

# Next things to do ~ neut ~

Yoshinari Hayato  
( Kamioka, ICRR, UTokyo )

## Next things to do #1 ~ Primary interactions

- 1) Interactions on deuteron ( Neut does not support D so far.. )
- 2) Quasi-elastic – like ( incl. multi-particle interactions )
  - Implement Local Fermi gas with RPA correction
    - a) *R. Gran, J. Nieves, F. Sanchez, MJ Vicente Vacas*
    - b) *M. Martini, M. Ericson*
  - TEM model
    - A. Bodek, M. E. Christy, B. Coopersmith*
- 3) Single pion production
  - ( not near term ) Nakamura – Sato model
- 4) Single K production
  - strangeness violating process
- 5) Single  $\eta$  production
  - new model ( currently using resonance decay  
using Rein-Sehgal resonance production )
- 6) Deep inelastic scattering
  - Updated Bodek-Yang correction

## Next things to do #2 ~ Secondary interactions & others

### 1) pion interactions in nucleus

Validation of the kinematics

Still using rather old “medium correction”

on the pion phase shift analyses results

Validation of the interactions in high momentum region

(  $P_{\pi} > 500 \text{ MeV}/c$  )

Model with higher resonances ( available?? )

Uncertainty of the multiplicity from high momentum pions

( simple cascade model may produce

large number of pions from high momentum pions )

*Interactions of energetic pions are getting important  
for the study of mass hierarchy , octant, and CPV  
using a few GeV atmospheric neutrinos.*

## Next things to do #2 ~ Secondary interactions & others

### 2) nucleon re-scattering

Current model is so simple.

Correct ( better ) way to “justify” the current model  
and/or “evaluate” uncertainties

Implement more “realistic” model

*nucleon emission and re-scatterings are important  
not only for the study of accelerator neutrinos  
and also in the proposed SK upgrade  
to add Gd in the water.*

*( Neutrons are captured by Gd  
and # of neutrons will be another interests in the analyses. )*

### 3) Radiative correction

Additional gamma emission other than leptons

Code is almost ready ( K. Iwamoto & K. McFarland )  
and will be included soon.