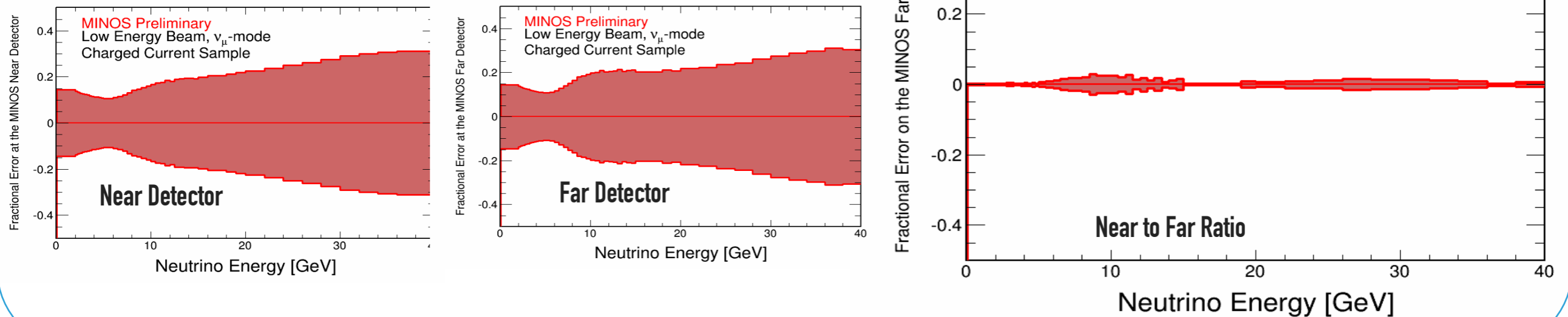

THE CENF-ND FORUM

- Near Detectors are necessary to control the systematics uncertainties and crucial to reach the very-few % level in future LBL neutrino experiments

MINOS hadron production uncertainty



ArXiv : 1704.06409

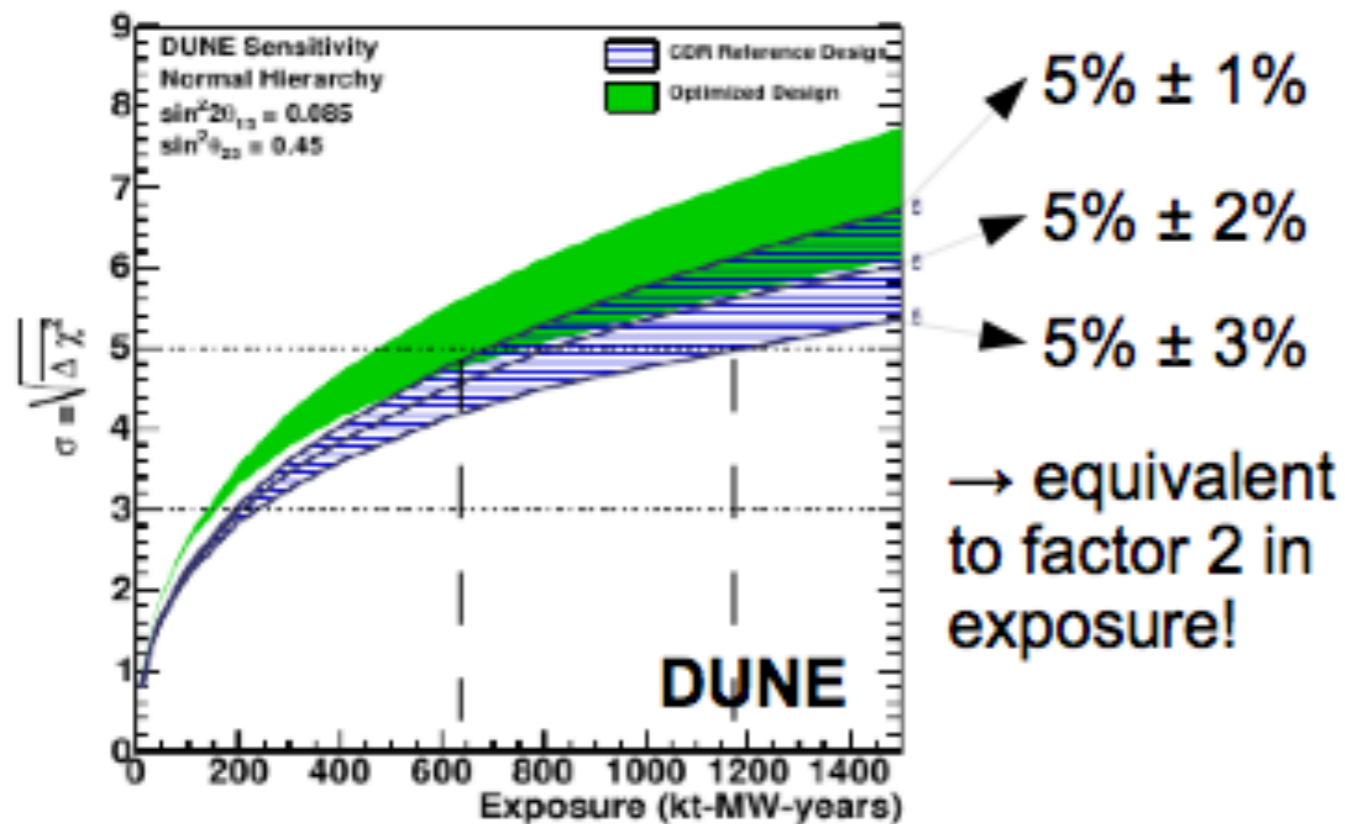
T2K

Source of uncertainty (number of parameters)	$\delta n_{SK}^{\text{exp}} / n_{SK}^{\text{exp}}$	
	neutrino mode	antineutrino mode
Flux+ ND280 constrained cross section (without ND280 fit result) (61)	10.81%	11.92%
Flux+ ND280 constrained cross section (using ND280 fit result) (61)	2.79%	3.26%
Flux+ all cross section (65)	2.90%	3.35%
Super-Kamiokande detector systematics (12)	3.86%	3.31%
Pion FSI and re-interactions (12)	1.48%	2.06%
Total (77)	5.06%	5.19%

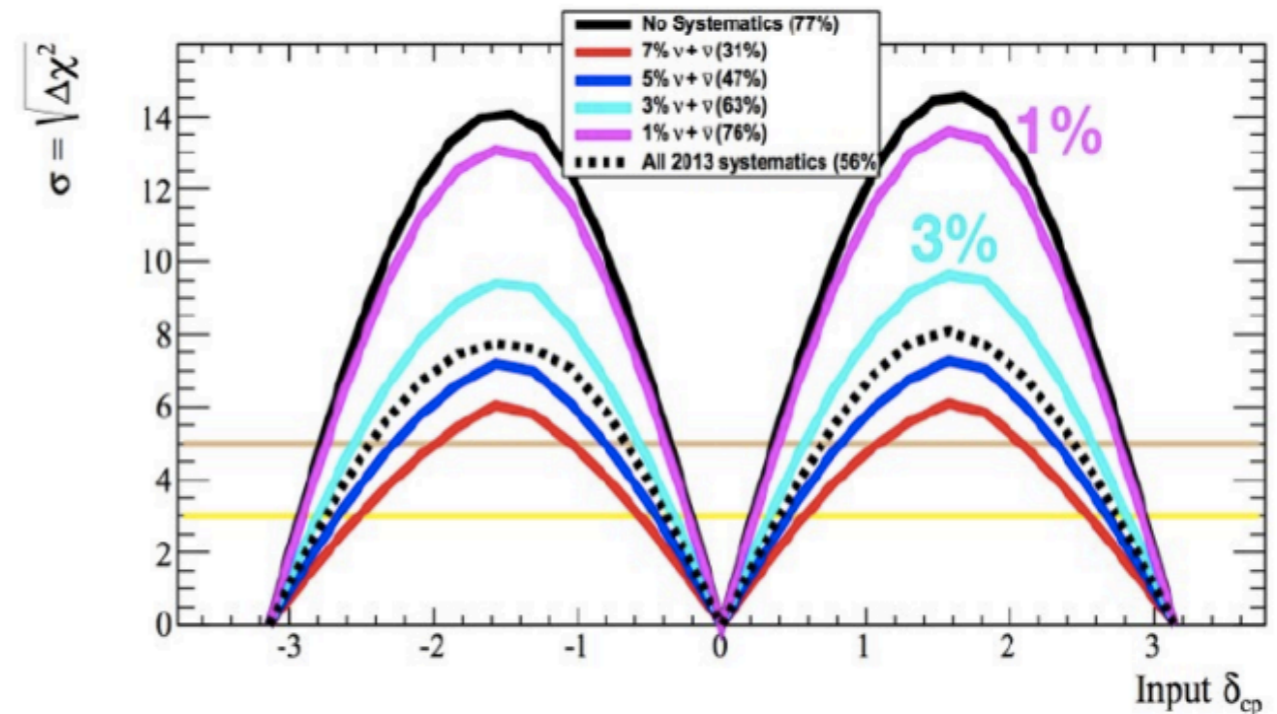
- ▶ Near Detectors are necessary to control the systematics uncertainties and crucial to reach the very-few % level in future LBL neutrino experiments

from DUNE CDR

50% CP Violation Sensitivity



HyperK (nuFACT 2015)



MOTIVATION/CONTEXT

- ▶ LBN experiments (T2K, HK, DUNE) are currently working on the design of their near detector, in some cases with tight schedule
 - ▶ DUNE : ND design determined by the end of 2017 (see Alfons talk)
 - ▶ T2K/T2K-II : upgrade of ND280 by 2020 and design of HK-T2K ongoing (see Marco's talk)
- ▶ European Institutes have:
 - ▶ great expertise in ND
 - ▶ deep know-how in detector technologies
 - ▶ large participation in LBN experiments or interests in joining

MOTIVATION/CONTEXT

- ▶ Even if US and Japanese experiments are conceptually different (baseline, on/off axis, detector target) several problematics are common:
 - ▶ how can we master our flux? how well can we measure it? which are advantages and limitations of different approaches (hadron production experiments, low-nu method, elastic scattering,...)
 - ▶ cross-section models are not perfect in any energy region. Which measurement a ND can do to improve the current knowledge? are there any other studies on existing data that can be performed to improve current Montecarlo generators
 - ▶ near to far extrapolation can be done in several ways (fit, bayesian probability, covariance matrices). Are those method robust? pro and cons? are there robust against the increase of number of samples or parameters

THE FORUM



A collaborative effort toward the design of a Near Detector for the new generation of neutrino oscillation LBL experiment

<https://twiki.cern.ch/twiki/bin/view/CENF/NearDetector>

- ▶ The forum is a new project of the Neutrino Platform and the EP-NU group
- ▶ Close collaboration with (support to) the LBN experiments, regular report to the collaborations. Many of the studies are already ongoing inside the collaborations, the aim is to participate to the existing works, not doubling the effort
- ▶ The aim of the forum is strength the European effort in its contribution to ND activities, attract new institutions and provide support for R&D

Europe can contribute to build a common knowledge and perform some experimental R&D, to assist DUNE and T2K/HK in the definition of the best ND configuration.

CERN can be an hub for such European activities.