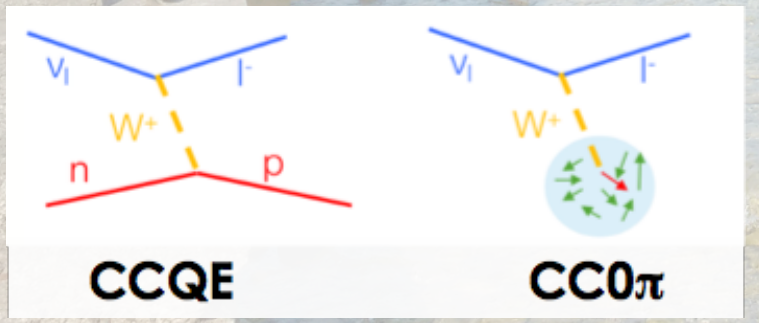
Wednesday session

Poster #95

Measurement of muon neutrino CC0π cross sections on Oxygen and Carbon at the T2K near detector

Motivations

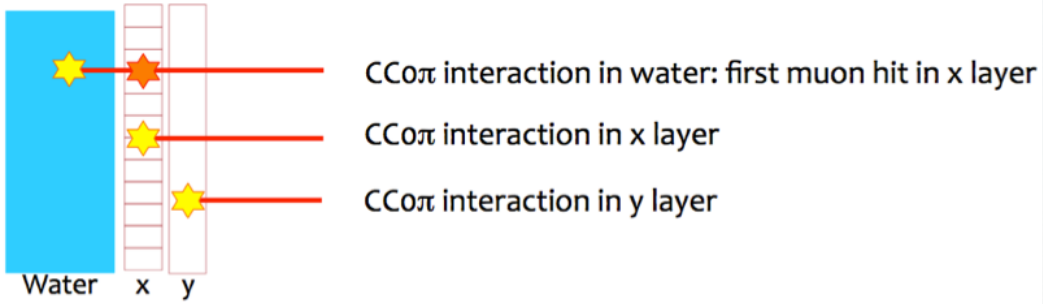
- The T2K far detector, Super-Kamiokande, is a Water Cherenkov detector: measurement of neutrino cross sections on Oxygen required!
- the O/C ratio helps to discriminate theoretical models
- Nuclear effects can hide pure CCQE interactions (dominant @T2K): better to study CC0π



Cross section extraction Technique

For the first time the data from the two Fine-Grained Detectors of ND280 (**FGD1 and FGD2**) combined to **simultaneously extract the O and C cross sections** as a function of the muon kinematics ($\cos\theta_\mu$, p_μ).

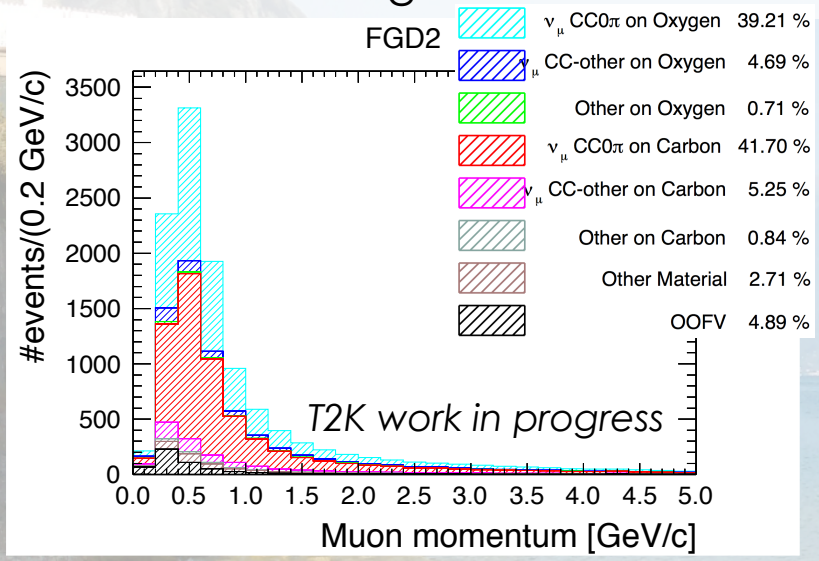
FGD1 only contains scintillator layers (C), while FGD2 also contains water modules (O).



- samples reconstructed in **FGD2-X** layers are **oxygen-enhanced**
- samples reconstructed in **FGD2-Y** layers and **FGD1** are **carbon-enhanced**

Signal samples

5 signal samples (1μ + 0 or N protons)
+
2 control regions to constrain the background



Carbon and oxygen interactions simultaneously fitted to the number of selected events, in all the signal and background samples:

Fit parameters of interest for C

Fit parameters of interest for O

$$N_i^{CC0\pi} = c_i N_i^{MC,\ CC0\pi,C} + o_i N_i^{MC,\ CC0\pi,O}$$

Blind analysis

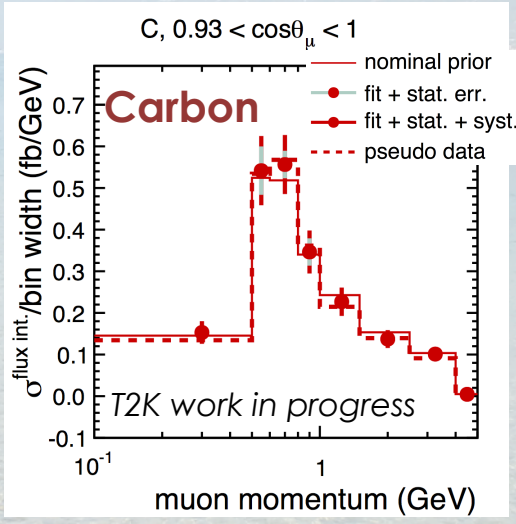
Detector, vertex migration, flux, model systematics + statistical fluctuations taken into account.

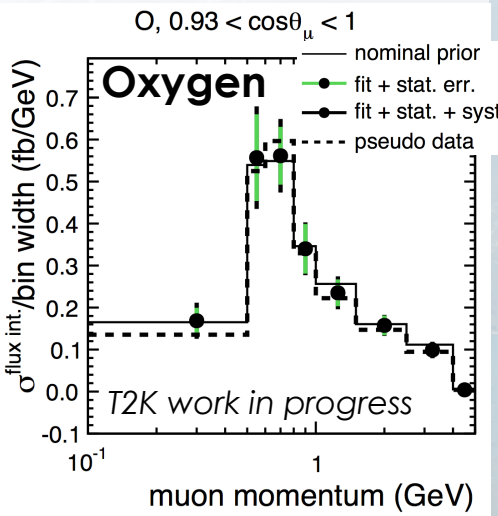
Fit validation on several sets of pseudo dat

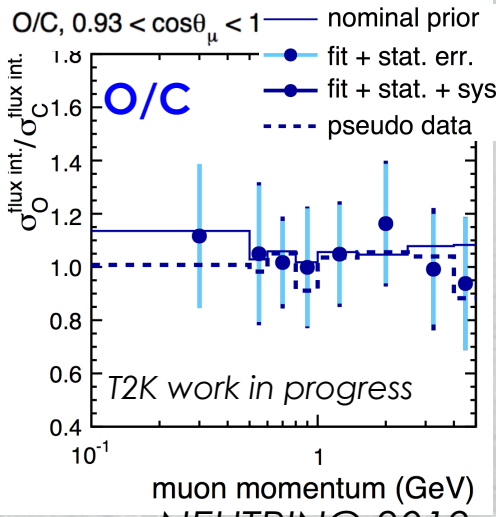
Example for the very forward region:

Prior: NEUT

Pseudo data: GENIE







The fit prefers GENIE: no bias due to the prior! Unblind soon!