Discussion session: Long-baseline sensitivity studies and comparison

1. Sensitivity and optimization studies

- **Concentrate on *feasible* projects (i.e., for beta beams)**
- **Express sensitivities in terms of error on parameters**

Short presentations for LBNE (J. Strait), Beta beams (E. Wildner), Neutrino Factory (K. Long)
Followed by discussion

Conclusions from discussion – mostly reformulated questions:

a) Systematics

- Systematics are especially important for large theta13. Assumptions in experiment comparison plots are, however, not transparent, maybe not even comparable; need to be documented, publically available
- Studies of performance as a function of exposure desirable, since these show when the systematics limitation becomes relevant and what the systematics-dominated limit will be
- Are the cross sections known a priori with a sufficient precision, or obtained by the future experiment in a self-consistent way (e.g. at near detectors)? May depend very much on experiment class ...

b) Optimization

- Does the optimization of the individual experiments change if the T2K hint is confirmed?
- What is the impact of prior theta13 (e.g. from Daya Bay) and mass hierarchy (e.g. from atmospheric neutrinos) measurements on sensitivities and optimization?
- Does a future experiment have to measure all parameters (deltacp, mass hierarchy) in a self-consistent way, or is it better to rely on a combination of different strategies (e.g. short baseline beam for CP violation plus atmospheric neutrinos)?

c) Performance indicators

- Can the theta13 precision expected from the reactor experiments be easily exceeded? What limits the theta13 precision measurement at reactor experiments?
- How to quantify precision on theta13 and deltacp? Maybe define benchmark points, or show as a function of (true) deltacp?
- Is deltacp or sin(deltacp) the quantity of interest?

2. Provide statement on precision that is interesting for measurements of $\nu\mu \Rightarrow \nu\tau$ and $\nu e \Rightarrow \nu\tau$ *oscillation* measurements. Report on studies of such measurements for superbeam and neutrino factory.

Observation:

If e.g. ~ 4-10 kt ECC at 17% efficiency (silver/discovery channel) versus 100 kt MIND at 80% efficiency (golden/disappearance channel), there is a factor of 50-100 difference in statistics.

Reformulated question:

Given that typical statistics difference in $\nu\tau$ detectors, what kind of new physics shows up in the $\nu\tau$ silver and discovery channels with a factor of 50-100 enhancement compared to the golden and disappearance channels *in spite of large atmospheric mixing*?

See review talk by Toshihiko Ota

Conclusions:

- Necessary requirement: need to excess tau production threshold
- Typically (e.g., NSI) golden and disappearance channels better, at least if degeneracies can be resolved (e.g., by magic baseline)
- Possible physics cases: epsilon^s_{mu tau} from chirally enhanced operator or additional CPV phases if sterile neutrinos are present

Questions:

- Which other new physics could be relevant for that?
- Does it affect the baseline optimization for the tau detection?