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The race for the Neutrino Mass Ordering

On Friday, 5/12, I gave the Wine and Cheese seminar at Fermilab titled “The race to the Neutrino Mass Ordering”.
The slides are here https://indico.fnal.gov/event/59268/

In this talk I argued that when JUNO’s measurement of Delta m^2_atm (31 or 32 or ee) is 1\% or better (which will happen very quickly)
then when combined with Delta m^2_atm from T2K and NOvA disappearance will give us a Delta Chisq between the two mass orderings, IO and NO, will exceed 9, in a combined fit with JUNO, T2K, NOvA and SuperK. So by Neutrino 2026 (or maybe Neutel 2025) we should know the mass ordering at better than 3 sigma. A hint of this can be seen in the 2022 NuFit plot (bottom right panel). http://www.nu-fit.org/sites/default/files/v52.fig-chisq-dma.pdf Replacing Daya Bay which is a 2.4% measurement with a new 1% JUNO measurement will greatly effect this plot.

The comparison of nu_e disappearance to nu_mu disappearance as a way to determine the mass ordering was first discussed in our 2005 paper https://arxiv.org/abs/hep-ph/0503283 This paper also was the first to defined Delta m^2_{ee}. We will update this in a paper in the next month or so and certainly before Neutel 2023.

If there is interest I could give a version of this talk explaining this development as plenary talk at Neutel 2023. For now I would keep the same title “The race to the Neutrino Mass Ordering”.

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