

# WP2 status

introduction

- WP2 is the Work Package dedicated to T2K detector upgrade and Neutrino Physics
- Recall of the main objectives:
  - Design, build, test and commission the upgrades for the T2K near detector (ND280), consisting of two TPCs and a scintillator based 3D Fine Grained Detector (Super-FGD).
  - Perfect the measurements of neutrino cross-sections, in particular to pin down nuclear effects and improve modelling.
  - Perform oscillation measurements with neutrinos and anti-neutrinos, both in appearance and disappearance, to maximize the sensitivity to leptonic CP violation.

# Tasks

- WP2 is organized in 4 tasks, 2 related to T2K upgrades, and 2 to analysis
  - Task 2.1: Construction and commissioning of the ND280 TPC [with participating institutes: INFN,CNRS,CEA,NCBJ,IFJ-PAN,IFAE,KEK]
  - Task 2.2: Construction and commissioning of the Super FGD [UGE,KEK,U-Tokyo]
  - Task 2.3: Neutrinos cross section measurement
  - Task 2.4: Neutrino oscillation analysis [INFN,CNRS,CEA,NCBJ,IFJ-PAN,IFAE,UGE,QMUL,KEK,U-Tokyo]

# Deliverables & Milestones

- Task 2.1 and 2.2
  - Deliverable: Technical Design Report of the upgraded ND280; EMD: 12
  - Milestone: production and test of first prototypes with front-end electronics; EMD: 24
  - Deliverable: report paper on the new detectors; EMD: 48 – some candidate papers/reports
    - <https://cds.cern.ch/record/2857032/files/SPSC-SR-328.pdf>
    - <https://arxiv.org/abs/2303.04481>
    - <https://arxiv.org/abs/2212.06541>
    - ... ?
- Task 2.3
  - Milestones: improved selection acceptance for cross-section measurements, EMD 24; neutrino energy reconstruction using detectors at different off-axis angles, EMD 36
  - Deliverables: report on cross-sections on C and O and reduction of uncertainties, EMD 48; report on electron neutrino cross-section and reduction of uncertainties, EMD 48
    - <https://arxiv.org/pdf/2004.05434>
    - <https://arxiv.org/pdf/2002.11986>
- Task 2.4
  - Milestone: inclusion of multi-ring topologies in the event selection; EMD: 24
  - Deliverable: report on  $\delta$ CP sensitivity; EMD: 48
    - <https://arxiv.org/pdf/2303.03222>

# Status of secondments

Institution	WP2 done (months)	WP2 planned	WP2 % done
INFN	42,8	49,0	87,4%
DESY		0,0	
OEAW-HEPHY		0,0	
IFJ-PAN	3,1	7,0	44,3%
UKP		0,0	
JSI		0,0	
METU		0,0	
TAU		0,0	
LAL-CNRS	8,9	10,0	89,0%
CEA	9,7	17,0	57,3%
IFAE	13,6	12,0	113,3%
UNIGE	15,4	18,0	85,4%
NCBJ	16,5	17,0	97,3%
KCL (Qmul)	6,9	3,0	231,1%
UKRI	0,7	6,0	12,2%
CAEN		0,0	
FBK		0,0	
Total	117,7	139,0	84,7%

# Comments

- WP2 secondments stopped ~ 85%.
  - Comment: several months of data taking were foreseen NOW ... And it would have meant using several months of secondments from WP2.
  - Overall, we had less beam operations than foreseen.
- Average usage of secondments was ~ 13% at the Jennifer2 suspension date.
- Since the restart we had a steady usage, first for installation, then commissioning and beam operations.
- Milestones all met
- Deliverables OK for 2.2, 2.3, 2.4
- Several papers and reports exist for 2.1, but not (yet) an official, final paper.