particle physics. The MicroBooNE collaboration will make measurements of neutrino–argon interactions for use in their own oscillation analyses as well as publishing vital argon-target scattering data for use in future analyses. MicroBooNE analyses stand to benefit from the inclusion of external datasets into their interaction model constraints; and future argon-target experiments—importantly DUNE and the short-baseline program—will rely in turn on MicroBooNE cross-section data. The NUISANCE toolkit presents an effective and open platform to assess and include such constraints.

I propose to collaborate with MicroBooNE analyzers to test the novel data release methods used in a new T2K argon-target result and improve the argon-target neutrino interaction predictions and uncertainty estimates used in future liquid argon neutrino scattering analyses.

- Compare the predictions of GENIE, NuWro, NEUT, and GiBUU to neutrino-scattering data to determine relevant subsets for use in model constraints for the MicroBooNE Monte Carlo. (3 months)
- Assess and improve the current neutrino–argon interaction model predictions, down-select the model components, and develop well-motivated systematic uncertainties. (5 months)
- Collaborate closely with MicroBooNE analyzers at Fermilab to establish the most effective way to include the available constraints—specifically the T2K argon gas measurement—in both oscillation analyses and neutrino interaction cross section measurements. (3 months)
- Use the experience to improve publicly-available tools and develop a set of data publication ‘best-practise’ that promote longevity and accessibility of published measurements. (1 month)

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