



# $\nu_{\mu} CC1\pi^{+}$ interaction on Carbon (FGD1) with $4\pi$ acceptance

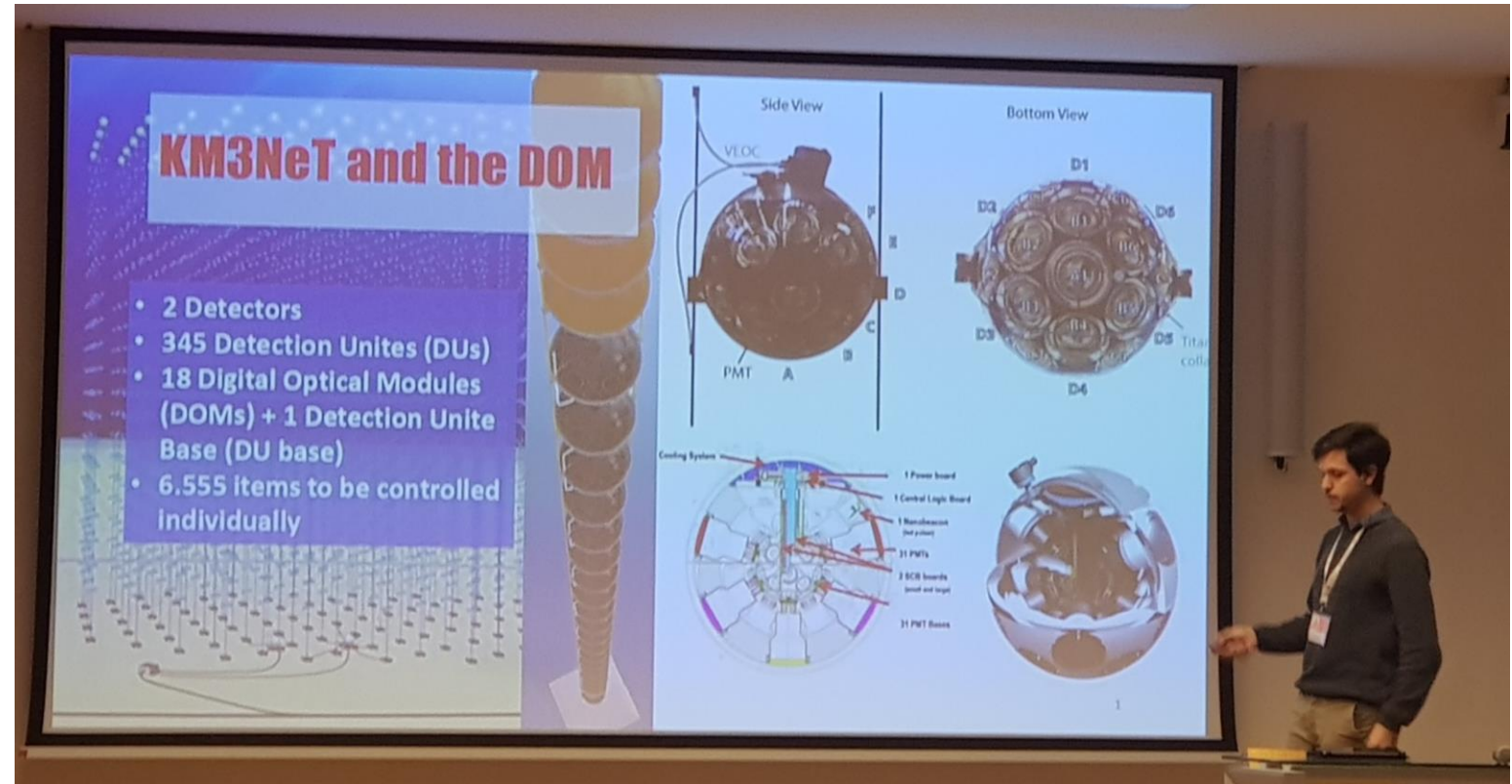
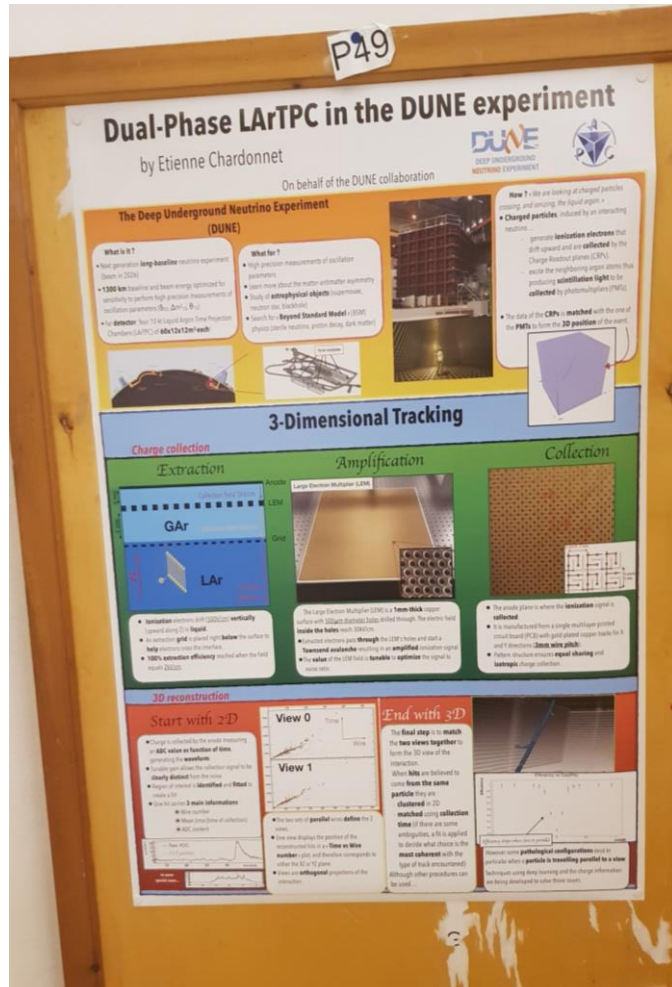
Neutrino group meeting

Danaisis Vargas Oliva

[dvargas@ifae.es](mailto:dvargas@ifae.es)

October 24th, 2019

# 15th Topical Seminar on Innovative Particle and Radiation Detectors (IPRD19)

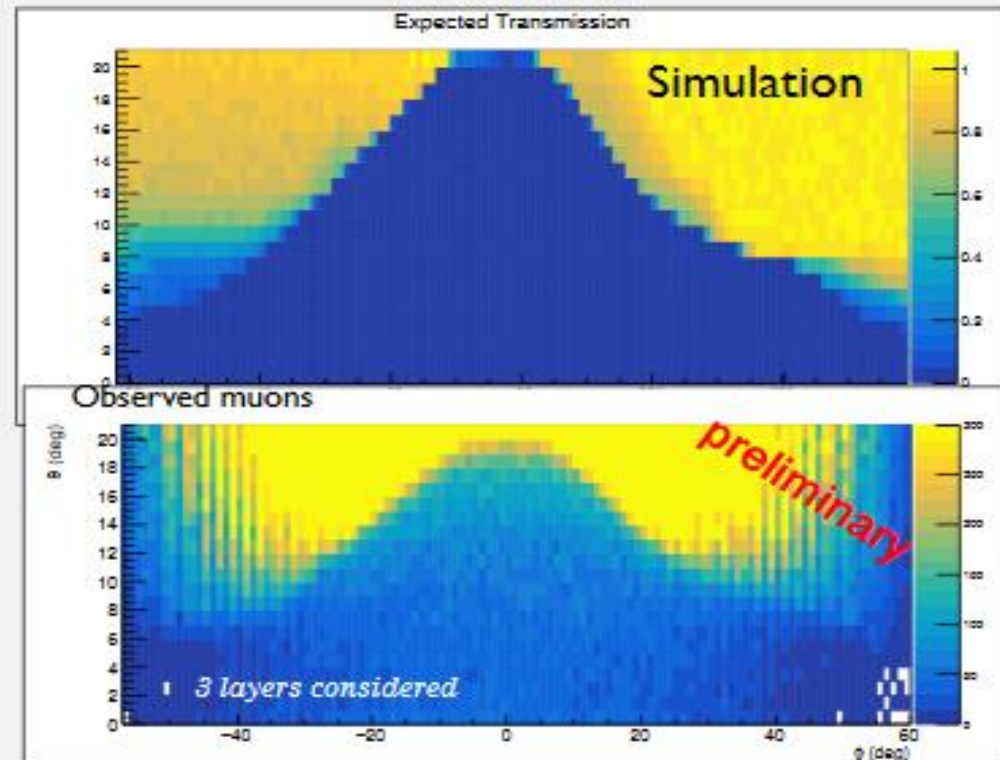
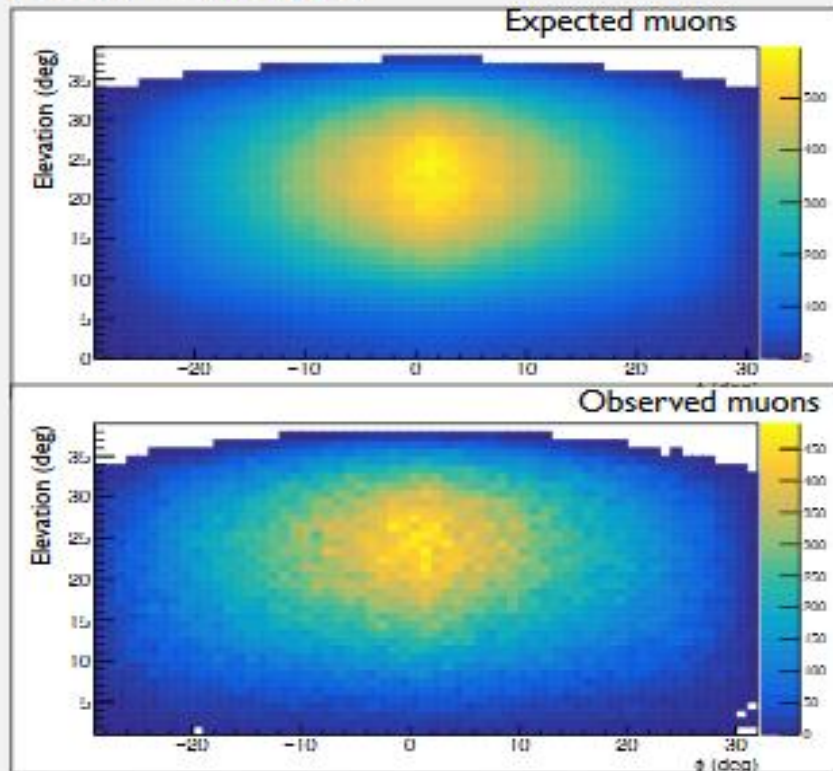


# 15th Topical Seminar on Innovative Particle and Radiation Detectors (IPRD19)

Muography

## MURAVES: PRELIMINARY RESULTS

Free sky - calibration



# T2K Cross-Section Workshop

## Software:

✓ nd280Highland v2r35

## Signal:

selecting events with a  $\text{CC}1\pi^+$  topology in FGD1:

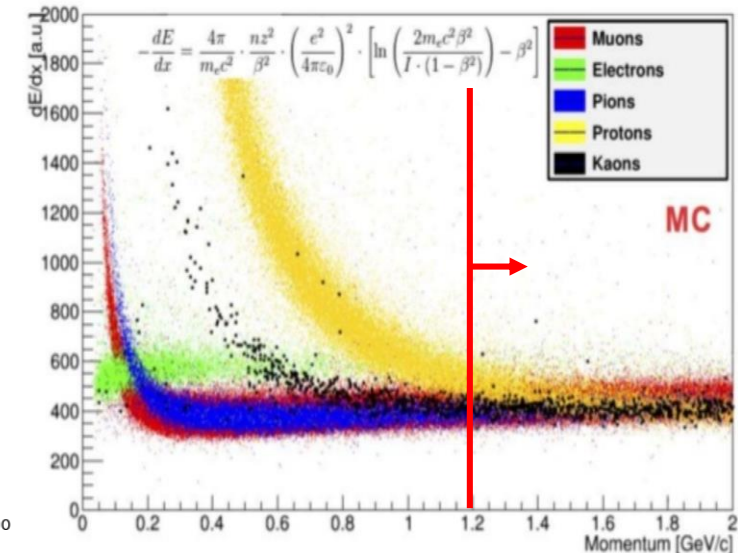
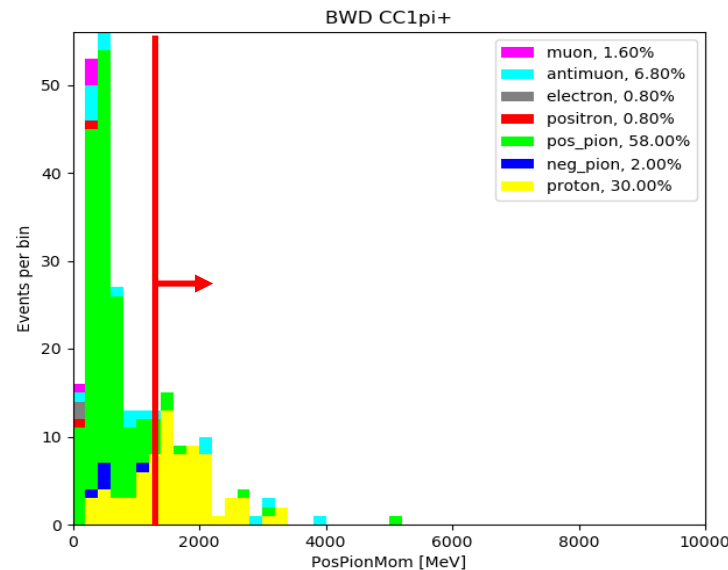
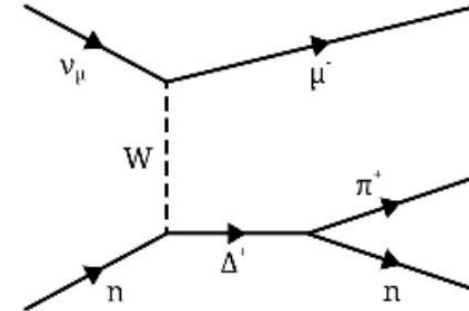
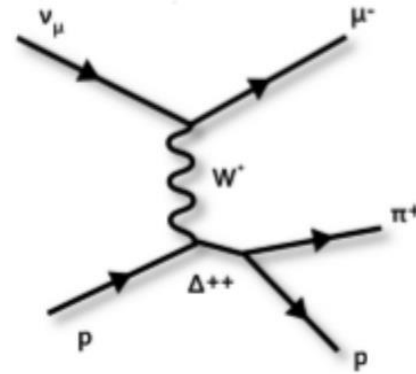
✓ 1 muon (in  $4\pi$  acceptance)

✓ 1 positive pion in TPC

✓ with or without cut on the  $P_\pi$  in TPC

✓ with or without FGD  $\pi$  and ME tagging

✓ with or without the  $\pi^0$  ECal veto



# T2K Cross-Section Workshop

## Momentum distribution for BWD based on true topology and true particle ID.

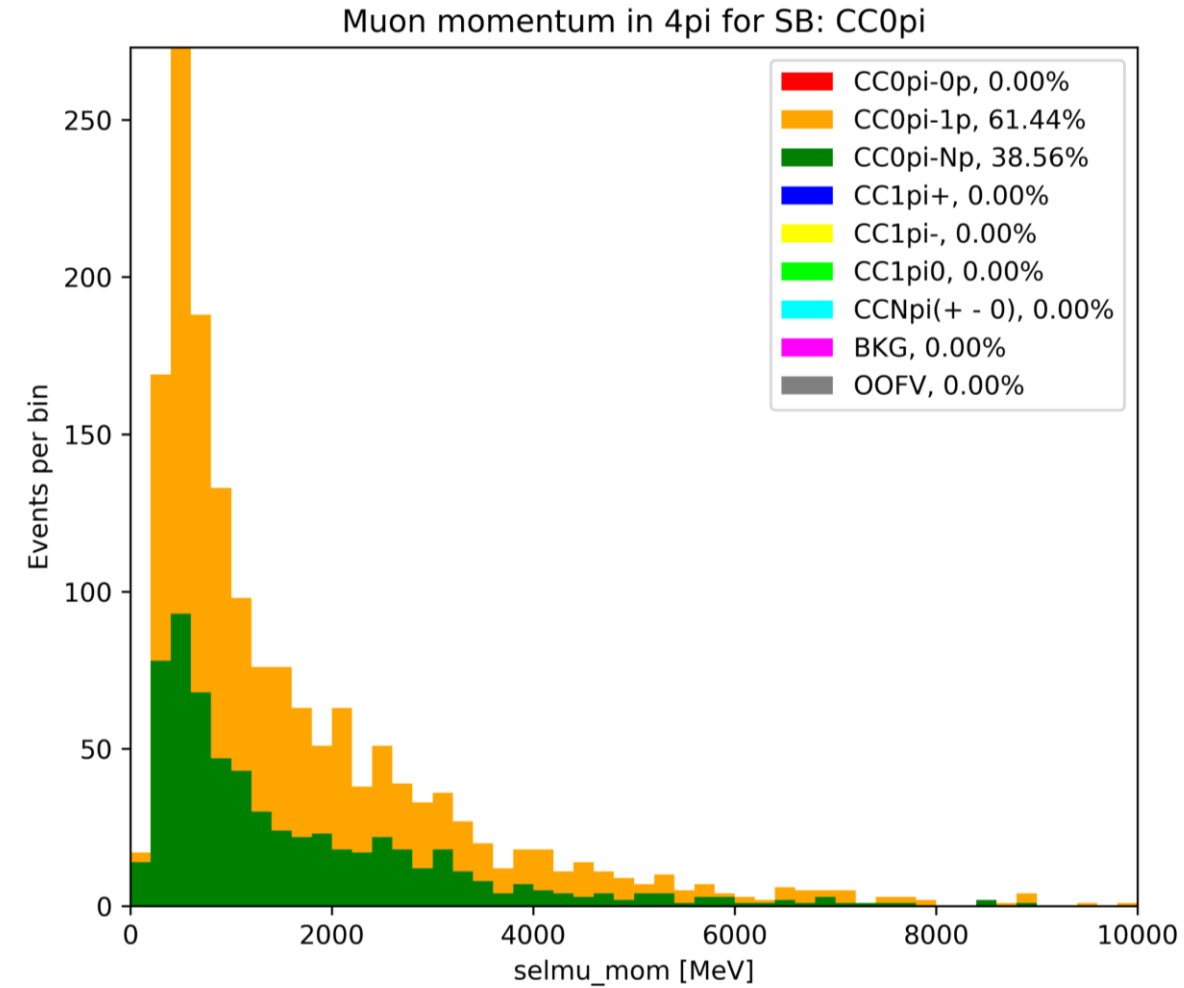
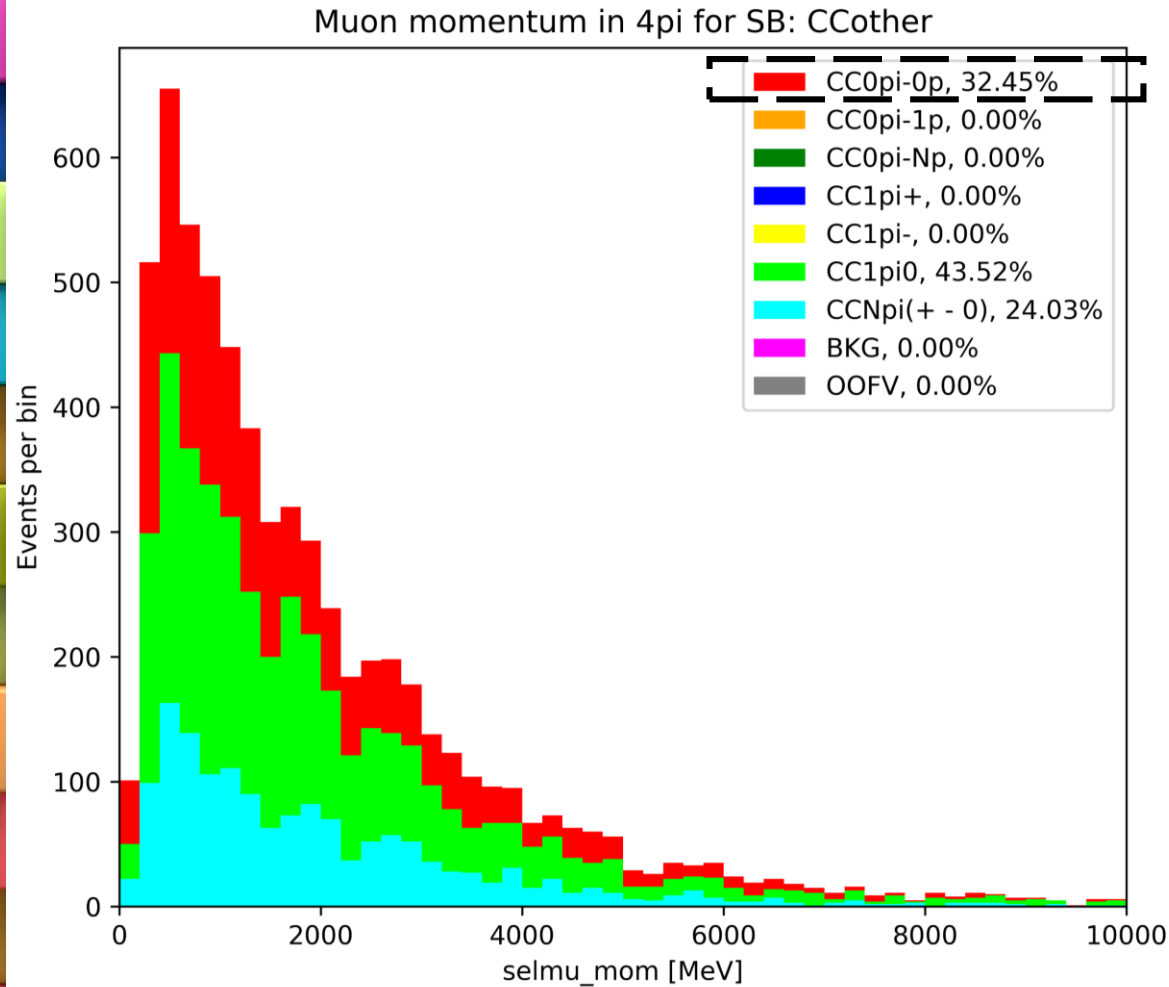
**Note:** In order to reduce the contribution of the  $CC0\pi$  (that one of the contribution is coming from protons identify as pions in the TPC) I applied the cut in the momentum of the particle when doing the TPC pion ID.



No momentum  
information of  
the ME or  
FGD pions!!!

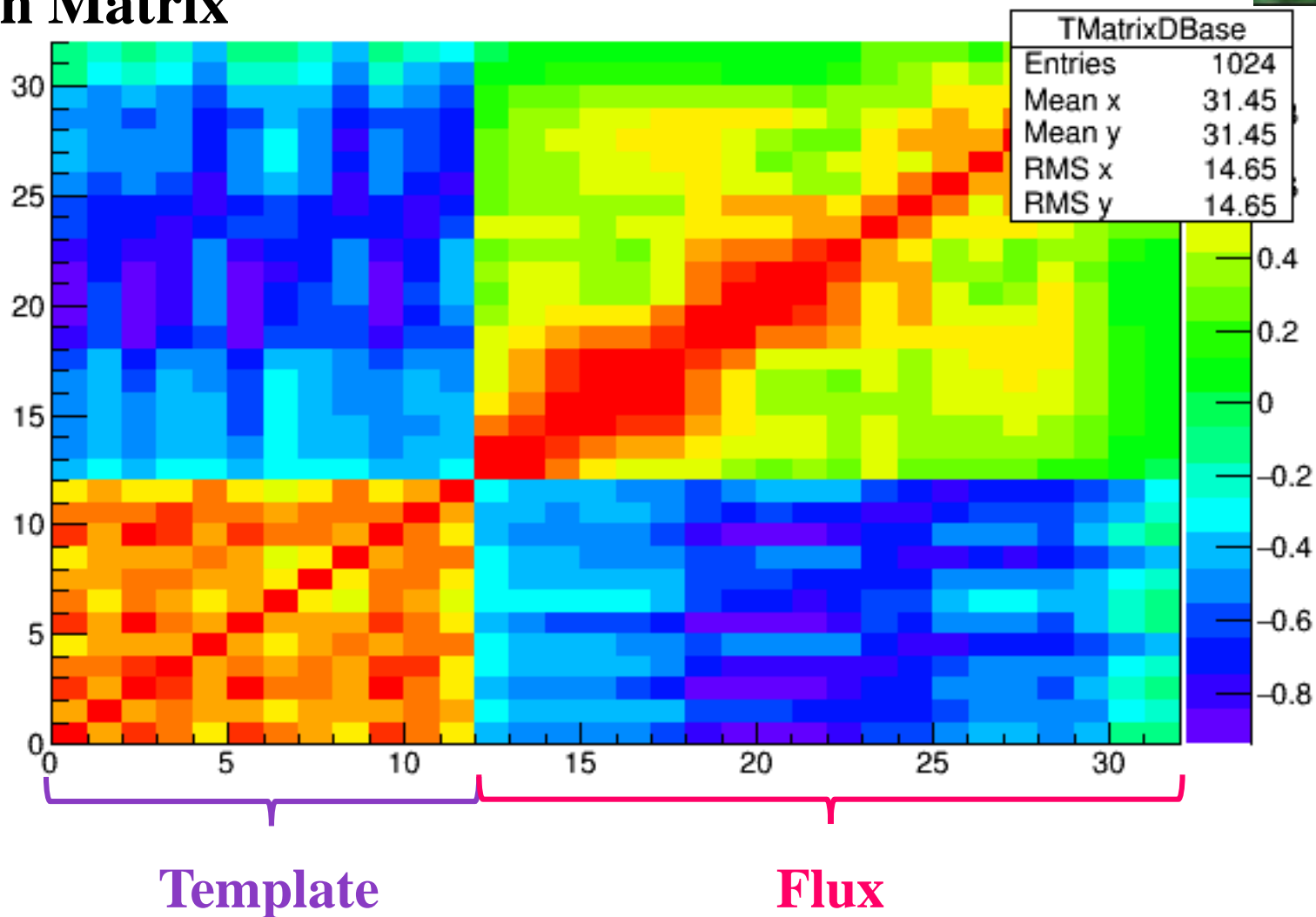
FGD $\pi$ & ME	$P_{\pi}$ (TPC) cut	$\pi^0$ ECal veto	Results (topogy)	Results (particle)	
X	---	---	$CC0\pi \sim 25\%$ $CC1\pi^+ \sim 30\%$ $CCother \sim 25\%$ $BKG \sim 5\%$ $OOFV \sim 16\%$	$\mu^- \sim 84\%$ $\pi^- \sim 11\%$ $\pi^+ \sim 4\%$	$\pi^+ \sim 58\%$ $p \sim 30\%$ $\mu^+ \sim 7\%$
X	---	X	$CC0\pi \sim 29\%$ $CC1\pi^+ \sim 35\%$ $CCother \sim 16\%$ $BKG \sim 5\%$ $OOFV \sim 15\%$	$\mu^- \sim 84\%$ $\pi^- \sim 10\%$ $\pi^+ \sim 4\%$	$\pi^+ \sim 55\%$ $p \sim 33\%$ $\mu^+ \sim 8\%$
X	X	X	$CC0\pi \sim 13\%$ $CC1\pi^+ \sim 50\%$ $CCother \sim 18\%$ $BKG \sim 3\%$ $OOFV \sim 16\%$	$\mu^- \sim 86\%$ $\pi^- \sim 7\%$ $\pi^+ \sim 5\%$	$\pi^+ \sim 76\%$ $p \sim 12\%$ $\mu^+ \sim 6\%$

# T2K Cross-Section Workshop



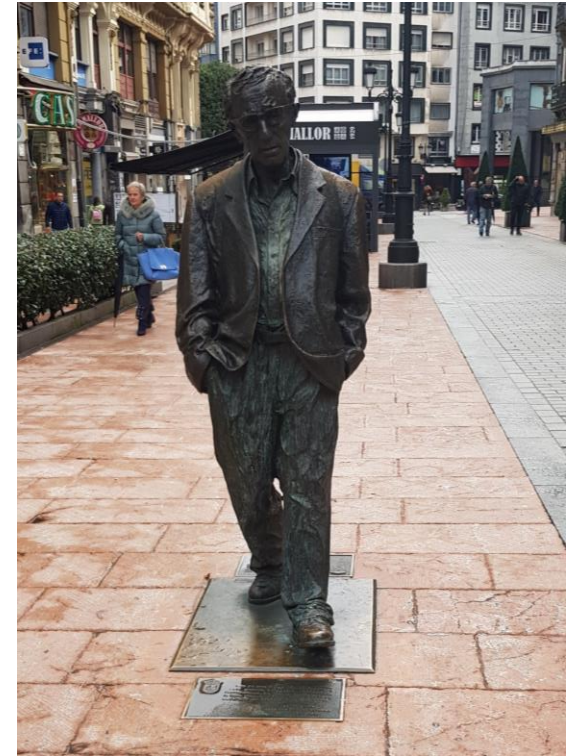
# T2K Cross-Section Workshop

## Correlation Matrix



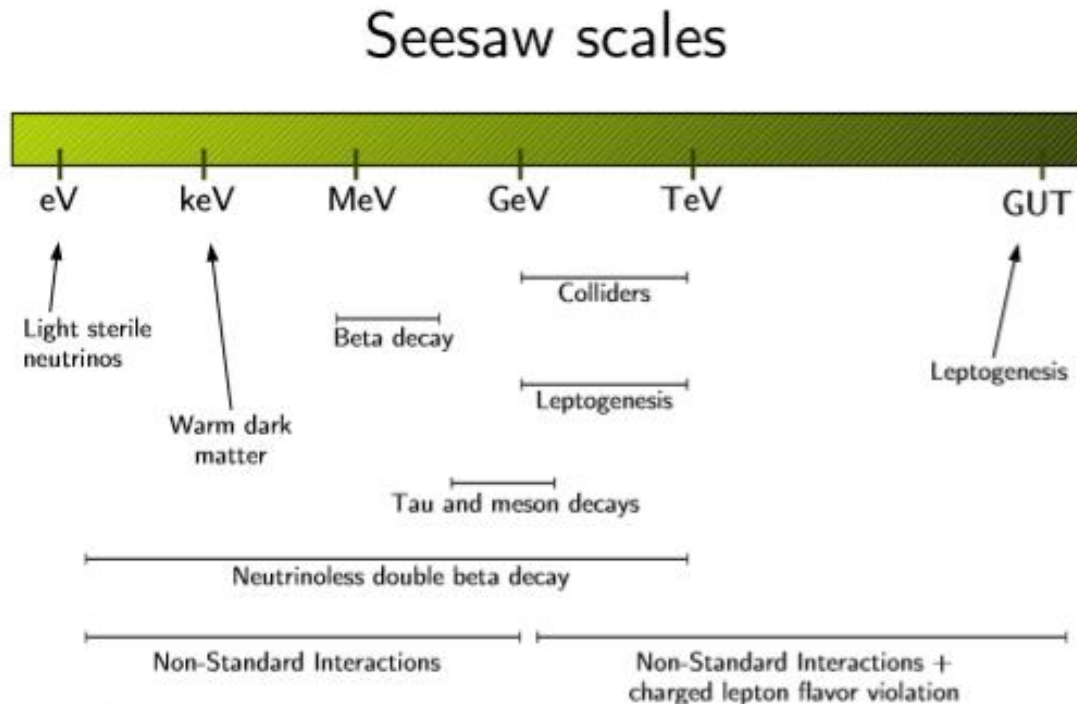
# XI CPAN DAYS

- **Theoretical Physics:**
  - A Strong Scalar Weak Gravity Conjecture and Some Implications
  - Charged Lepton Flavor Violation in low scale seesaw models
- **Astrophysics:**
  - Light detection results in protoDUNE Dual-Phase at the CERN Neutrino Platform
- **Plenary talks:**
  - The global 3-neutrino picture [before DUNE and Hyper-K]
  - New physics searches with neutrino experiments



# XI CPAN DAYS

## New physics searches with neutrino experiments



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7

## Summary

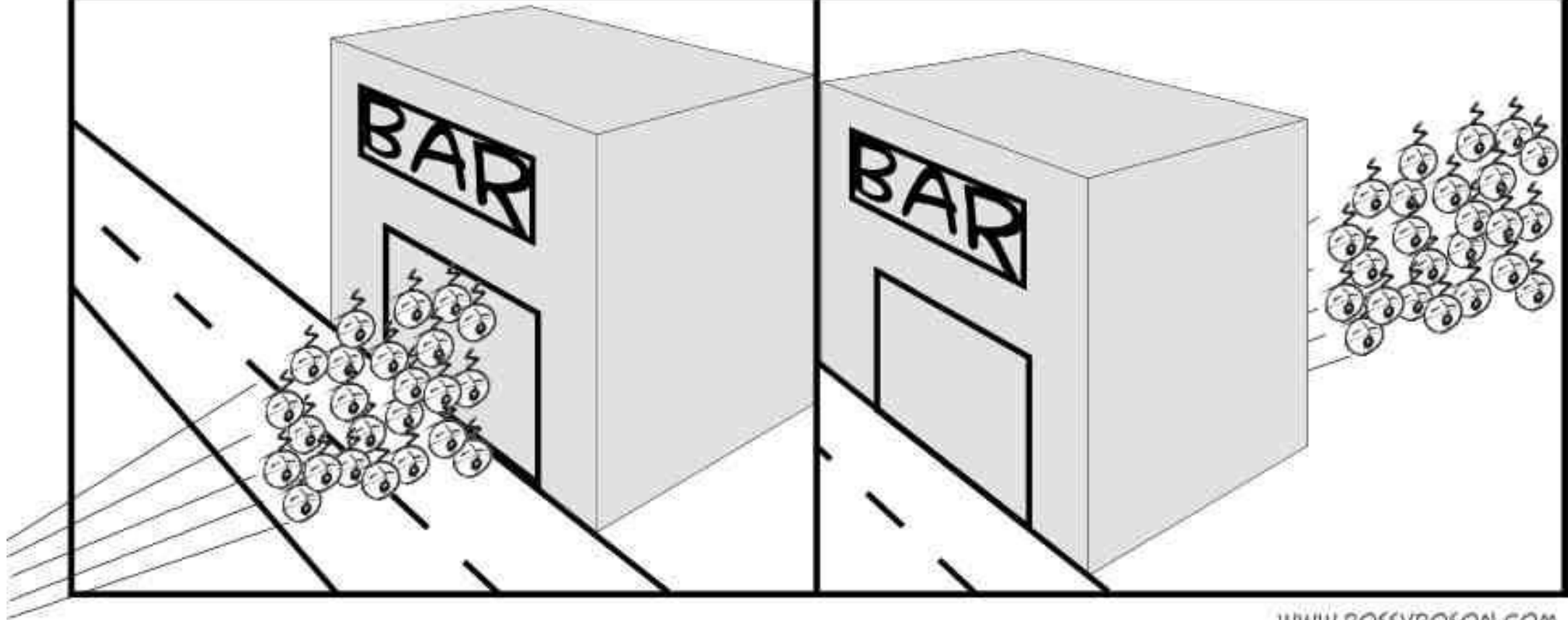
- New physics may be weakly interacting, and hiding at low energies
- Low-scale seesaws are theoretically well-motivated and lead to a very rich phenomenology
- They can be tested using a variety of experiments, including oscillations experiments and Icecube.
- Other portals may lead to additional effects observable in intensity frontier experiments such as MiniBooNE, LSND, and COHERENT.

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26

300 TRILLION NEUTRINOS WALK INTO A BAR

THEN WALK THROUGH THE BAR



**Thank you!!!**