

LBL & Calibrations

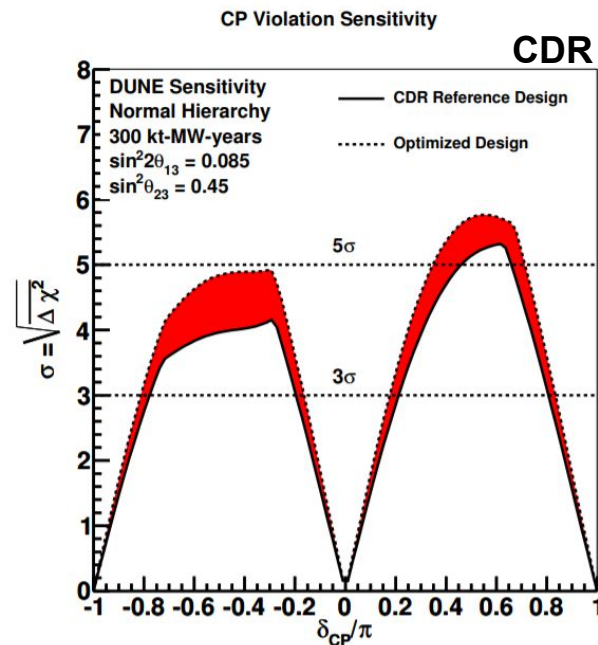
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DUNE Physics Week

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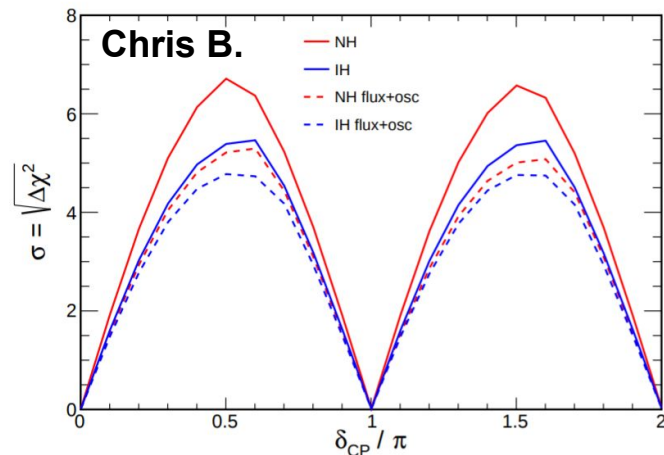
Fitters (GLOBES)

- **GLOBES** based sensitivity studies are the current baseline with multiple configurations available
 - **CDR** configurations
 - **MVA** (multiple versions) and **CVN** based configurations (via MVAtoGLOBES)
- Tools and configurations available in Ibl [github](#)
- Will continue to maintain GLOBES configurations, but still planning to use a more flexible, custom oscillation analysis tool



Fitters (CAFAna)

- Initial **CAFAna** port from NOvA done at February LBL hack days
 - C++/ROOT based
- Used for initial MVA-based sensitivity studies and ND studies with systematics
 - GENIE and flux reweighting
- Validation in progress
- Not much development work planned on CAFAna during physics week
 - Plan to get some documentation in place



Propagating systematics

Methods we've used so far:

- **Normalization** systematics: separate normalization knobs per signal and background and per sample (nue, nuebar, numu, numubar)
 - Newer versions of GLoBES allow for correlations between samples
- **Shape** systematics
 - GLoBES: “tilt” and “scaling” systematics; not much effect seen in past studies
 - GLoBES/MGT/FastMC: response functions computed from Fast MC
- **Flux & cross section**
 - GLoBES/MGT/FastMC: response functions from GENIE & flux simulations
- **CAFAna**
 - Has demonstrated all of the above at some level

Systematics studies

Bottom-up: re-run entire simulation/reconstruction chain with sim/detsim/physics parameters varied, rerun selections & sensitivity analysis for each variation

Resource intensive

Ready to go in both CAFAna and GLoBES

Top-down: shape, normalization systematics or modify smearing to account for underlying detector/physics effect

Difficult to relate to underlying parameters?

Ready to go in both CAFAna and GLoBES

Reweighting: reweighting events to account for parameter variations

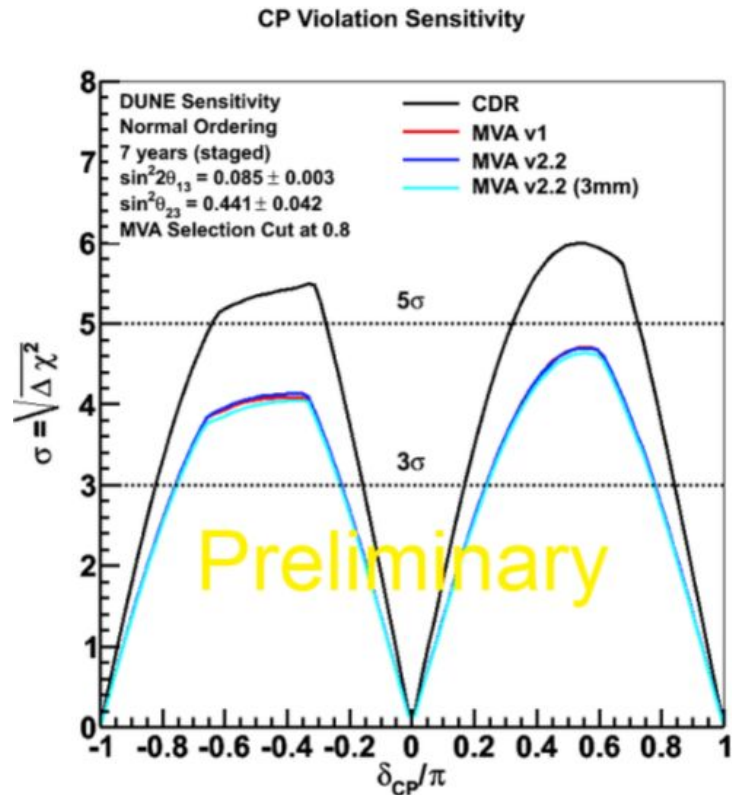
Reweighting not in place in larsoft

Some reweighting possible with CAFAna

Related study: wire pitch

An example of a bottom-up study where we rerun the full sim/reco/analysis chain was the wire spacing study for the FD optimization TF:

- Process whole chain with both 3 mm and 5 mm wire spacing
- MVA selection
- Little effect on sensitivity
- Conclusion was that reco would need to be reoptimized for smaller wire spacing to see benefits



Related study: energy bin level systematics

Top-down study: allow signal energy bins to vary in fit, evaluate effect on CPV sensitivity

- 0.5, 1.0, 2.0, 3.0, 5.0 GeV bins
- Combinatorics on 2%, 3%, 5%, 10%

