Self Introduction

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Bio

- Dung Duc Phan, 27, from Hanoi.
- 4th year graduate student @ Univ. of Texas at Austin.
- Main research: neutrino oscillations and related exotic models (sterile neutrinos, neutrino decoherence). Currently working on MINOS+, NOvA and some involvement in DUNE PD (Arapuca).
- Other interests: detector electronics (SiPM FEB), ML for physics.
- Some experiences in scientific programming, ML, circuit/board design, web front-end. Hope these might help the group somehow.

Today I would go over general information about my research.

Neutrino Oscillations

Current status

- Historically, nuosc emerged as theoretical solutions for atm nu anomaly and solar nu problem. SNO (Canada) and Kamiokande (Japan) are the two experiments finalizing these problems and set a firm ground for nuosc.
- Standard nuosc model depends on 6 params: 3 mixing angles, 2 mass squared gaps and 1 CPV phase. We measured 5 among all of them.
- Still lots of questions left open:
  - Neutrino Interaction at micro-physics level?
  - CP violation?
  - Maximal mixing or not?
  - Majorana or Dirac?
  - Absolute mass scale?
  - Mass ordering?
  - Exotic models (NSI, Sterile, Decoherence)?

Neutrino Oscillations

MINOS/MINOS+

- On-axis lbl, 735 km, ~GeV beam. Magnetized steel + tracking/calo scint.
- Designed to explore Δm^2_{32} and θ_{32}. Did a good, if not to say best, job on that until Daya Bay became a new player.
- MINOS+ is an upgrade in beam (minor stuff in FD too). Higher statistics in the higher energy region means a lot the precision measurement of Δm^2_{32} and θ_{32}.
- Exotics: LED, Sterile, NSI...
- I'm working on sterile search and decoherence using ν_e-app in MINOS+. My sterile search had box opening last week. Hope to share results with our group soon.
- There is a list of notable MINOS/MINOS+ publications in the last 2-3 years in the reference. Please take a look.

Neutrino Oscillations

NOvA

- Off-axis lbl, 811 km, tracking/calo scint. Big, bad FD.
- With off-axis beam (peaks at $\sim$2 GeV, $\nu_\mu \to \nu_e$ 1st maximum), NOvA aims at exploring θ_{13}, δ_{CP} and mass ordering.
- Interesting, NOvA showed somewhat non-maximal mixing. Gold mine for decoherence model.
- I'm working on sterile search using NC deficit and NOvA testbeam.

Reference

MINOS/MINOS+

- MINOS/Daya Bay/Bugey-3 Sterile Analysis [Phys. Rev. Lett. 117, 151801]
- MINOS Sterile Analysis [Phys. Rev. Lett. 117, 151803]
- MINOS/MINOS+ Large Extra Dimensions Analysis [Phys. Rev. D94, 111101]