

# Search for light sterile neutrino oscillations at MicroBooNE

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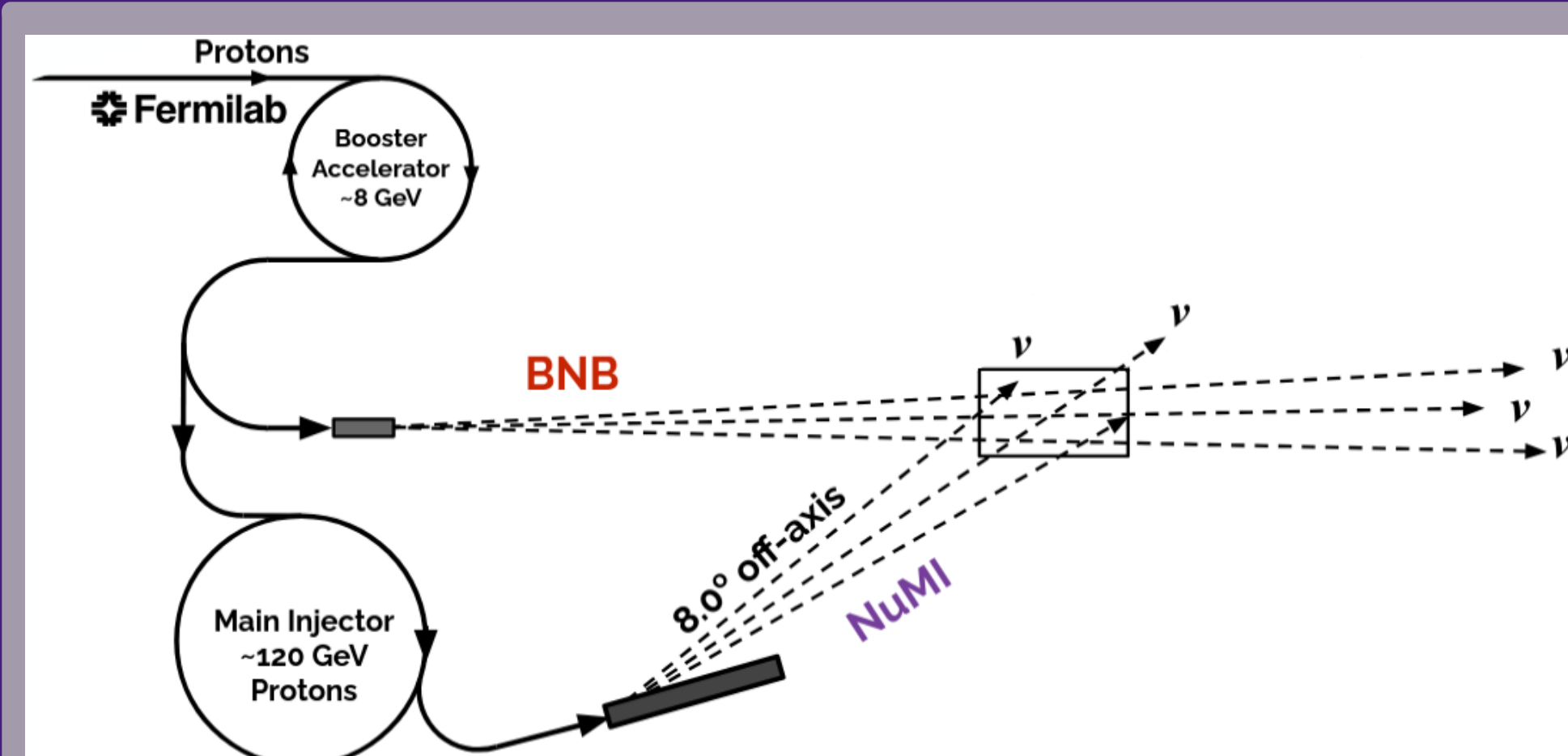


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## MicroBooNE Goals

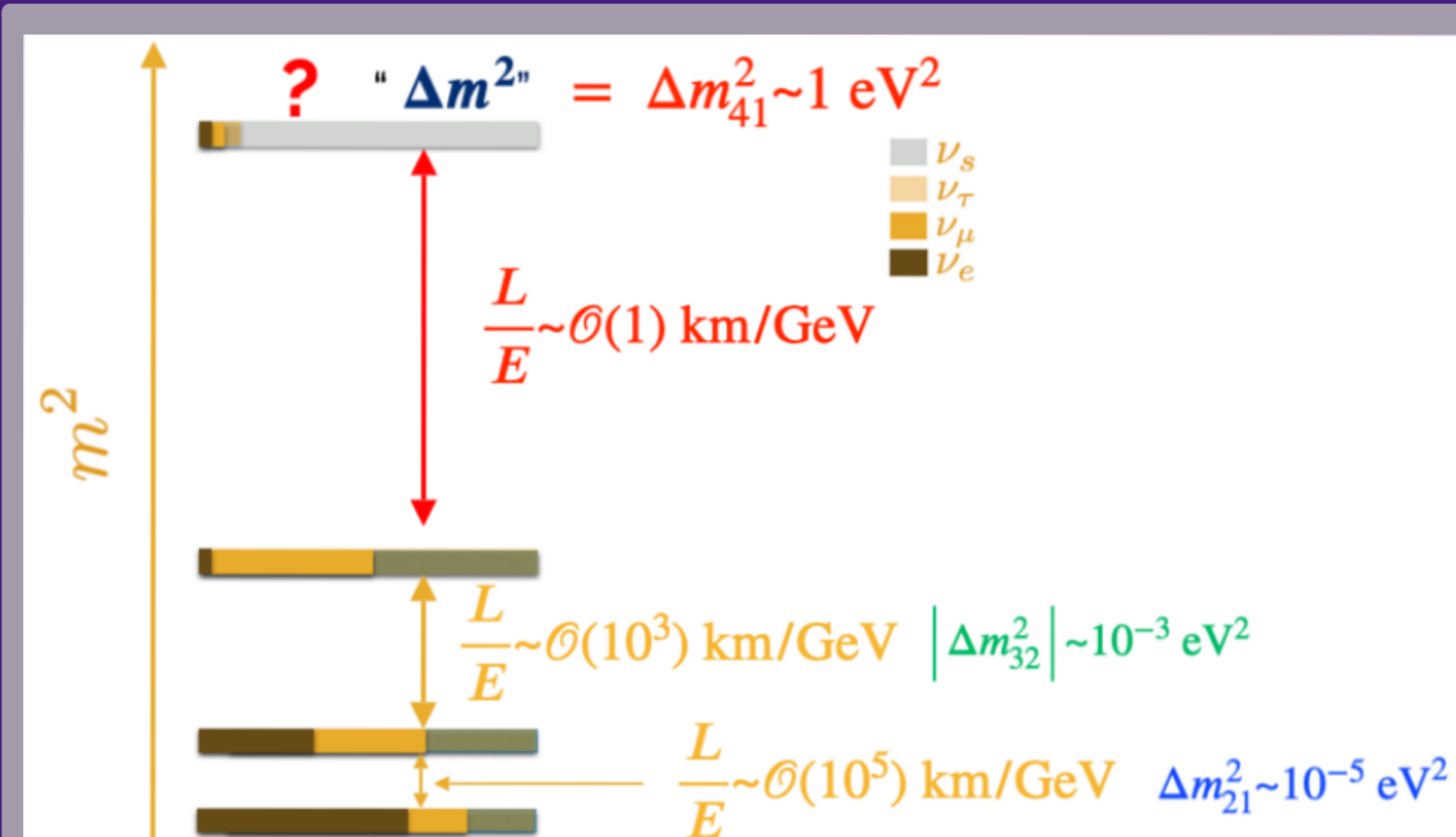
- Explain MiniBooNE excess  $\nu_e$  events
- Contribute to neutrino detector R&D

## Two Beams One Detector



Liquid Argon Time Projection Chamber Neutrino Detector located at Fermilab

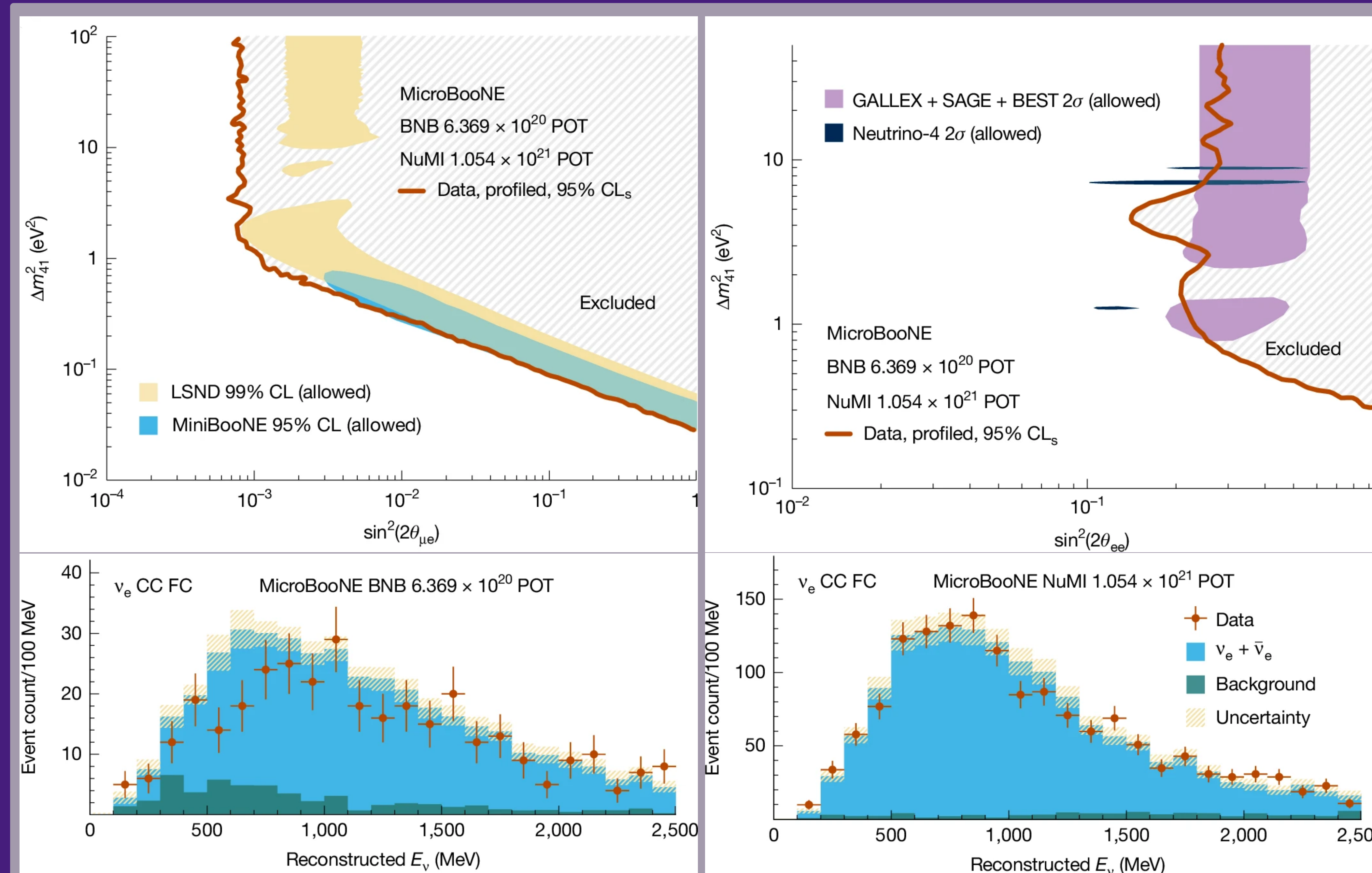
## 3+1 Hypothesis



1 additional light "sterile" neutrino

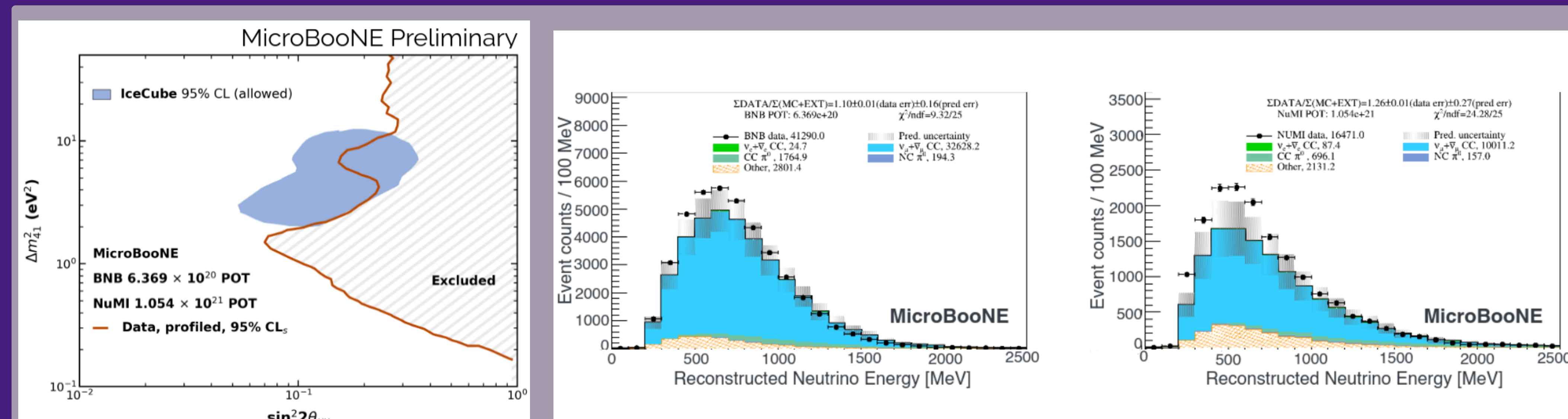
Search for light sterile neutrinos with two neutrino beams at MicroBooNE. Nature 648, 64–69 (2025).

## MicroBooNE Finds No Evidence of Single Sterile Neutrino Oscillations



2025 published result uses 3yr dataset and new method to address degeneracy

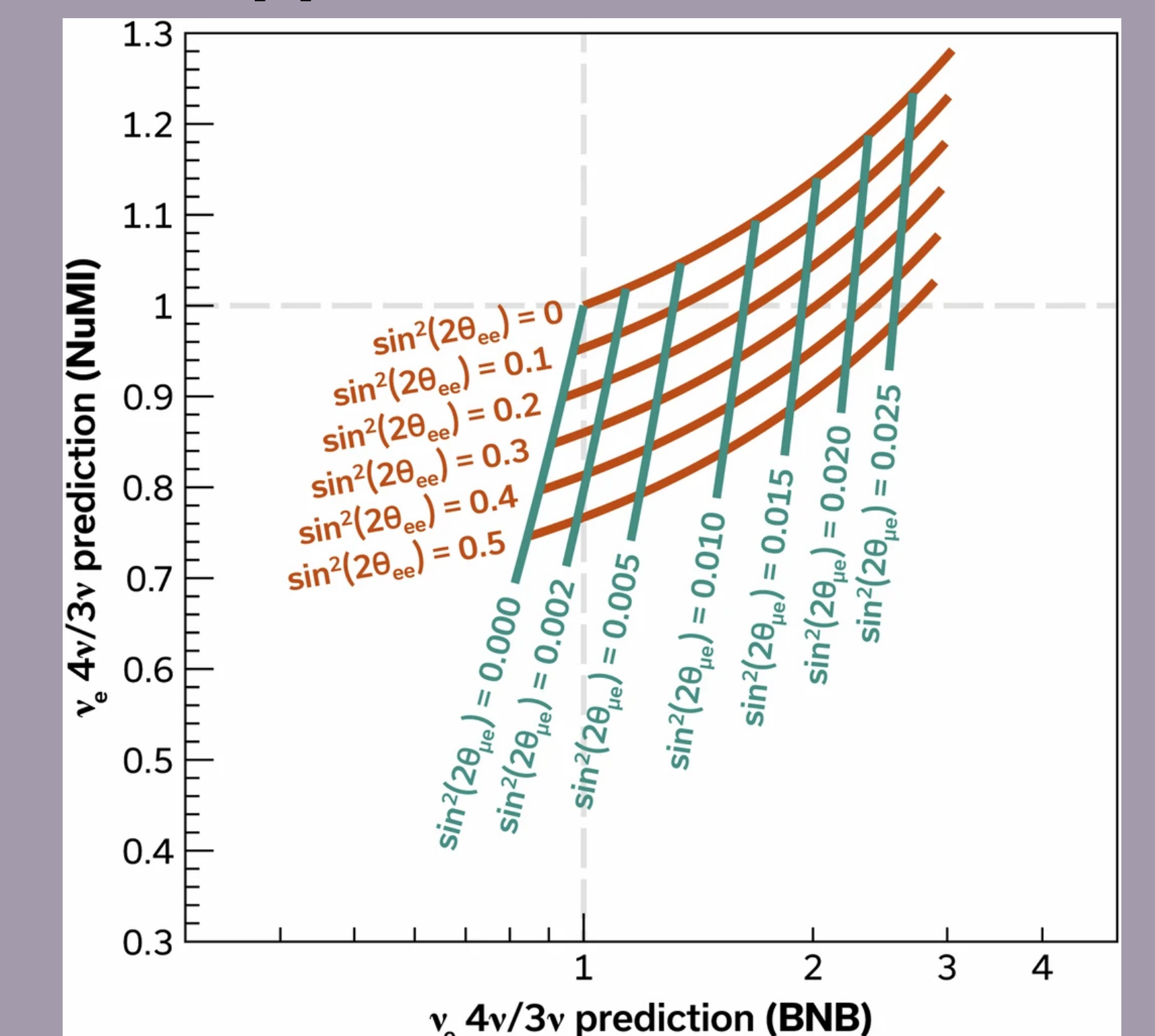
## Preliminary $\nu_\mu$ Disappearance



New investigation with  $\nu_\mu$  data originally used as  $\nu_e$  measurement constraint

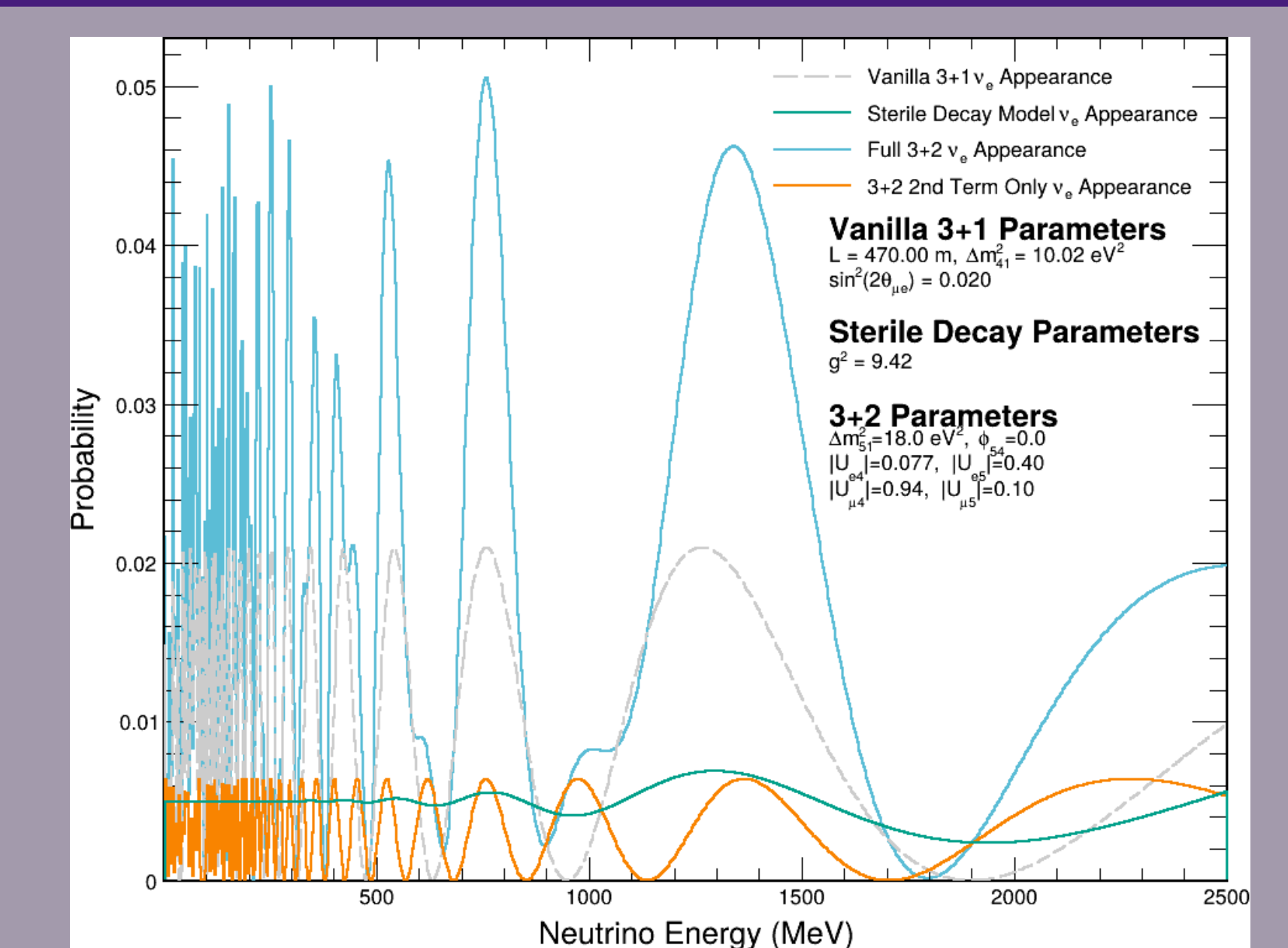
## What is Degeneracy?

Degeneracy: competing appearance and disappearance effects



- Different parameters make same prediction
- NuMI beam has different composition
- Combine data to break degeneracy

## MicroBooNE Beyond 3+1



Other models under investigation

- Sterile decays and tension with cosmological observations
- 3+2 as a possible explanation to LSND anomaly