Physics and Peformance Evaluation Group

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IDS-NF plenary meeting

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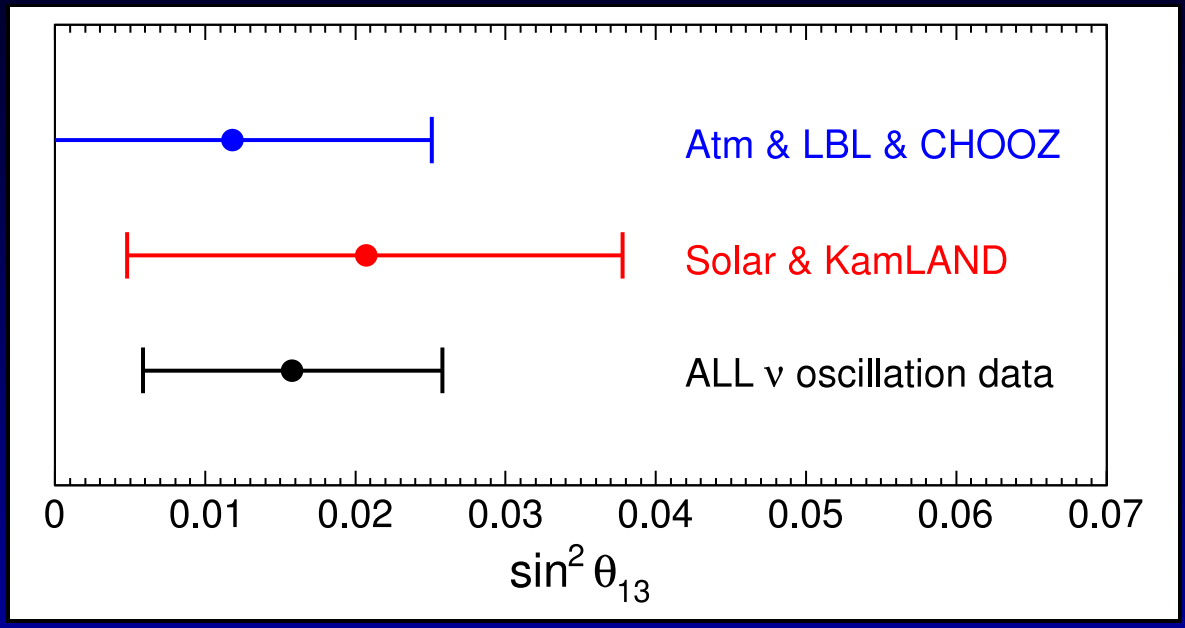
TIFR, Mumbai, India

Hints for $\theta_{13} \neq 0$



E. Lisi, *et al.*, arXiv:0806.2649.

$\sin^2\theta_{13} = 0.016 \pm 0.010$ or $\sin^2 2\theta_{13} = 0.06 \pm 0.04$

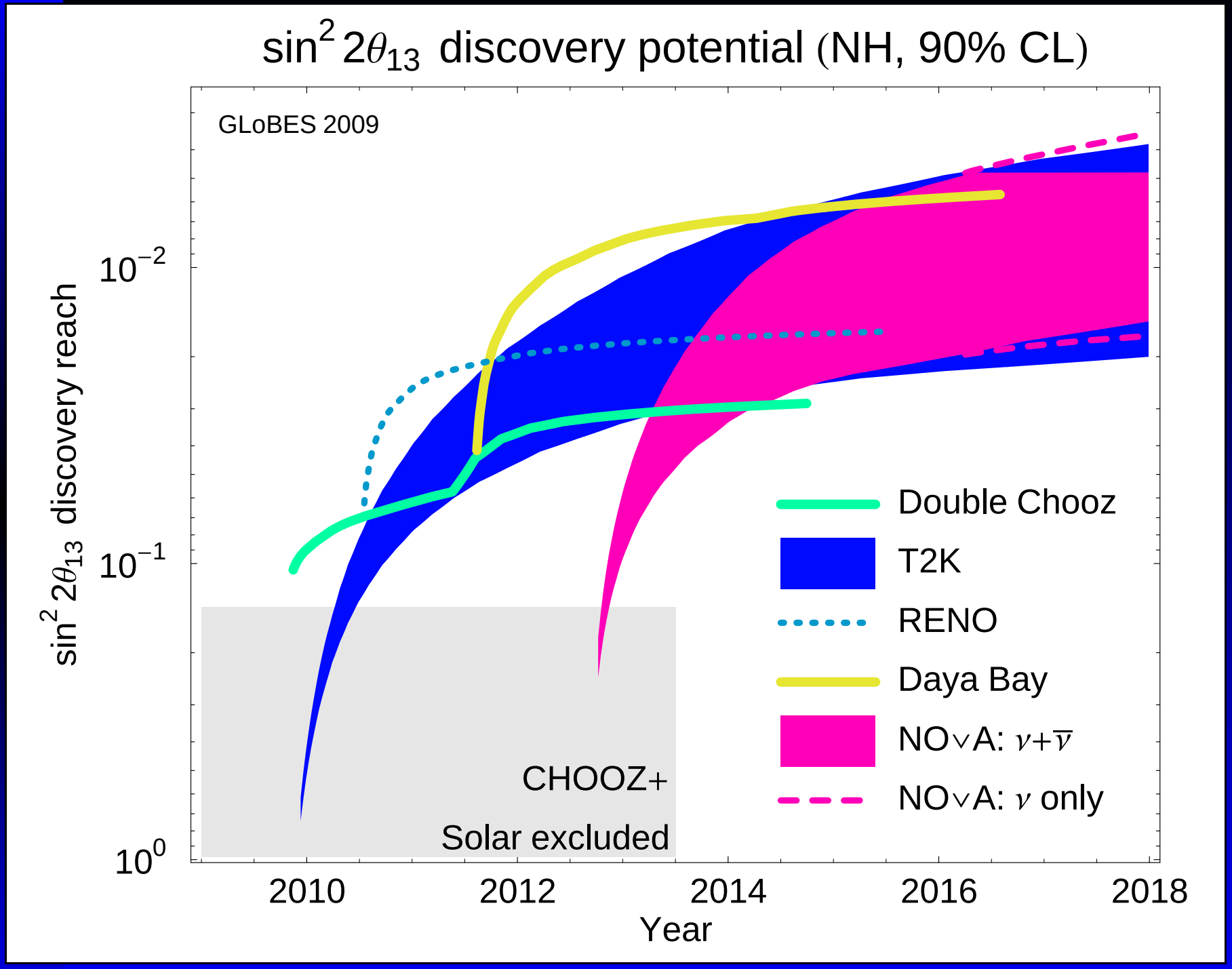
MINOS' first ν_e appearance results

35 events seen vs $27 \pm 5 \pm 2$ expected for $3.14 \cdot 10^{20}$ pot

From hints to the hunt for θ_{13}

Timeline

- Double Chooz: Start 09/2009, 1.5 yr with FD only, then ND+FD, 5 years total Talk by S. Peeters, NOW 2008
- RENO: Start 06/2010, ND+FD, 5 years Talk by Y. Oh, NOW 2008
- Daya Bay: 7/2011 all modules, Talk by R. McKeown, CIPANP 09
- T2K: 09/2009 - 12/2012: 0 MW - 0.75 MW linear, neutrinos only Talk by H. Kakuno, NOW 2008
- NOvA: 08/2012 - 01/2014: 2.5 kt - 15 kt linear,1/2 neutrinos & 1/2 antineutrino Talk by M. Messier, ICHEP08



PH, M. Lindner, T. Schwetz, W. Winter, arXiv:0907.1896

Implications for IDS-NF

- Should the hints be correct, then there should be a discovery within the next 1-3 years.
- The problem is, that the hints are vague and thus the error bars large. We only will know once experiments release their data, even then likely no $5\,\sigma$ certainty!
- Thus we need to have contingency plan for both the midterm and final report.
- Thus, we need to better understand the merits of a NF in the large θ_{13} case and document our results

I think, we (at least within PPEG) have reached agreement that the low energy NF (LENF) is our large θ_{13} plan.

LENF – PPEG perspective

- Conceived in the context of Fermilab - DUSEL
- Do we need to rephrase it in an international, site independent context?
- Or do we want to exploit the political momentum it has gathered as a Fermilab option for the future?
- In any case, we need to study the physics optimization (see talks by Bross and Li).
- Non-standard physics study lacking
- Staging?

PPEG is prepared and has the man power to implement whatever our decision on these points is.

Precision

While it easy to say that a NF is a tool for precision neutrino physics, it is quite difficult to demonstrate that in a quantitative way.

- Better input on systematics needed from especially the detector WG
- No simple performance indicators yet
- We need to demonstrate the a NF is indeed the most precise tool

No progress, here. Not clear, whether we can make progress in time for the IDR.

Non-standard physics

- Model building better understood and it seems difficult to get large, generic non-standard interactions which a NF could detect (Madrid, MPI, Wuerzburg groups)
- Role of near detectors (including ν_τ's) emphasized (Wuerzburg, MPI)
- Some sensitivity to CP violation in new physics (MPI)
- New software tools, MonteCubes (MPI)

For the baseline, these issues are reasonably well understood (with maybe the exception of near detectors), but essentially *terra incognita* for LENF. This needs to be addressed!

NuFlavour 09

Joint IDS-NF PPEG/EuroNu WP6 theory workshop at Cosener's house, UK, from June 8-10.
57 participants from the worldwide HEP-TH community, also many non-neutrino people. Very good turn out given the this was at the same time than SUSY09.
Topics were

- LFV in GUT
- LFV at a TeV (SUSY and non-SUSY)
- Leptogenesis
- NSI
- Neutrinos and LHC
- Neutrinos in astrophysics and cosmology

NuFlavour 10

- NuFlavour09 was a great success
- We would like to repeat it in the US in 2010
- Probable site is Fermilab
- Probable date is spring
- Goal is to create awareness for a NF and neutrino physics in general in the US HEP-TH/PH community

Work in progress

Miscellaneous

- PPEG has worked hard to substantiate the various baseline change requests
- Main purpose of this meeting for PPEG is agree on a plan of how to deliver the IDR in time.
- Near detectors – can we have enough information to plausibly discuss their physics impact for IDR?
- Staging?
- Discussion of specific sites in the IDR?

Summary

- Hints for θ_{13} can become discoveries on timescales we can not ignore
  - Suggest to break physics study in a large and small θ_{13} case
  - Large θ_{13} should focus on LENF, requires work esp. for non-standard physics
- It is time to make some political/strategic decisions (sites and staging)!
- NuFlavour 10
- Planning the IDR