

Empirical parameterisations of neutrino oscillations

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About me

Physicist (mostly with LBL neutrinos).



MINOS

- $N \rightarrow \bar{F}$ extrapolation and systematics for (first) $\nu_\mu \rightarrow \nu_\mu$ measurement
- Sterile neutrinos (looked for ν_s , not ν_4 !) and parameterisations



- Mostly on “hands-on” stuff, but advise students doing analyses



- Charged lepton flavour violation $\mu^- + \text{Al} \rightarrow e^- + \text{Al}$



About the poster

Historically neutrino oscillation fits done in 2v empirical parameterisation: $(\sin^2 2\vartheta, \delta m^2)$.

- These map to standard PMNS parameters closely for accessible channels (i.e. electrons, and muons for higher E/L)
- But originally useful because they describe results directly.

Recent changed to using 3v fits in $(\theta_{ij}, \Delta m_{ij}^2, \delta)$ directly.

- Likelihood functions no longer tend towards Gaussians.
- No longer just “summarising the data”, independent of other experiments ($\therefore$ not quite ‘future-proof’)

This change is not neutral in terms of statistical inference



About the poster (II)

Want to think a bit more about this change.

- Were there any *babies* in that bath water?
- Should we separate *fitting* from *inference*?

Jump in where you get to unfamiliar stuff ►

Discussion is good!

- Some of this is deliberately provocative!
- ✖ Put this mark where I skipped a bunch of stuff...
- (...but also ran out of space.) >_<

$$\Delta m_{\text{atm}}^2 - \Delta m_{32}^2 = \frac{|U_{\mu 1}|^2}{|U_{\mu 1}|^2 + |U_{\mu 2}|^2} \Delta m_{21}^2$$

$$P_{\mu\mu}^{\min} = 1 - 4 |U_{\mu 3}|^2 \left(1 - |U_{\mu 3}|^2\right) + \frac{\alpha^2 \pi^2}{4} \frac{2 |U_{\mu 1}|^2 |U_{\mu 2}|^2}{1 - |U_{\mu 3}|^2}$$

LBL v fitting

3v and 2v

?