PPEG – plans & goals

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9th IDS-NF plenary meeting

October 8-10, 2012, FNAL, US

θ_{13} is large!

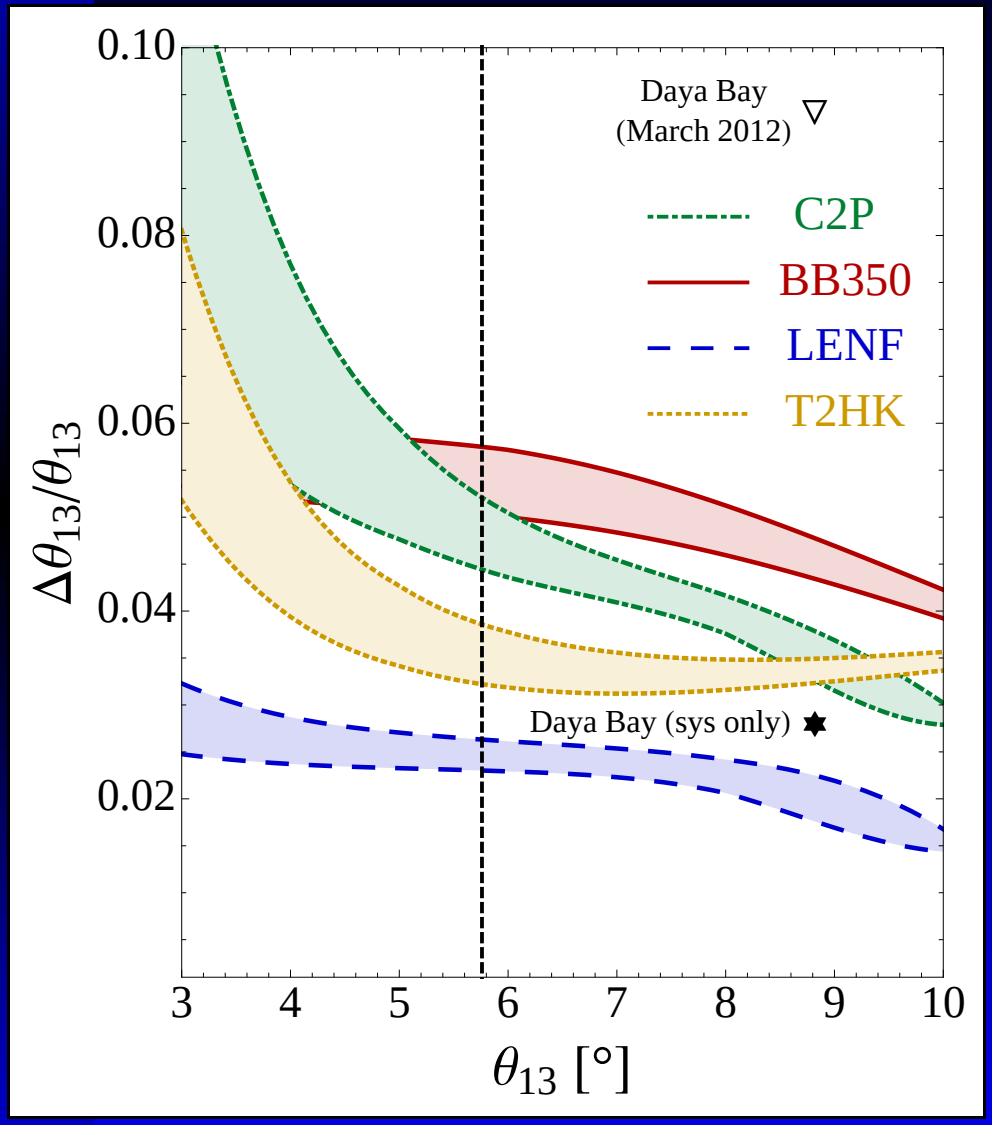
The Daya Bay result is

$$\sin^2 2\theta_{13} = 0.089 \pm 0.010(\text{stat}) \pm 0.005(\text{syst}) \,,$$

which translates into a more than $5\,\sigma$ exclusion of $\theta_{13} = 0$, confirmed by RENO.

NB – a year ago we had only $2\,\sigma$ indications.

The future of θ_{13}



FAPP θ_{13} will be known to very high accuracy

At $\sin^2 2\theta_{13} = 0.1$ the measurement error at T2K will be 10%

At $\sin^2 2\theta_{13} = 0.1$ the measurement error at Daya Bay will be <5%

Agreement of values of θ_{13} from reactors (disappearance) and beams (appearance) constitutes a critical test of the 3 flavor framework

P. Coloma, A. Donini, E. Fernandez-Martinez, P. Hernandez, arXiv:1203.5651

Flavor models

Simplest un-model – anarchy Murayama, Naba, DeGouvea

$$dU = ds^2_{12}\, dc^4_{13}\, ds^2_{23}\, d\delta_{CP}\, d\chi_1\, d\chi_2$$

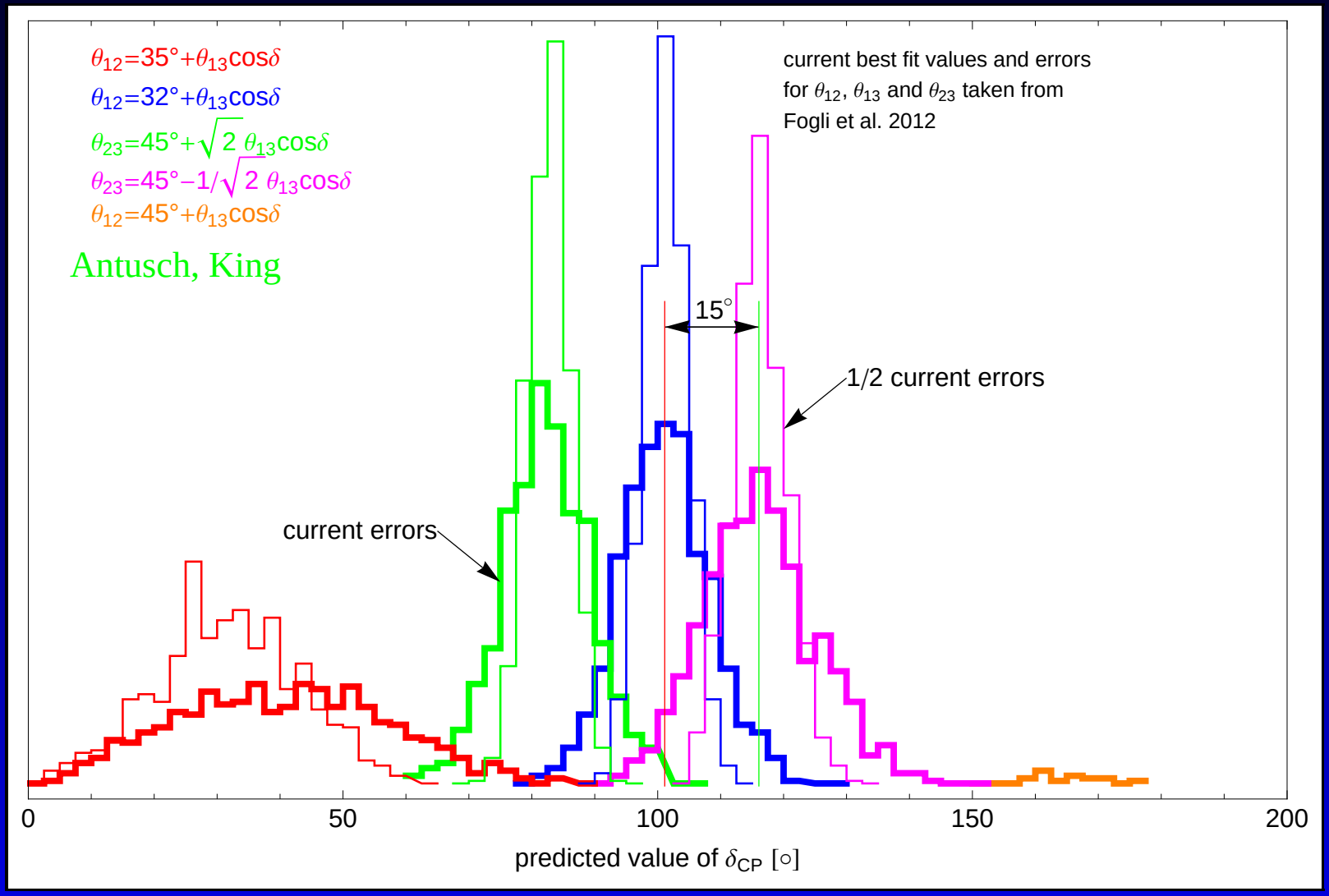
predicts flat distribution in δ_{CP}

Simplest model – Tri-bimaximal mixing Harrison, Perkins, Scott

$$\begin{pmatrix} \sqrt{\frac{1}{3}} & \frac{1}{\sqrt{3}} & 0 \\ -\frac{1}{\sqrt{6}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} \end{pmatrix}$$

to still fit data, obviously corrections are needed – predictivity?

Sum rules



$3\,\sigma$ resolution of 15° distance requires 5° error. NB – smaller error on θ_{12} requires dedicated experiment like Daya Bay II

Mass hierarchy corollary

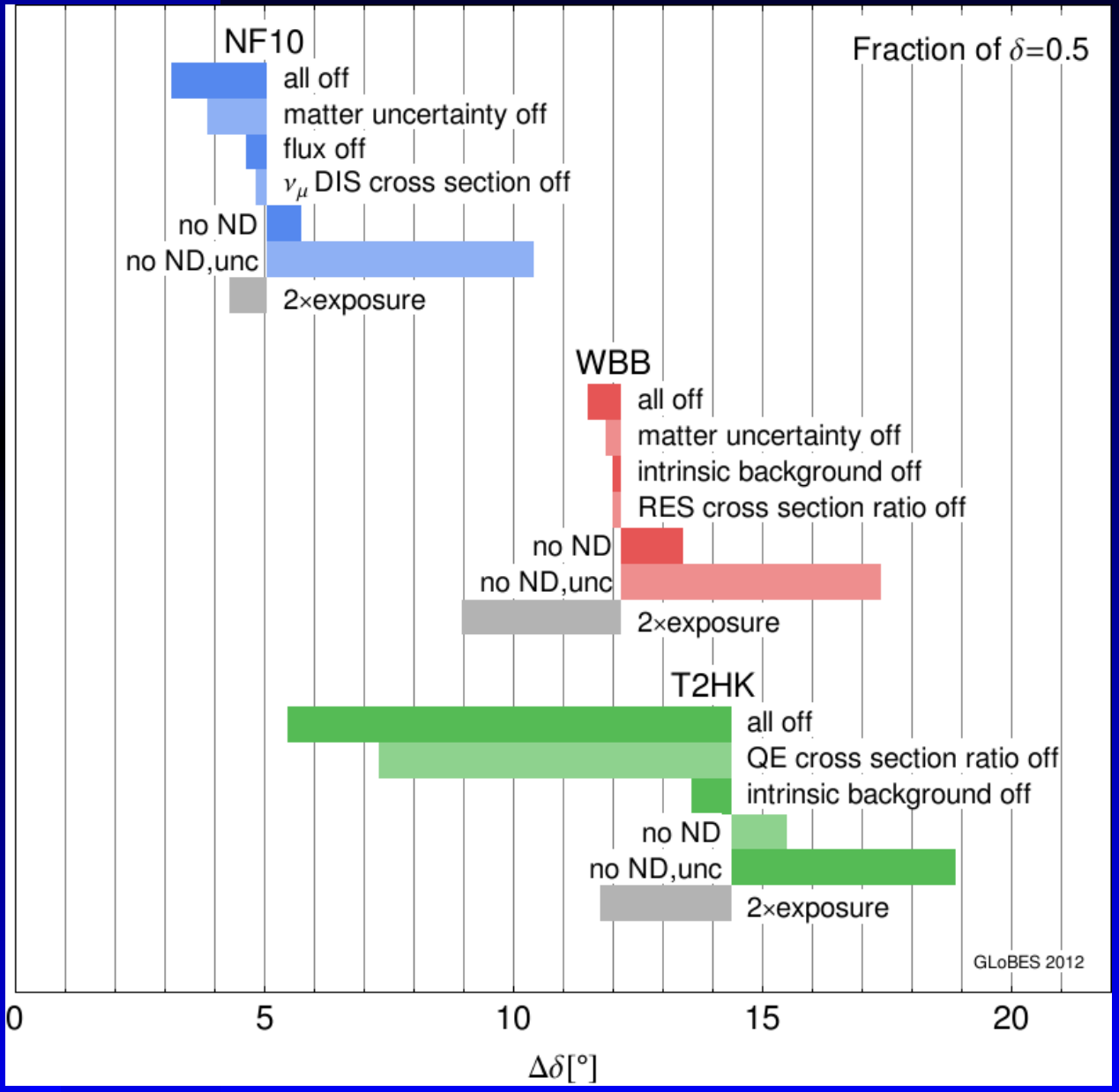
- Given the large value of θ_{13} mass hierarchy can be done in many different ways
- PINGU, ICAL, Daya Bay 2, HK atmospheric data, . . .
- It therefore seems very likely that the mass hierarchy will be determined at some level w/o a new long baseline experiment

Thus, this is no longer a main physics goal – in any case the NF will do an excellent job.

Sterile neutrinos – status update

- The status has not changed since Glasgow and presumably will not change until first Planck data.
- Planck data will happen on RDR timescale – need to prepare? probably not.
- If found soon they will change the midterm direction of the field, *e.g.* NuSTORM would be high priority

Near detectors



Disappearance data can play the role of near detector if three flavor framework is assumed

This uses a very simplistic near detector, need input from Detector WG

New Physics searches have to rely on near detector

see Pilar's talk in parallels

Precision

- The focus for future experiments has clearly shifted to precision and thus, also systematics.
- NF clearly superior, quantitatively and qualitatively
- SB community slowly starts to address systematics issues – synergy with NuSTORM?
- First phenomenological (GLoBES) studies of CP precision with detailed systematics have been performed – is this sufficient for the RDR?
- Within three flavor framework near detector performance not critical (assuming a 0.5% flux error)

Staging

- Staging will be the focus of PPEG for the RDR
- Work will be done in close collaboration with MASS (Muon Accelerator Staging Study)
- 10 GeV with 0.025 of full luminosity has been defined as goal for a low luminosity NF
- At 10 GeV MIND works well and 2000 km baseline is optimal

In the US context, *i.e.* within MASS, 1300 km baseline seems attractive

- Magnetized LAr?
- Beam energy?

Open Issues

- Need *final* MIND performance from the Detector WG at least 4 weeks prior to first draft of RDR
- What performance indicators do we want to use, CPV discovery, CP precision? How do we quantify mass hierarchy? Linear scale in θ_{13}?
- Near detector specs from Detector WG (parallels tomorrow)
- Flux at near detector from Accelerator WG
- Flux error from Accelerator WG

This would be a good time to let us know what else you need from PPEG!