Imperial College London

MaCh3 2D binning

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Overview

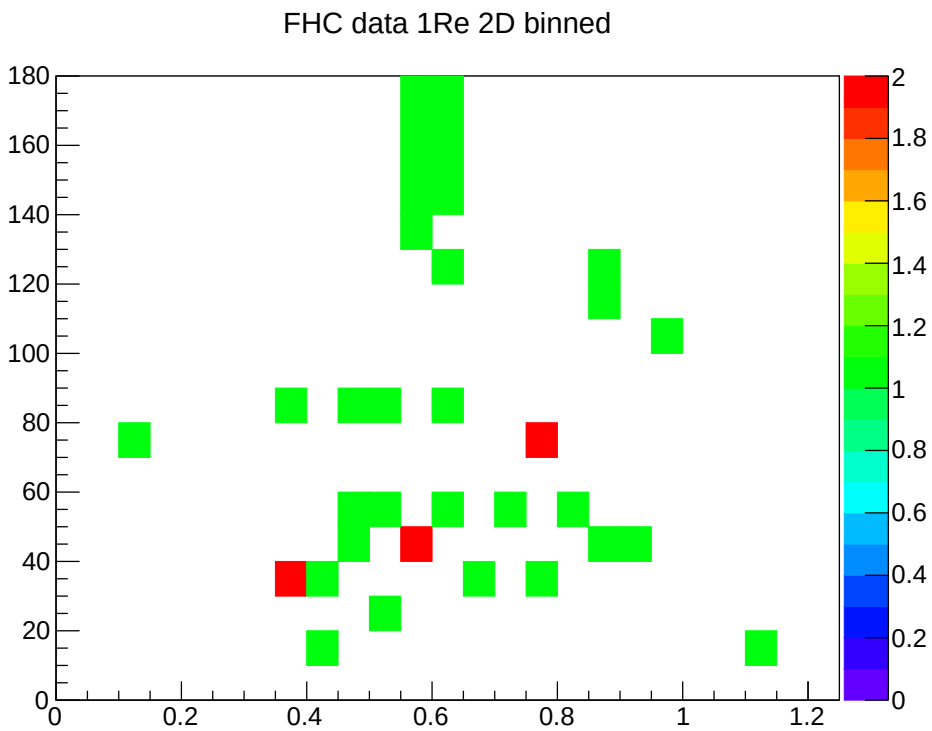
- For 2016 analysis Valor and p-theta used 2D event binning in p/E_{rec} and θ for ν_e while MaCh3 used 1D binning in E_{rec}
- We are looking to move to 2D for future analyses to make us more sensitive to differences between Asimov and observation
  - Run 6 and Run 7 data have differences in the θ distribution observed and expected
  - MaCh3 is not currently sensitive to this
- For now ν_μ sample will still use 1D E_{rec} bins, but we hope to change to 2D there as well eventually.
  - Valor splines used for ν_e
- Previously showed good agreement of Asimov rates, spectra and contours from 2D with those from Valor
- Will show data fit comparisons today

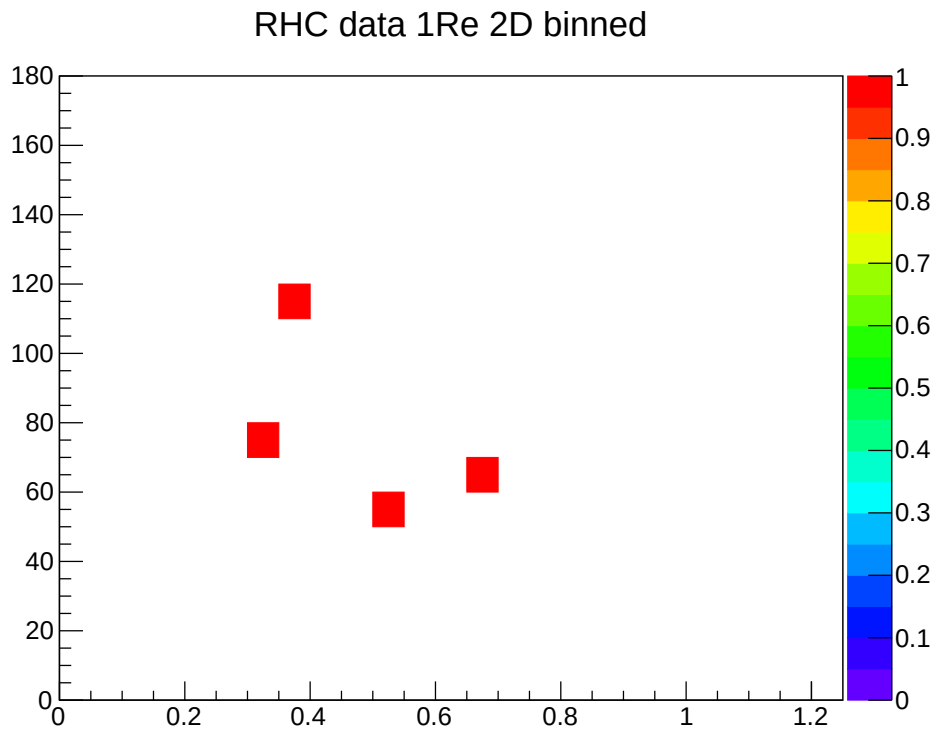
Binning

- For all studies shown today ν_μ is binned in E_{rec} only with 73 bins as described in TN 269
- For 1D TN269 MaCh3 analysis ν_e has 25 E_{rec} bins of 50 MeV from 0 to 1.25 GeV
- For 2D MaCh3 analysis ν_e E_{rec} binning is the same, but there are also 15 bins in θ
  - 14 10° bins from 0-140° and 1 bin from 140° to 180°
  - Same as Valor analysis

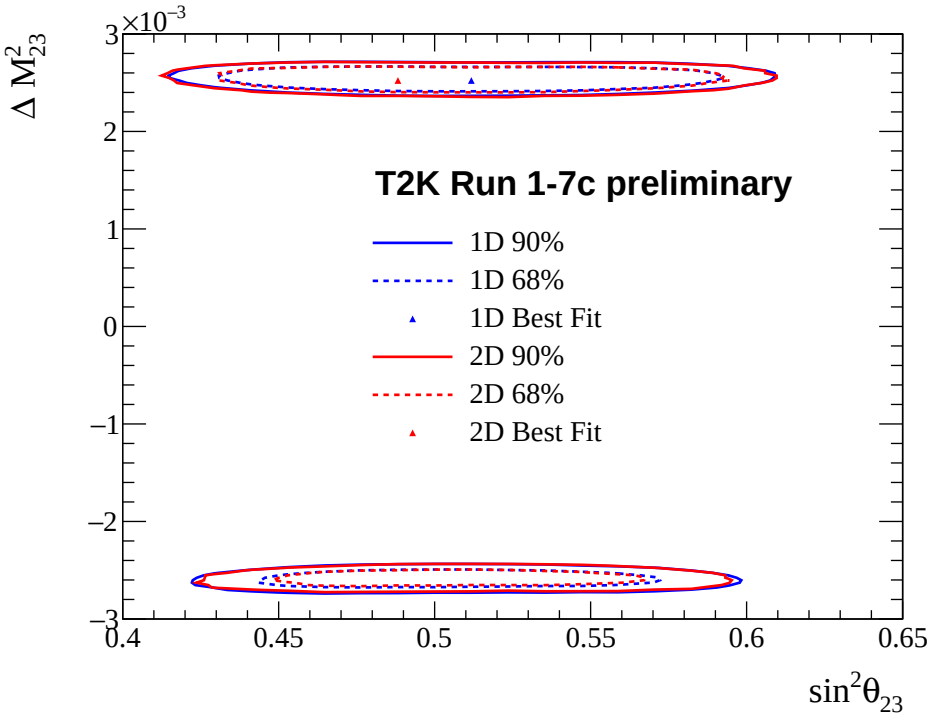
Data Spectra

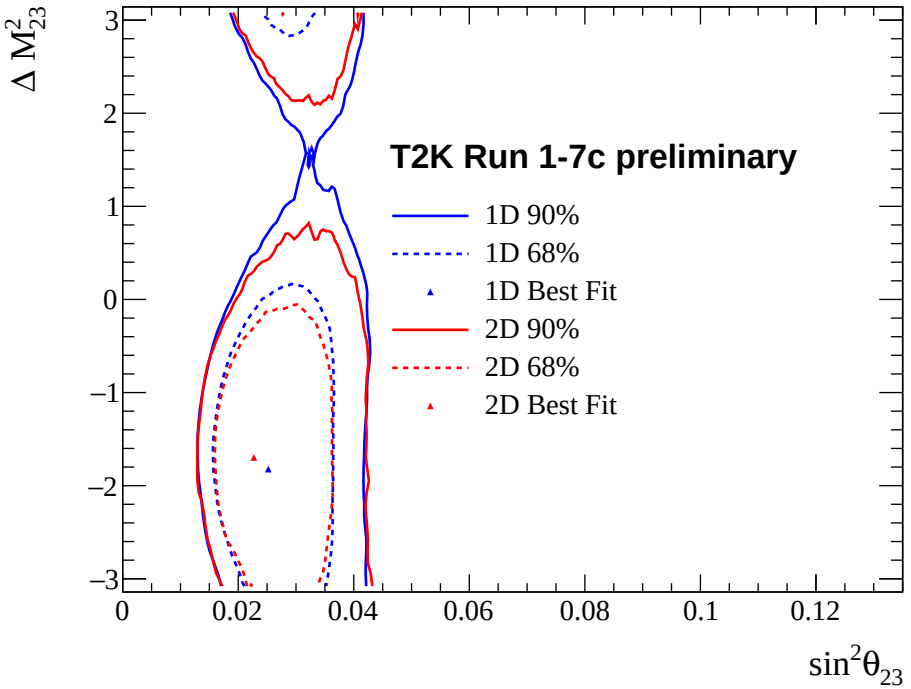
ν_e and $\bar{\nu}_e$ spectra





MaCh3 1D-2D comparisons woRC


×10⁻³
Δ M²₂₃
T2K Run 1-7c preliminary
1D 90%
1D 68%
1D Best Fit
2D 90%
2D 68%
2D Best Fit
sin²θ₂₃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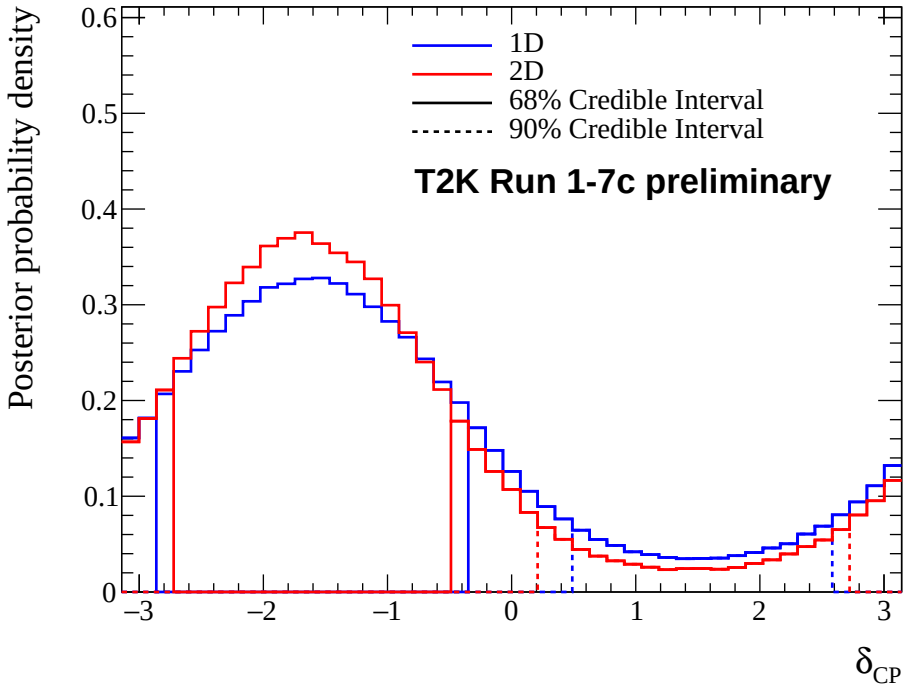
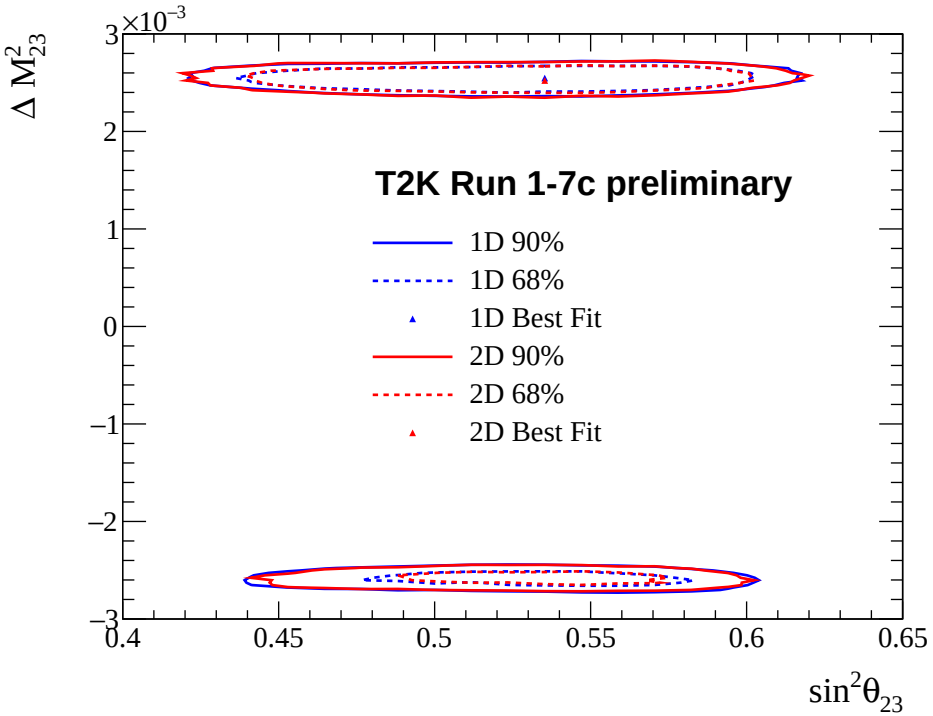

Posterior probability density
0.6
0.5
0.4
0.3
0.2
0.1
0
−3
−2
−1
0
1
2
3
δ_{CP}
1D
2D
68% Credible Interval
90% Credible Interval
T2K Run 1-7c preliminary

MaCh3 1D-2D comparisons wRC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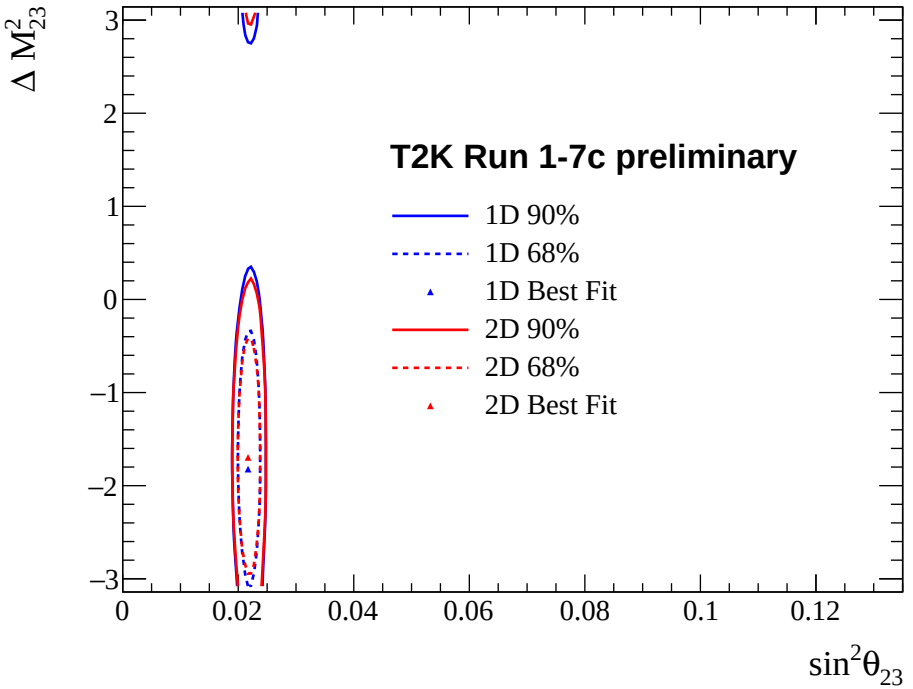
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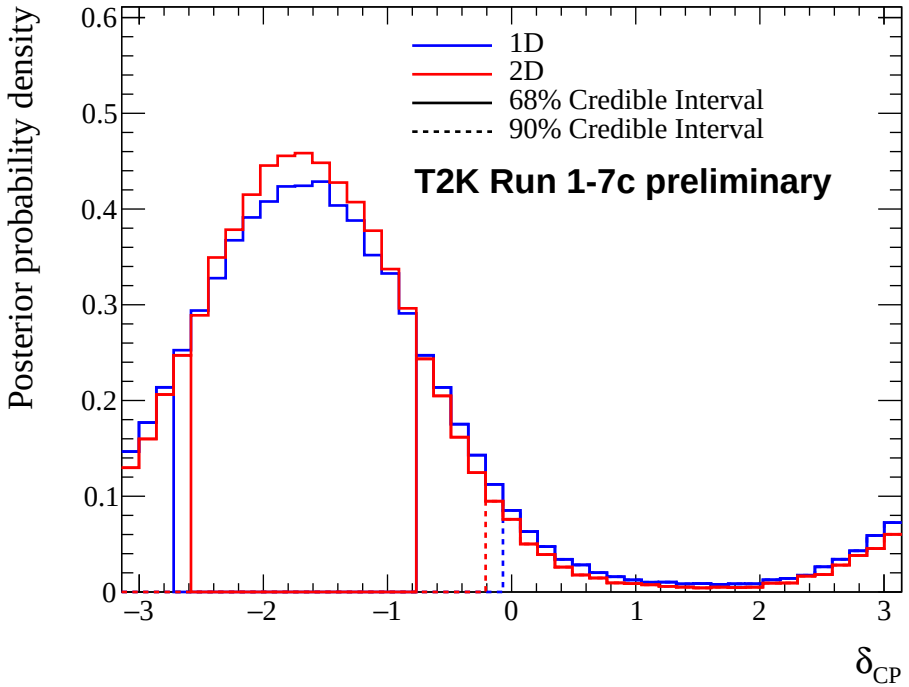
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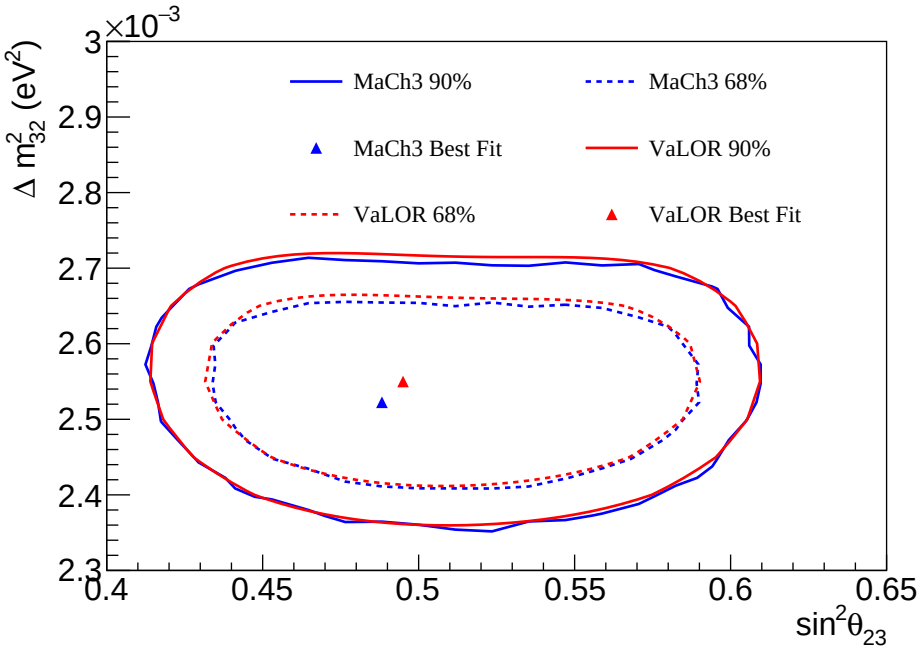
MaCh3-Valor comparisons woRC

Disappearance parameters

NH



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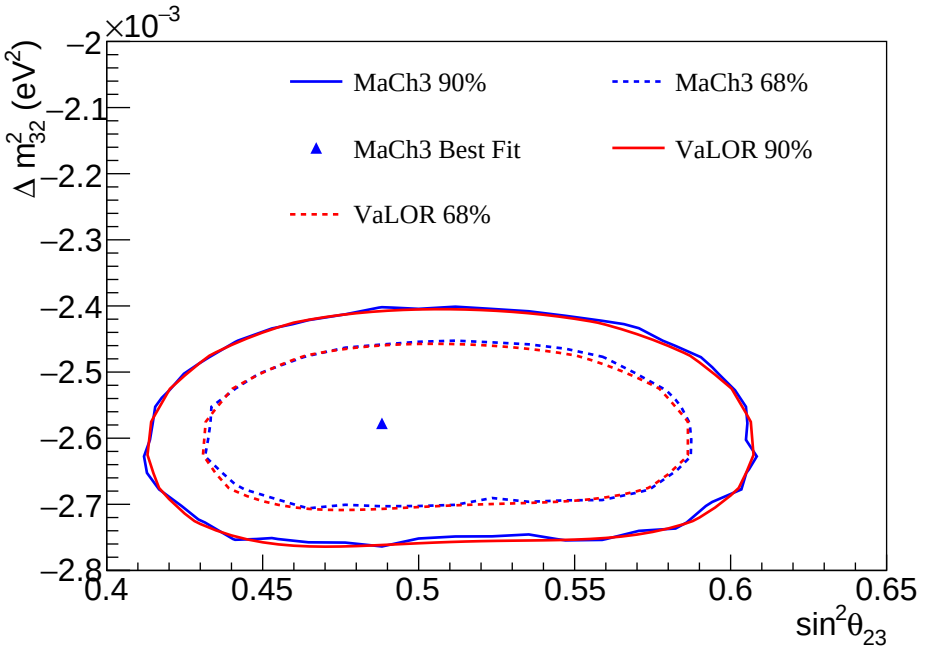

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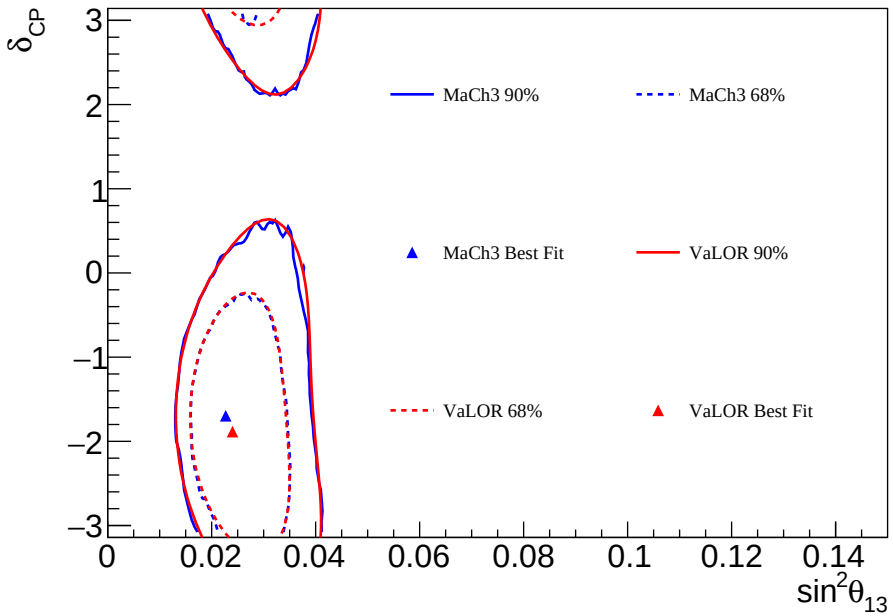

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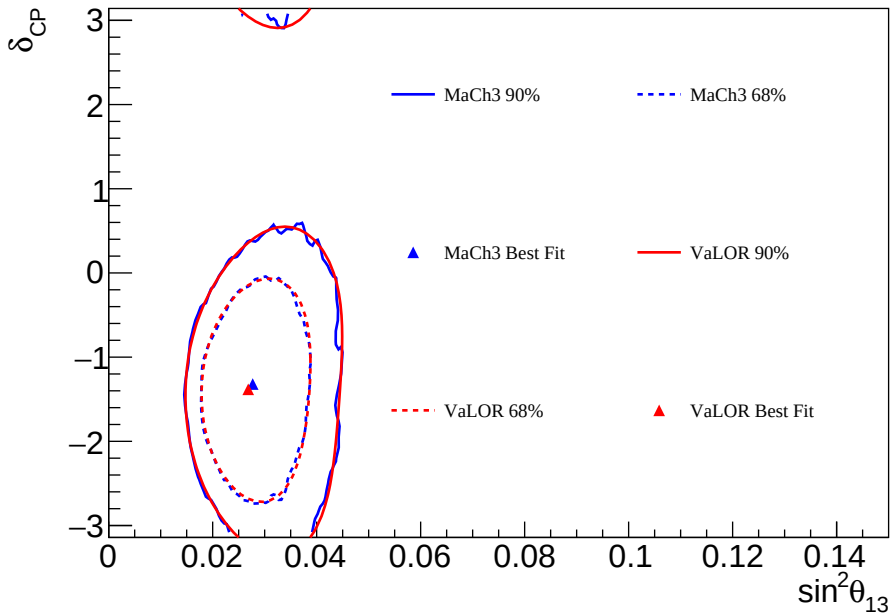

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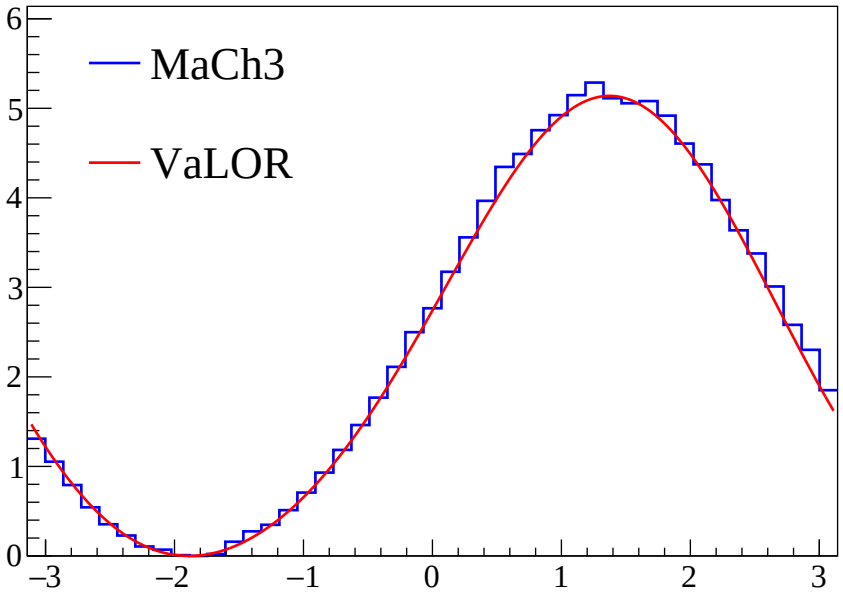

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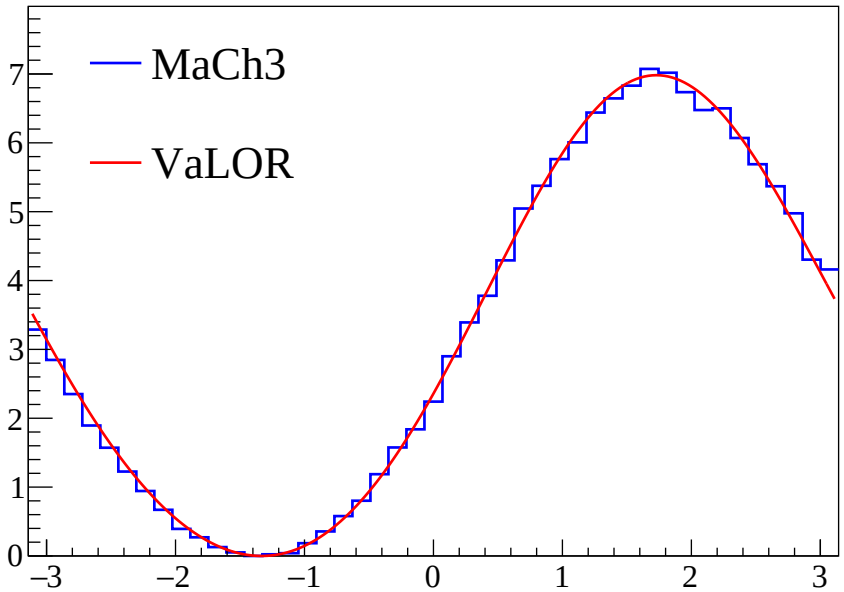

MaCh3-Valor comparisons wRC

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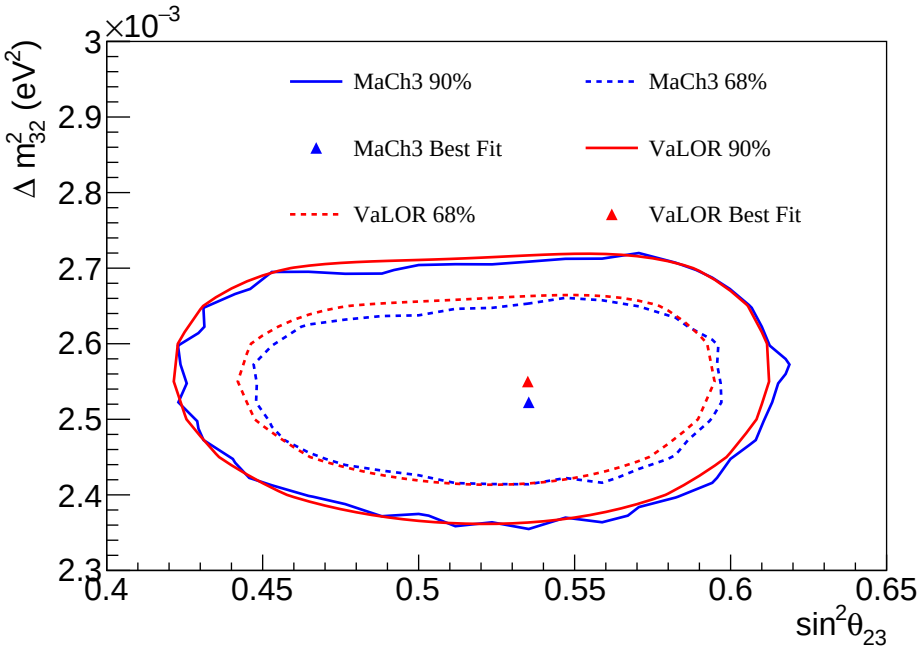

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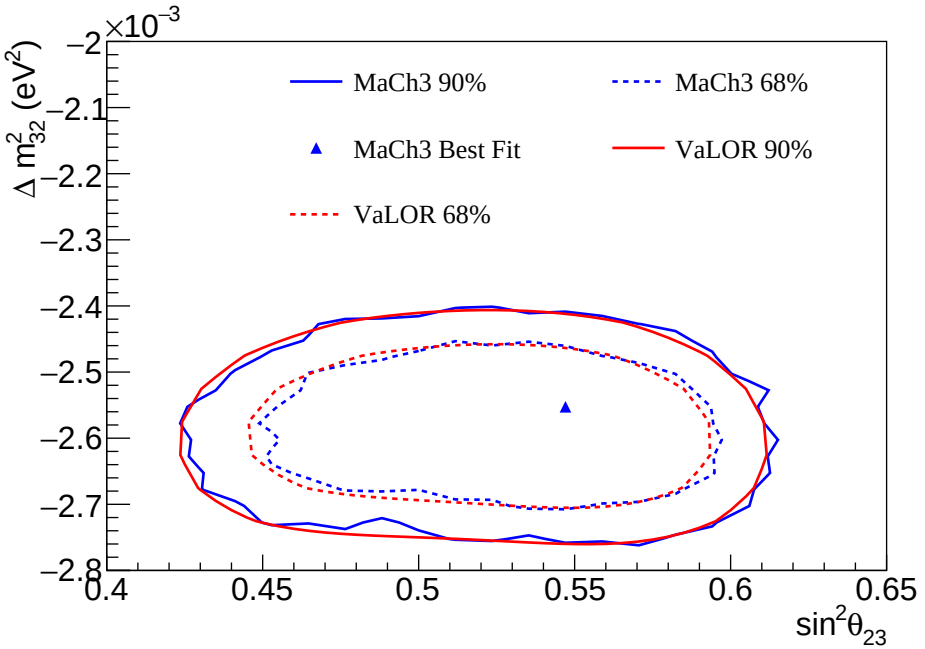

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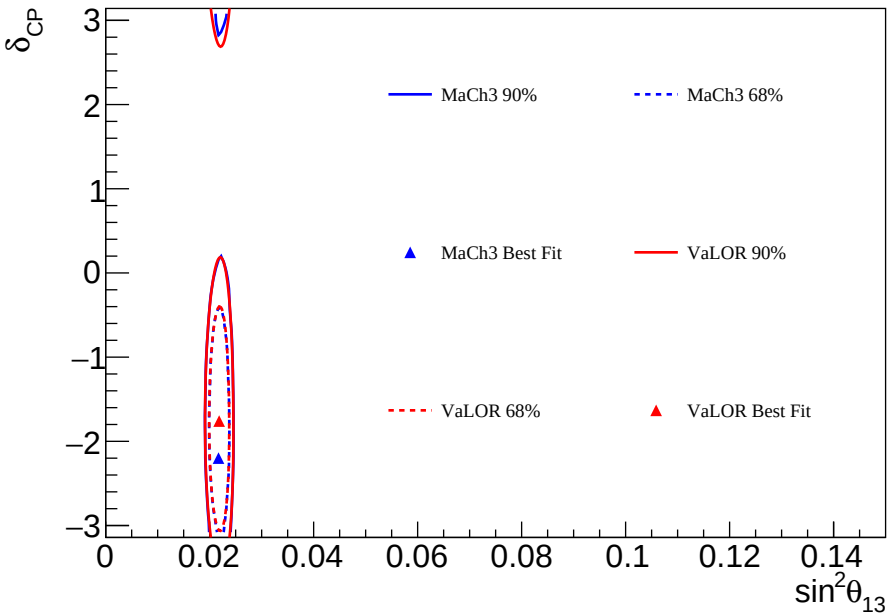

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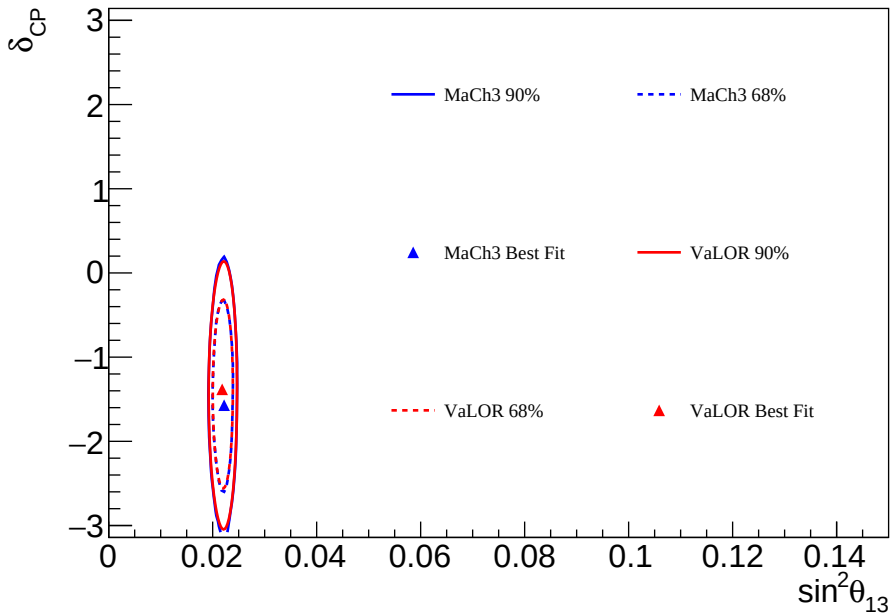

δ_{CP}

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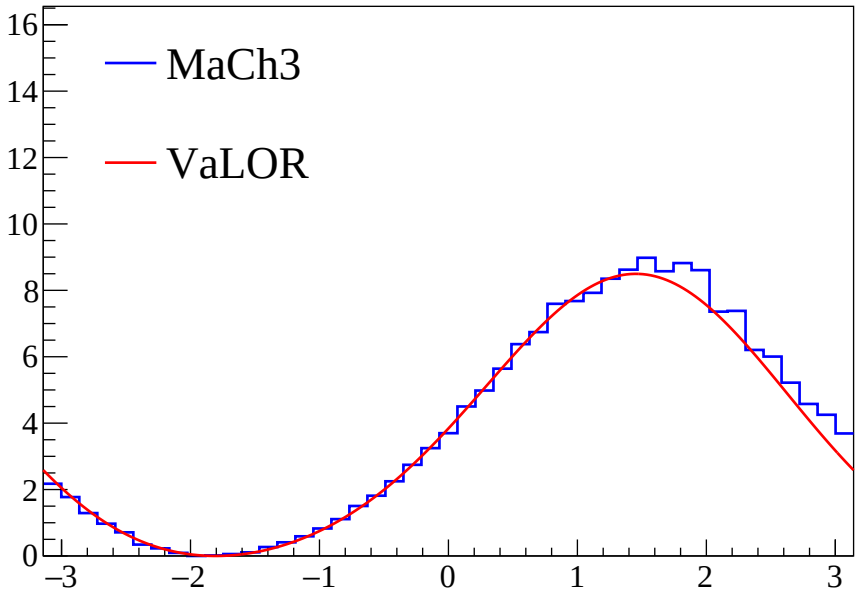

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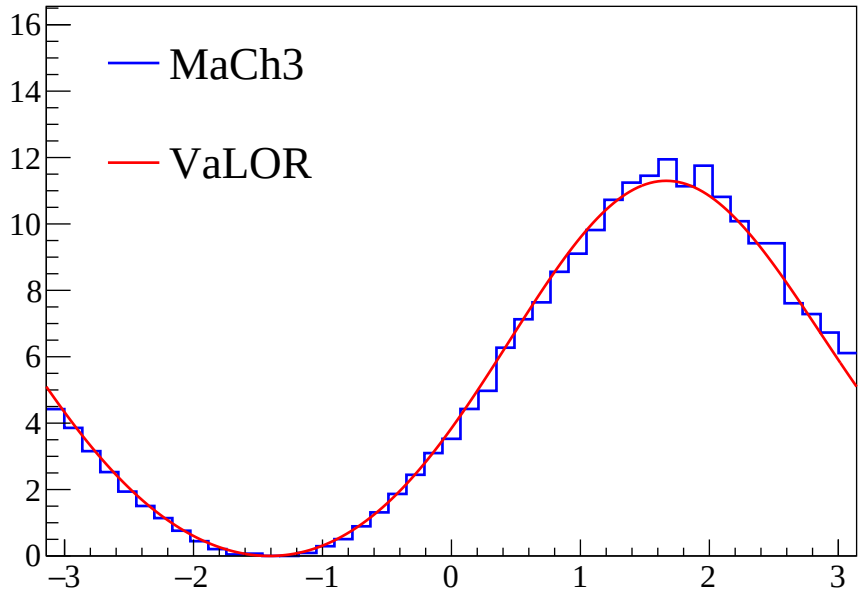

- Fairly good agreement seen between MaCh3 and Valor when MaCh3 move to the same binning for ν_e
- Confirms that tighter constraint seen by Valor for Run 1-7c is due to binning
  - Previously seen that 1D binned Valor analysis gave same result as 1D MaCh3
- We plan to use 2D binning for ν_e for future MaCh3 analyses and will look into 2D binning for ν_μ as well