

μ BooNE

Neutrinos as a probe for physics beyond the Standard Model

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URM Workshop Lightning Talk

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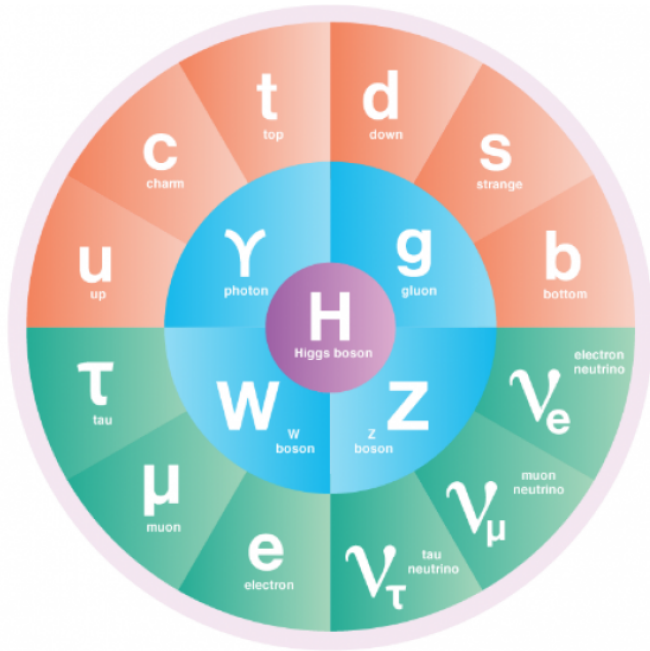


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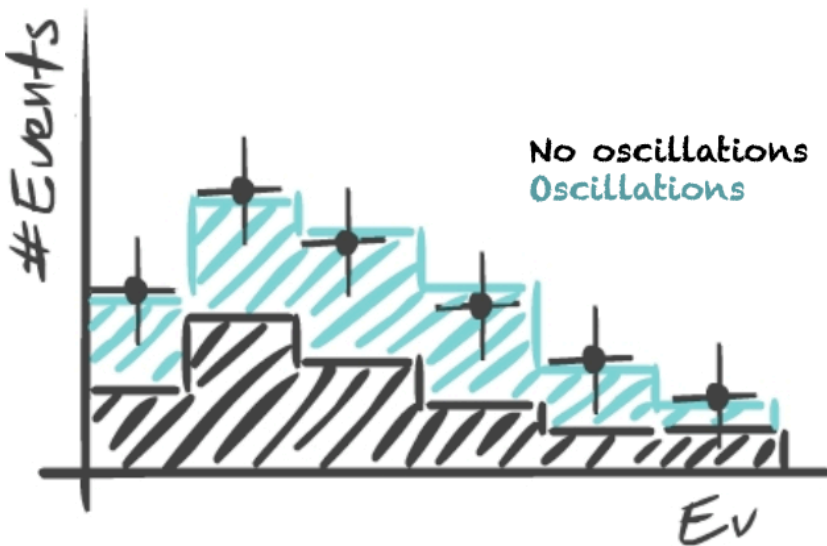
Neutrino Oscillations



- Neutrinos come in **three flavors** & **oscillate** as they **propagate through space & time**
- Studying this behavior allows us to probe physics beyond the Standard Model
 - What is the neutrino mass ordering?
 - Are there more than 3 neutrino flavors?
 - Why is there more matter than antimatter?
- Electron neutrino appearance is the golden channel for potential discovery

Electron Neutrino Appearance

"...uncertainty on the ν_e and $\bar{\nu}_e$ cross-sections... [is] the second-largest single source of systematic uncertainty in the CP asymmetry measurement."
(T2K Collaboration, Nature vol. 580, p. 339–344, 2020)

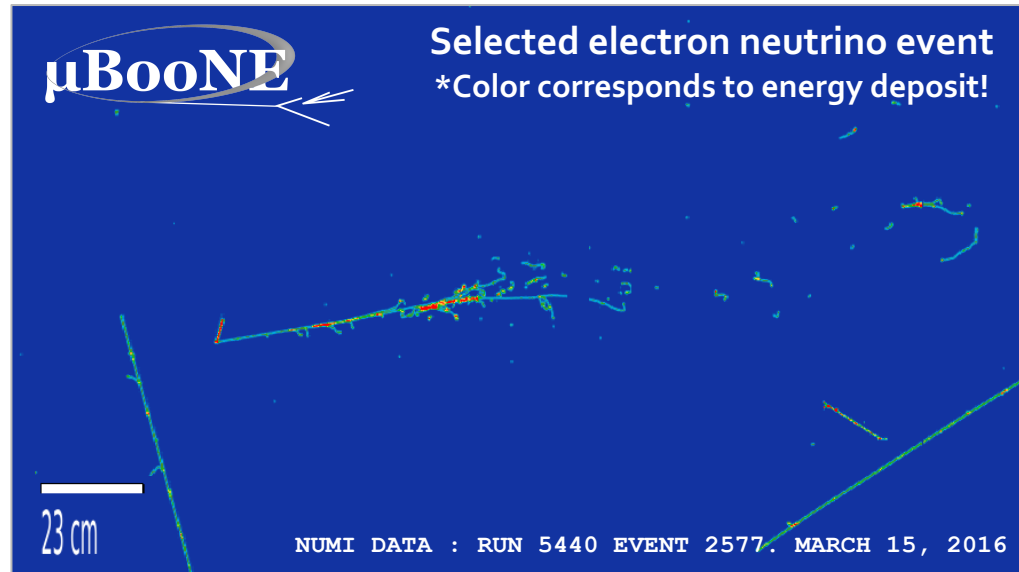


of ν_e events = ν_e flux \times ν_e cross section

- We observe electron neutrino appearance when signal is **above** expected ν_e event rate if no oscillations were present
- Measurements of ν_e appearance require **accurate knowledge of the ν_e cross section**, but limited data is available
- To measure a cross section, we need:
 - Ample source of electron neutrinos
 - Accurate prediction of the ν_e flux
 - High purity, high statistics sample of ν_e events

NuMI @ MicroBooNE

- MicroBooNE is a **liquid argon** neutrino detector with **3D image reconstruction**



- Higher energy & off-axis nature of NuMI → higher electron neutrino flux content
- Perfect for cross section studies!