

Working Status

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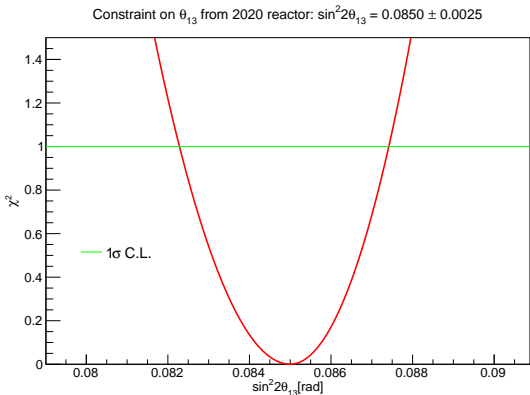
NuGroup Meeting, March 30, 2018

Outlines

- 1 Check and modify Reactor2.glb
- 2 T2K-II event rates and systematic uncertainties
- 3 Update NOvA selection ratio
- 4 T2K-II sensitivity for CP-violation
- 5 Comparisons

Check and modify Reactor2.glb

- Constraint on θ_{13} from current reactor: $\sin^2 2\theta_{13} = 0.085 \pm 0.005$
- Constraint on θ_{13} from 2020 reactor (Daya Bay: arXiv:1605.01502v1 [hep-ex] 5 May 2016):
 $\sin^2 2\theta_{13} = 0.0850 \pm 0.0025$



T2K-II event rates and systematic uncertainties

- Update T2K-II sys. uncertainties: 4%
- Event rates for the case true $\delta_{CP} = -\pi/2$:

	Total	Signal $\nu_\mu \rightarrow \nu_e$ $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$	Beam CC $\nu_e + \bar{\nu}_e$	Beam CC $\nu_\mu + \bar{\nu}_\mu$	NC
ν -mode ν_e sample	556	448.6	73.3001	1.80002	32.2998
$\bar{\nu}$ -mode $\bar{\nu}_e$ sample	59.9998	52.3	29.2	0.399997	14.0998

	Total	Beam CC ν_μ	Beam CC $\bar{\nu}_\mu$	NC
ν -mode ν_μ sample	2568	2393		175
$\bar{\nu}$ -mode $\bar{\nu}_\mu$ sample	774.1001		707.9	66.2001

Update NOvA selection ratio

- NOvA paper: arXiv:1703.03328v2 [hep-ex] 24 May 2017
- For an exposure of 6.05×10^{20} POT ($\sim 10\%$ full exposure):
 - + Signal: 33 ν_e events
 - + Background: $8.2 \pm 0.8_{\text{sys}}$.

ν_μ CC	ν_μ NC	ν_e CC	ν_τ	cosmic events
8.4%	45.3%	38%	1.8%	6.5%

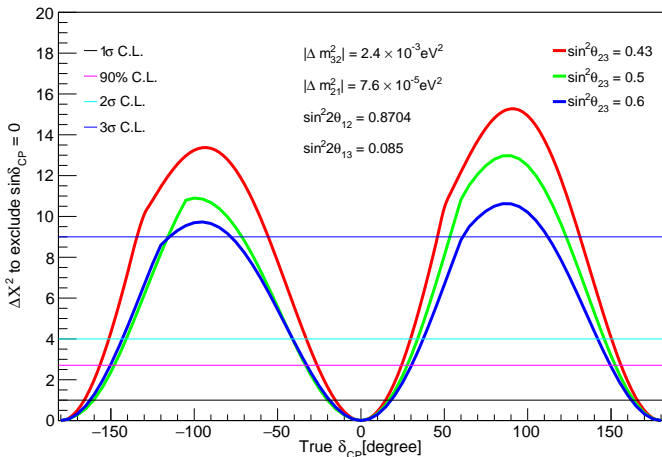
- For full exposure 6×10^{21} POT:
 - + Signal : 330 ν_e events
 - + Background: $82 \pm 8_{\text{sys}}$.

Bckg	ν_μ CC	ν_μ NC	ν_e CC	ν_τ	cosmic events
Percentage	8.4%	45.3%	38%	1.8%	6.5%
Events	7	37	31		

T2K-II sensitivities for CP-violation

- Raw data

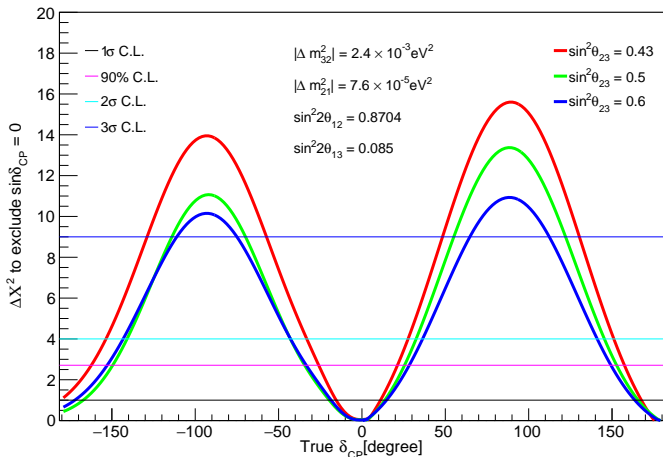
T2K-II statistics + sys. uncertainty



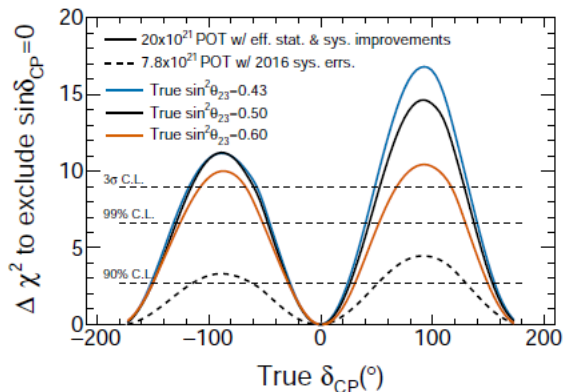
T2K-II sensitivities for CP-violation

- Gaussian fit

T2K-II statistics + sys. uncertainty



T2K-II sensitivities for CP-violation

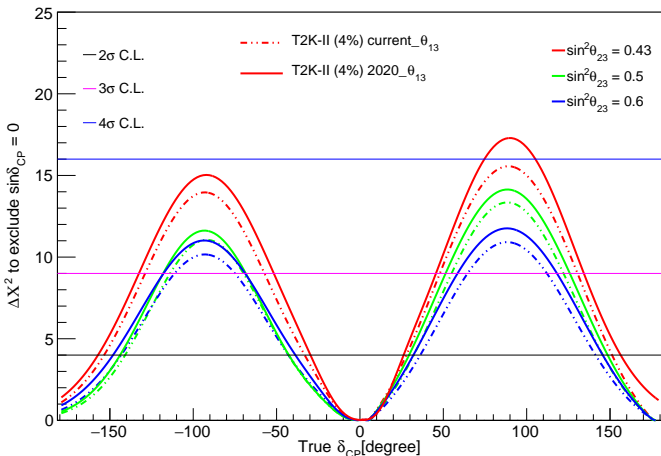


(b) Assuming the MH is known – measured by an outside experiment.

Comparisons

- Update constraint on θ_{13}

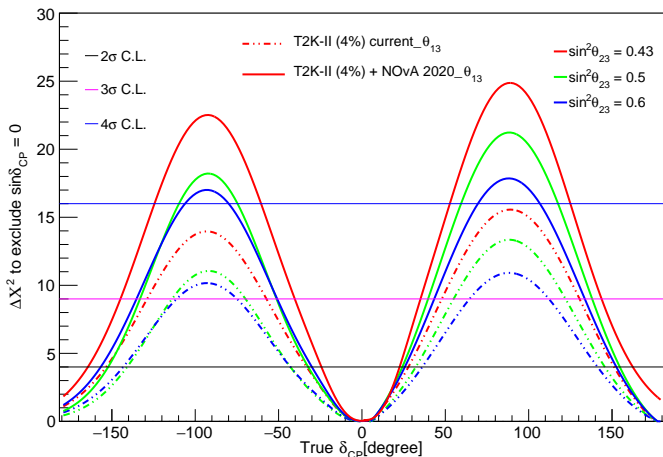
Sensitivities increase by 6.2% - 9.9%



Comparisons

- Update constraint on $\theta_{13} + \text{NOvA}$

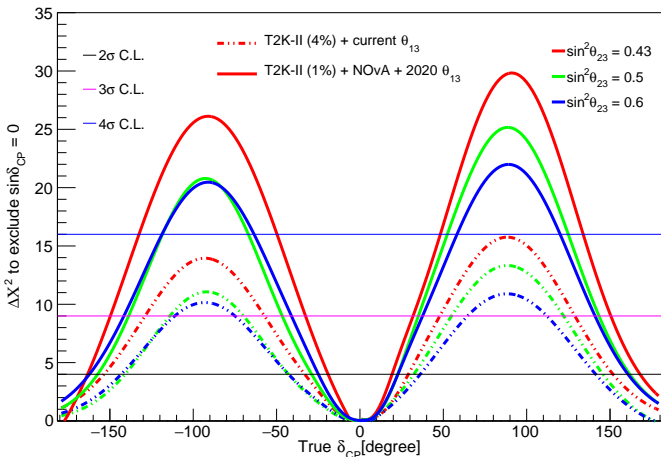
Sensitivities increase by 57.9% - 63.8%



Comparisons

- T2K-II vs T2K-II + NOvA + 2020 constraint on θ_{13} + reduce T2K-II sys. uncertainties down to 1%

Sensitivities increase by 88.3% - 101.4%



Comparisons

- T2K-II + NOvA by reducing T2K-II sys. uncertainties from 4% down to 1% (2020 constraint on θ_{13})

Sensitivities increase by 18.1% - 22.9%

