Updates on ECAL Calibration Studies
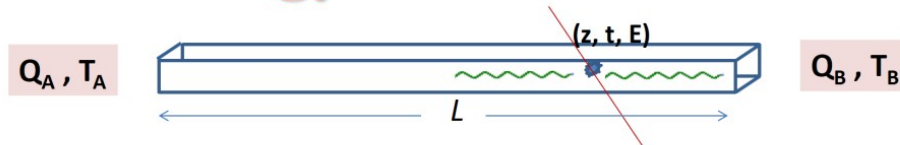
Riccardo D'Amico

26/07/2024

Calibration in KLOE

Energy reconstruction

Q_A, T_A (z, t, E) Q_B, T_B

L

$$E_i^{(A,B)}[\text{MeV}] = \frac{(Q_i^{(A,B)} - P_i^{(A,B)})[\text{ADC counts}]}{C_i[\text{ADC counts/MIP}]} K \times f_{MIP2MeV}[\text{MeV/MIP}]$$

DUNE

From last <u>meeting</u>

- C_i = peak of the MIP distribution
- Corrections to the C_i with the Bhabha scattering events ($e^+e^- \rightarrow e^+e^-$): showers of 510 MeV
- Absolute energy scale K fixed at cluster level with the $e^+e^- \rightarrow \gamma\gamma$ events

$$\Rightarrow \text{Calib. Const.} = \frac{K}{C_i}$$

KLOE ECAL calibration

Constants were evaluated from Bhabha

scattering events and cosmic muons

Entering vertically in the barrels.

- Look for possible periodic variation of the constants

P.Gauzzi   Calib.WG 7/6/2024

INFN Istituto Nazionale di Fisica Nucleare   Università degli Studi di Ferrara   DUNE
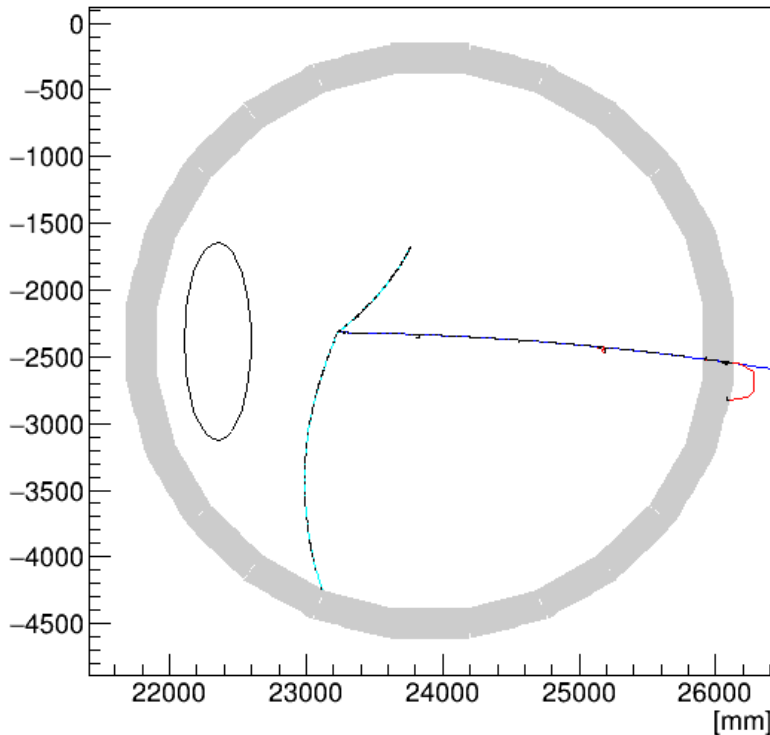
Calibration in SAND

- No Bhabha events.

- Cosmic muons underground reduction of a factor 100 (100 mu/s without selection)
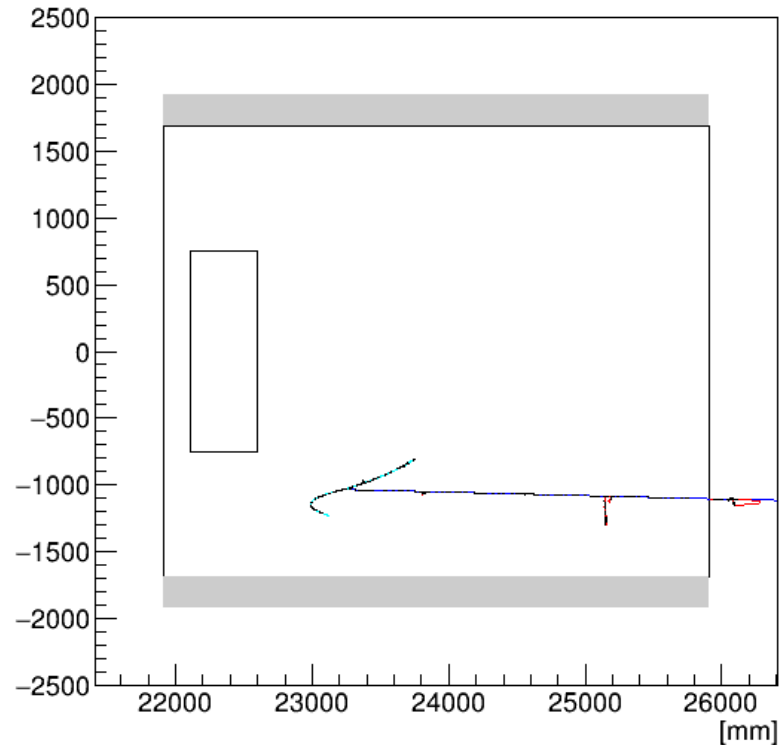
Need for a new calibration strategy.

Test for MIPs from beam interacting in rock,

magnet, Fe yoke and upstream ECAL modules.

Neutrino Event production.
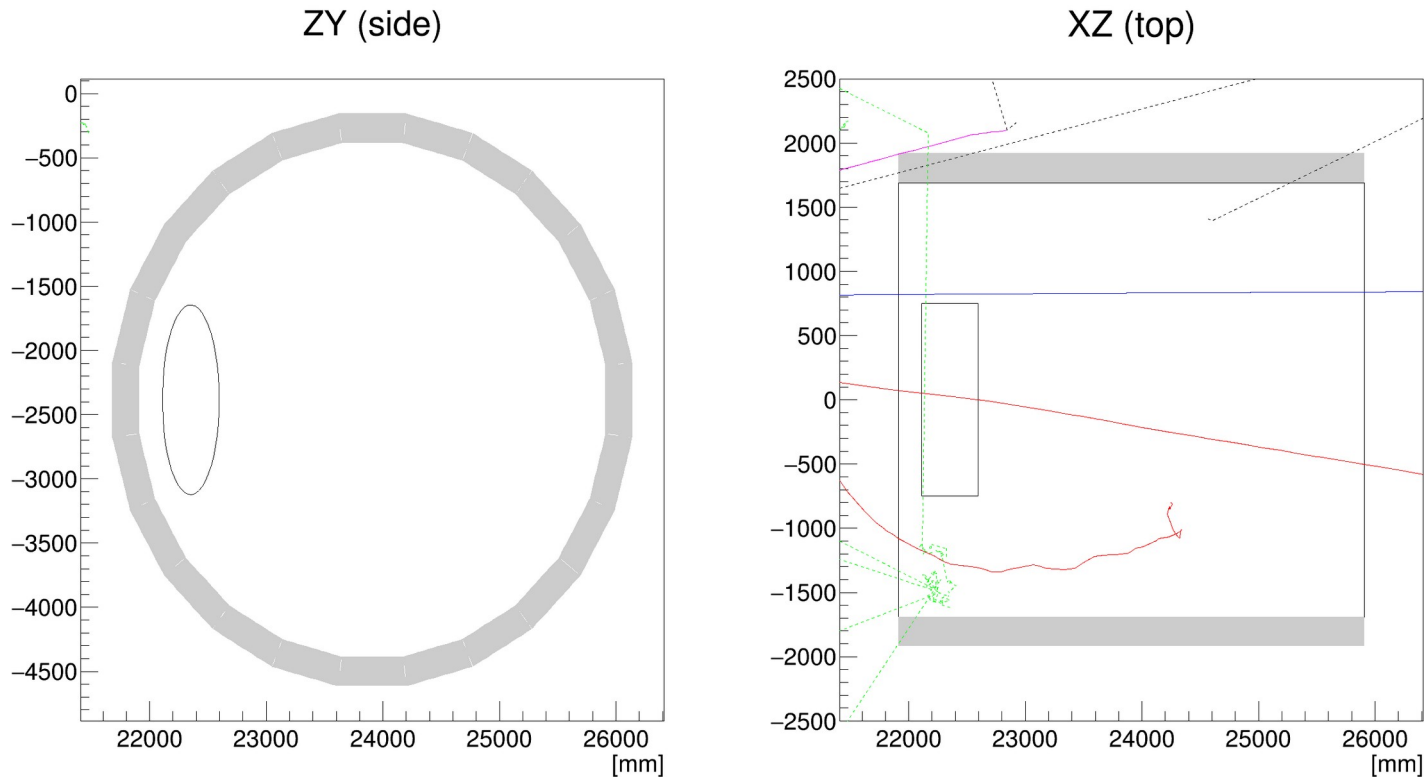

Single Neutrino events with beam energy, position and direction are generated using GENIE and the particles from the vertex are propagated using EDEP-Sim libraries.
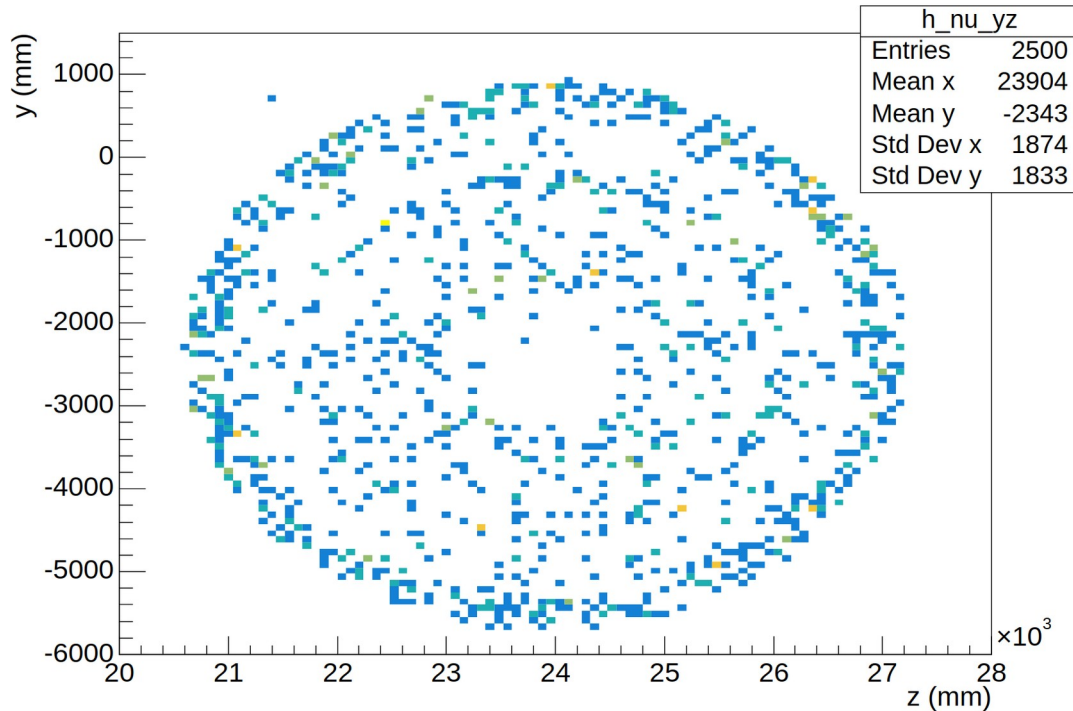
Neutrino Event production.

ZY (side)   XZ (top)

In the generation we allow muon neutrinos to interact in the rock surrounding the detector enclosure and the whole SAND volumes.
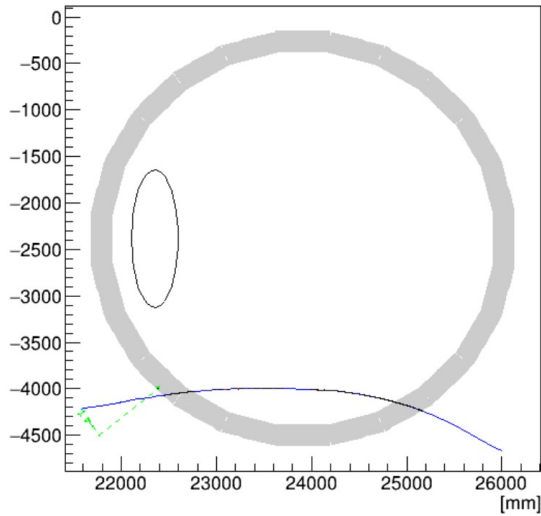
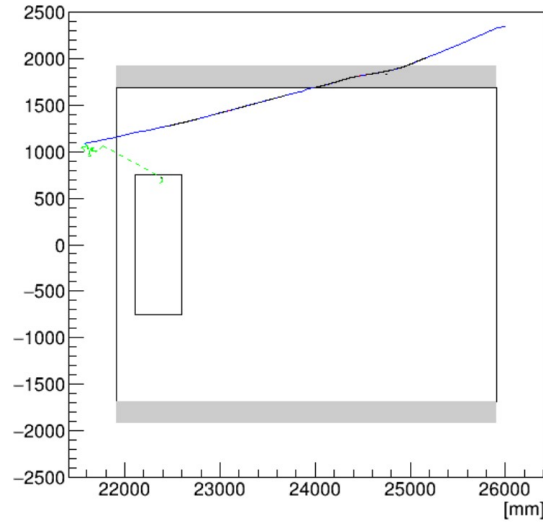# **Neutrino Event production.**

Neutrino vertices in SAND (yz view).

A preliminary production of 2.5k ν_μ has been generated.

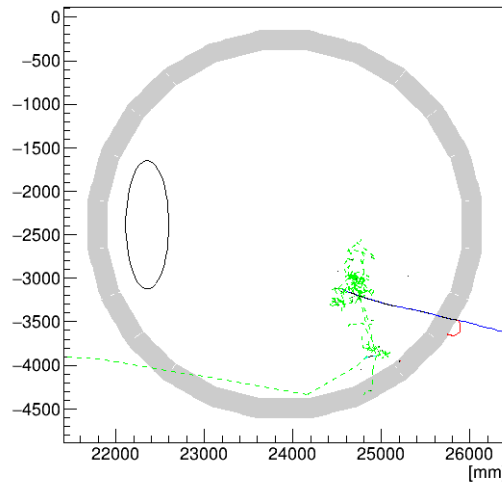# Neutrino Event production.

ZY (side)

XZ (top)

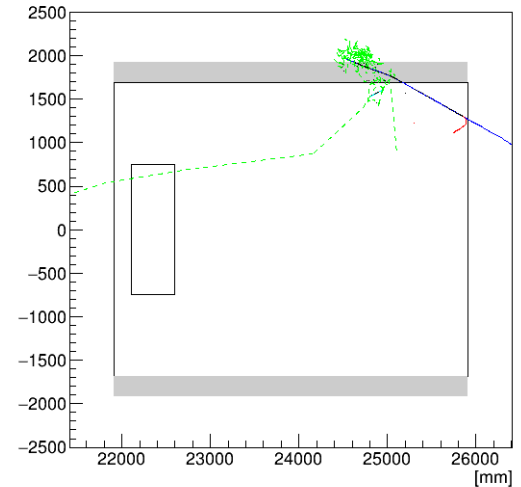Currently looking for events to be used for the calibration.

Events upstream in ECAL, with ν_μ

interaction in Magnet/Yoke.

ZY (side)

XZ (top)

26/07/2024

Next steps:

- Include digitization and clustering steps in the event production.

- Study Cluster topology w/ Monte Carlo Truth to select events

- Generate events from beam flux.