

# Working Status

Tran Van Ngoc

Neutrino Group  
IFIRSE - ICISE

NuGroup Meeting, June 22, 2018

# Outlines

- 1 Related works
- 2 Edit the paper
- 3 T2K-II sensitivity
- 4 NOvA sensitivity
- 5 Make combined sensitivity plots

## Related works

- Weekly check hardware room
- Get T2K account to log in T2K website
- Get eZuce account to join in T2K meetings
- Successfully install VPN in Windows 7 (32bits), can connect via kmvpn

# Edit the paper

- Revise the GLoBES files.
- Make plots
- Update the paper with new plots and event rates

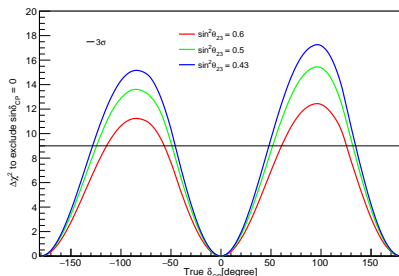
[https://github.com/ngoctranapc06/globes\\_nova](https://github.com/ngoctranapc06/globes_nova)

[https://github.com/ngoctranapc06/globes\\_t2k2](https://github.com/ngoctranapc06/globes_t2k2)

[https://github.com/ngoctranapc06/globes\\_t2k2\\_nova](https://github.com/ngoctranapc06/globes_t2k2_nova)

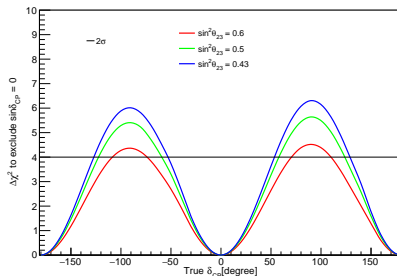
# T2K-II sensitivity

- <https://arxiv.org/pdf/1607.08004.pdf>
- <https://arxiv.org/pdf/1707.01048.pdf> for  $\nu_e$
- <https://arxiv.org/pdf/1704.06409.pdf> for  $\nu_\mu$
- Energy window:  $0.2\text{GeV} - 5.2\text{GeV}$
- Efficiency:  $66.3\%$   $\nu_e$  appearance;  $69.7\%$   $\bar{\nu}_e$  appearance;  
 $72.6\%$   $\nu_\mu$  disappearance;  $80.2\%$   $\bar{\nu}_\mu$  disappearance



# NOvA sensitivity

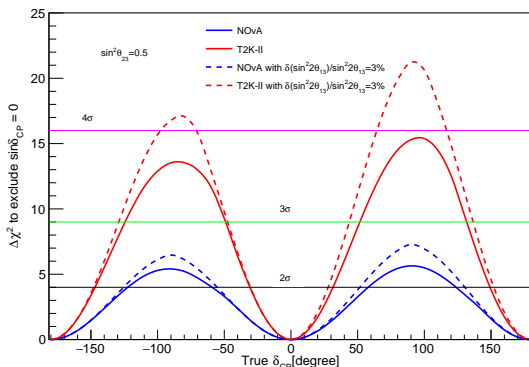
- <https://arxiv.org/pdf/1806.00096.pdf> for  $\nu_e$  and  $\nu_\mu$
- [nova\\_msanchez-neutrino18-June-04.pdf](#) for  $\bar{\nu}_\mu$
- Energy windows:  $0.1\text{GeV} - 9.1\text{GeV}$
- Efficiency: **61.0%**  $\nu_e$  appearance; **71.5%**  $\bar{\nu}_e$  appearance;  
**32.0%**  $\nu_\mu$  disappearance; **38.0%**  $\bar{\nu}_\mu$  disappearance



# Make combined sensitivity plots

- Fraction region (FR) to exclude  $\sin\delta_{CP} = 0$  at  $2\sigma$ :  
+ NOvA:  $[-122.2; -59.2]$  and  $[58.0; 123.8]$

$$\frac{(-59.2 - (-122.2)) + (123.8 - 58.0)}{360} = 36\%$$



# Make combined sensitivity plots

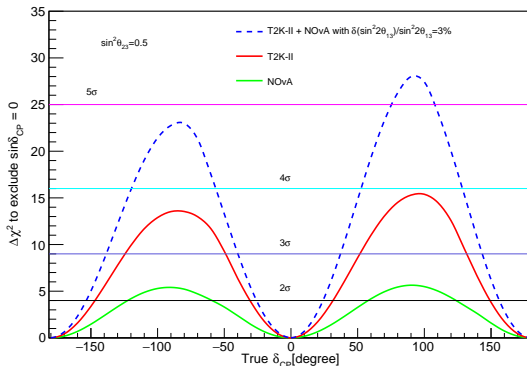
- FR to exclude  $\sin\delta_{CP} = 0$  at  $2\sigma$  for NOvA: 36%
- FR to exclude  $\sin\delta_{CP} = 0$  at  $2\sigma$  for NOvA + Reactor: 41%
- FR to exclude  $\sin\delta_{CP} = 0$  at  $3\sigma$  for T2K: 43%
- FR to exclude  $\sin\delta_{CP} = 0$  at  $3\sigma$  for T2K + Reactor: 48%



# Make combined sensitivity plots

For T2K+NOvA+Reactor, FR to exclude  $\sin\delta_{CP} = 0$ :

- at  $3\sigma$ : 57%
- at  $4\sigma$ : 39%
- at  $5\sigma$ : 9%



# Make combined sensitivity plots

By reducing systematic uncertainties down to 2%, FR to exclude  $\sin\delta_{CP} = 0$  at  $5\sigma$  for T2K+NOvA+Reactor with  $\sin^2\theta_{23} = 0.5$ :  
**24%**

