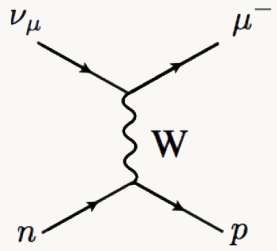
Neutrino event detection with nuclear emulsion in the NINJA experiment

A. Hiramoto (Kyoto Univ.)
on behalf of the NINJA collaboration

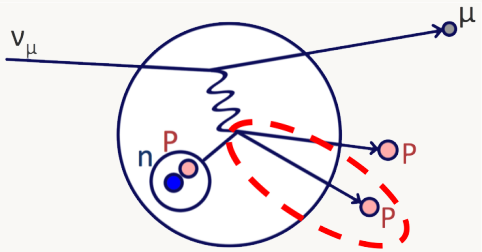
Physics Motivation

❖ Measure low momentum proton/pion and understand multi-nucleon interactions (such as 2p2h interaction) at sub-multi GeV region.

CCQE



2p2h (multi-nucleon)



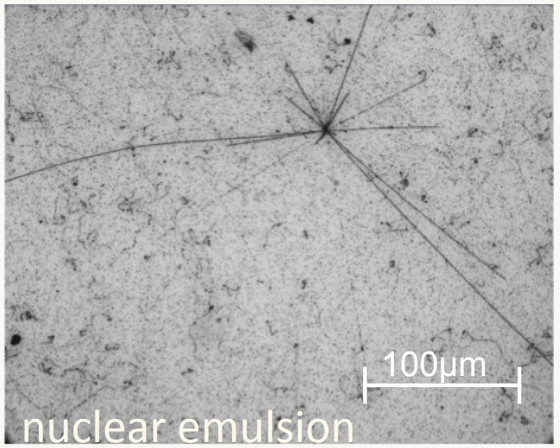
→ Could be a dominant systematic error for T2K by changing reconstructed E_ν at Super-K.

Nuclear Emulsion

- Sub-micron position resolution
- Flexibility for target materials: H_2O, Fe…

  -> Low proton threshold for H_2O target (~200MeV/c)

  -> High capability to distinguish e from ν_e / gamma

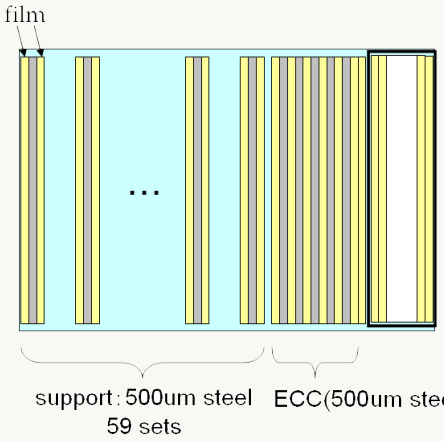


Far more precise information on short track particles!

Monday #103

Detectors

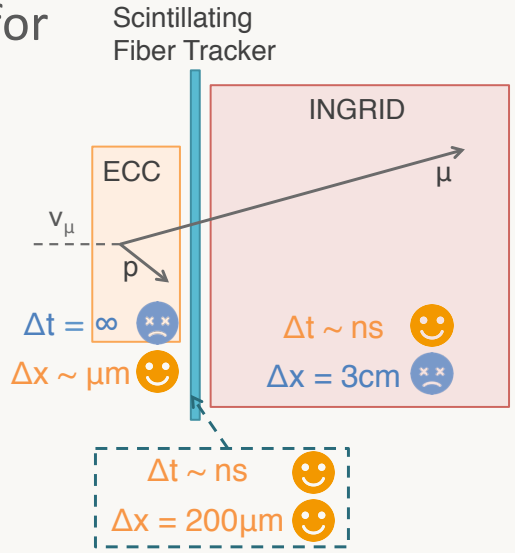
- ECC (Emulsion Cloud Chamber)



- Water target
- Sandwich structure of target / emulsion
- ~60 layers

- INGRID: T2K on-axis Near detector
- SFT: Scintillating Fiber Tracker

- Time-stamper for ECC tracks
- Good position resolution

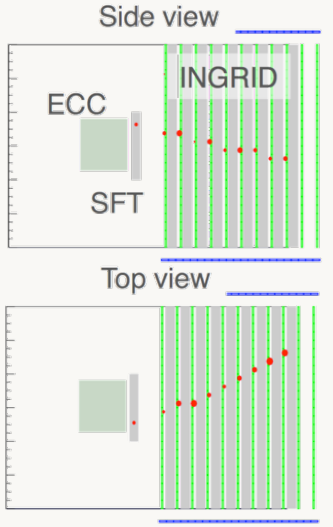


Track matching among detectors is important !

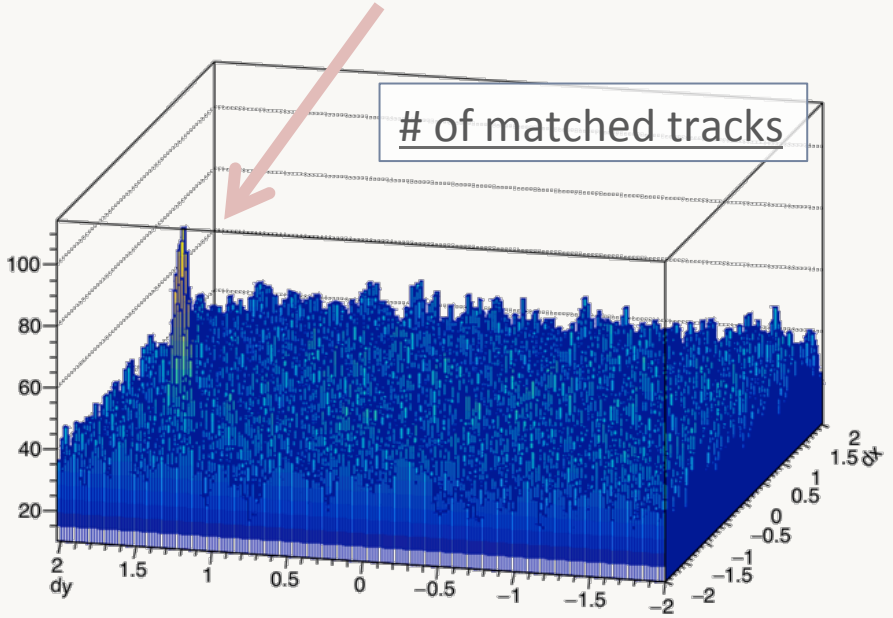
Track matching

I.) SFT & INGRID
-> by using timing info

II.) SFT & ECC
Count # of matched tracks within a defied window



-> Search the maximum point



Successfully connect tracks among detectors!

Monday #103