

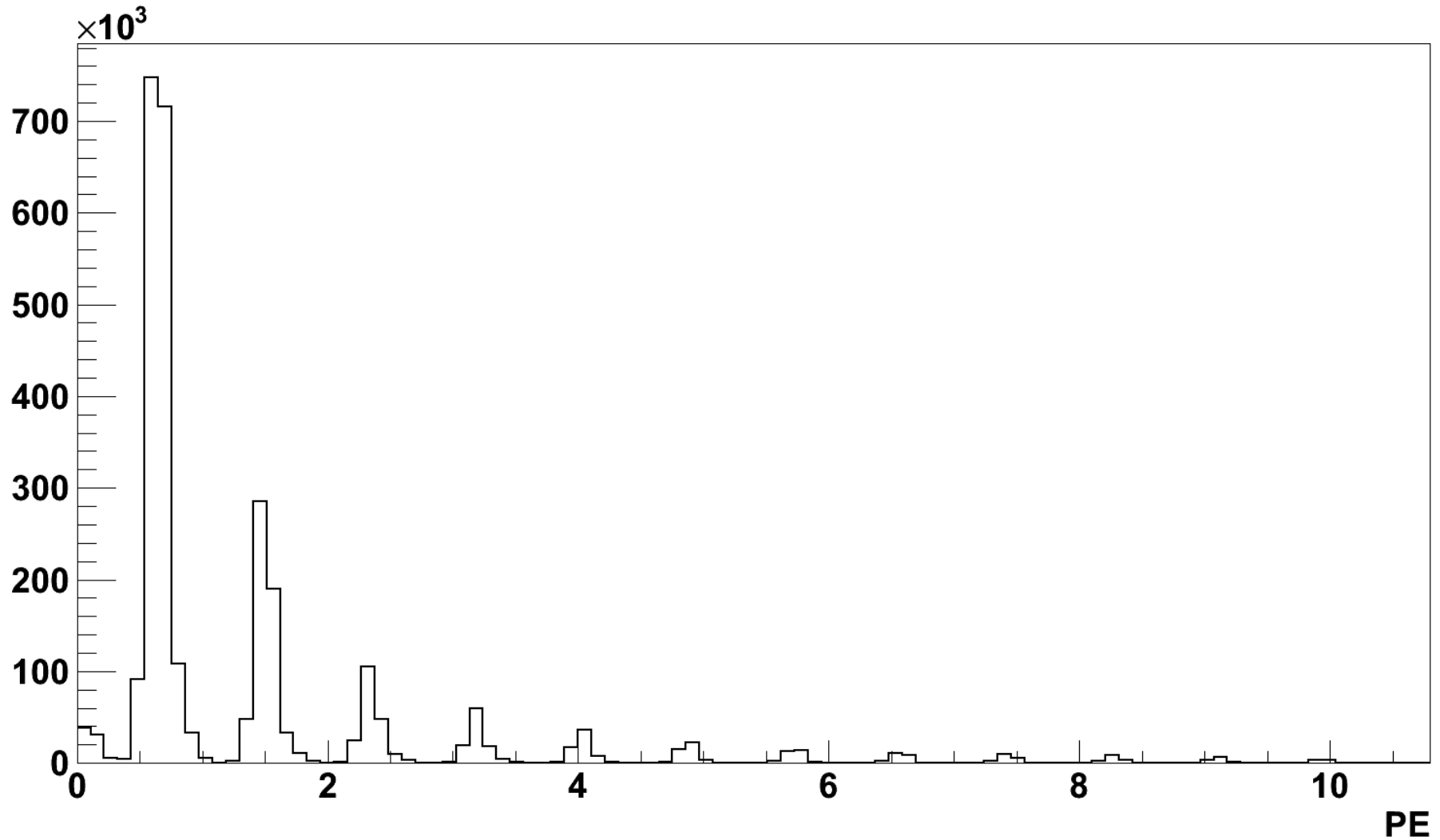
Photon Detector Reconstruction Efficiency Study

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DUNE 35ton Sim/Reco/Analysis
June 10, 2015

Small hit finder improvements

- AlgoSiPM (the new hit finder) is controlled via FHiCL parameters:
two thresholds, minimum width, pedestal
- PE is calculated using hit area
(previously used peak height,
so seems more trustworthy now)
 - Still somewhat off

Number of PEs per OpHit



PD efficiency study

- Paused attempts at improving PD simulation and reconstruction to estimate performance of what already works

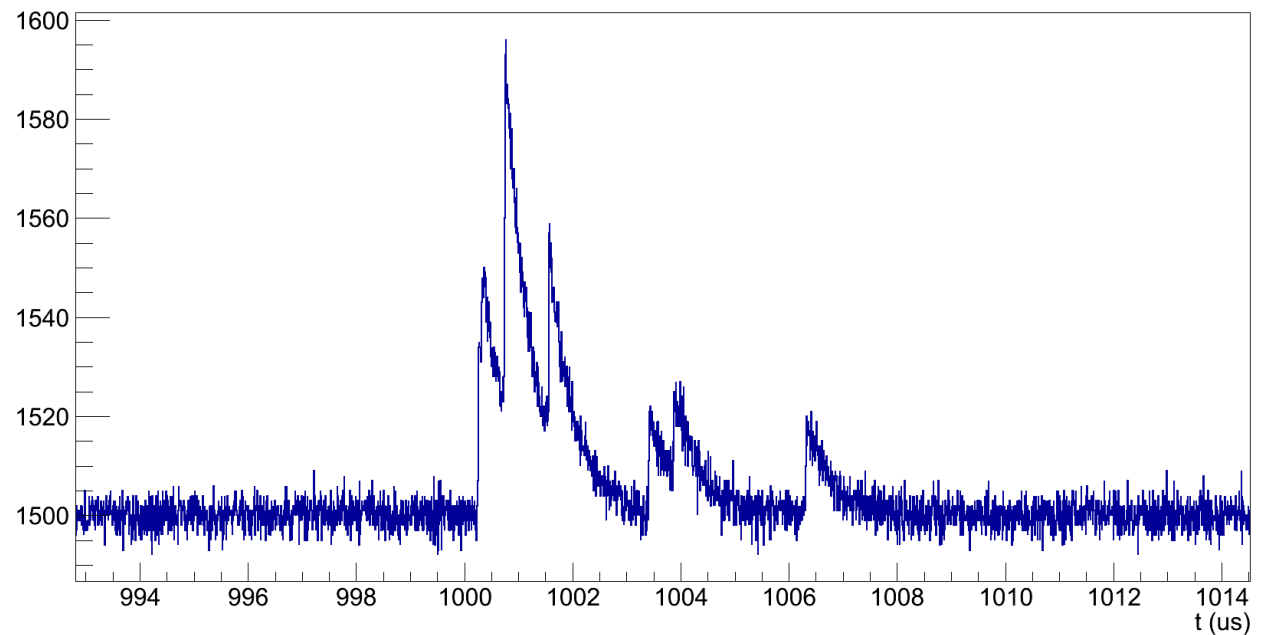
Simulation

- $\sim 10\,000$ events
- Single electrons
- Energy: 0.005, 0.010, 0.200, 0.500 GeV
- X_0 : 0 to 220 cm in 20 cm steps
- Isotropic direction
- Y_0 : 50 cm (want uniform distribution, but don't know where to find active volume dimensions)
- Z_0 : 0 cm (same here)

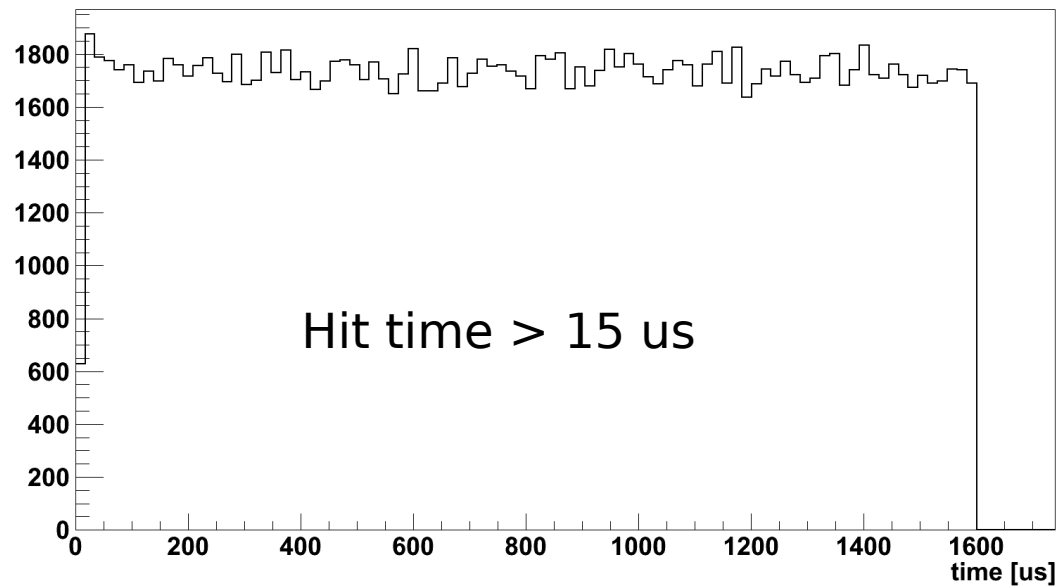
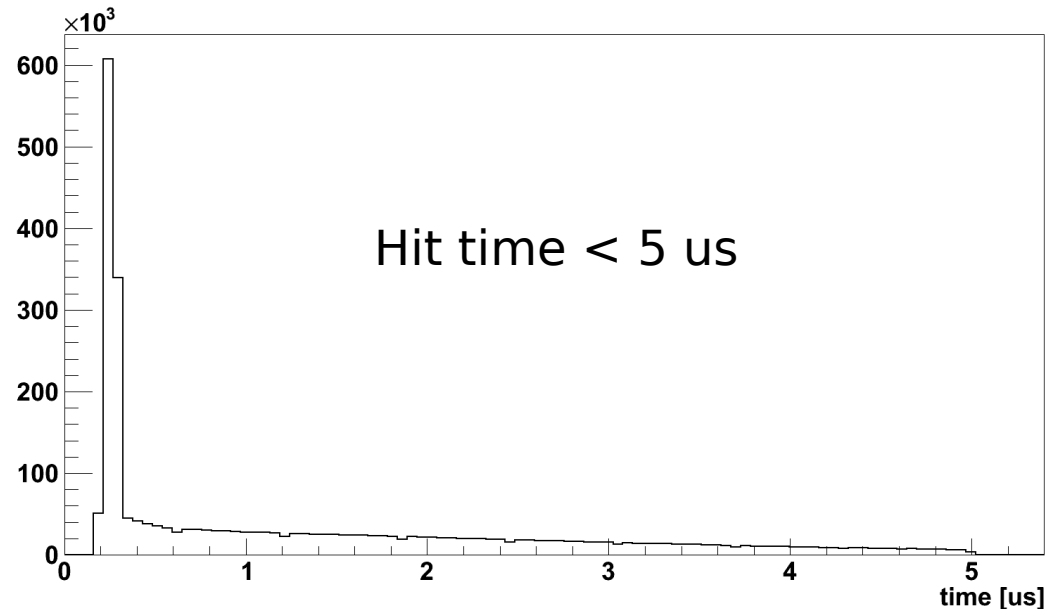
PD simulation

- Dark noise rate: 10 Hz
- Line noise RMS: 2.6 ADC counts
- Cross-talk: 16.5%
- Pedestal: 1500 ADC counts

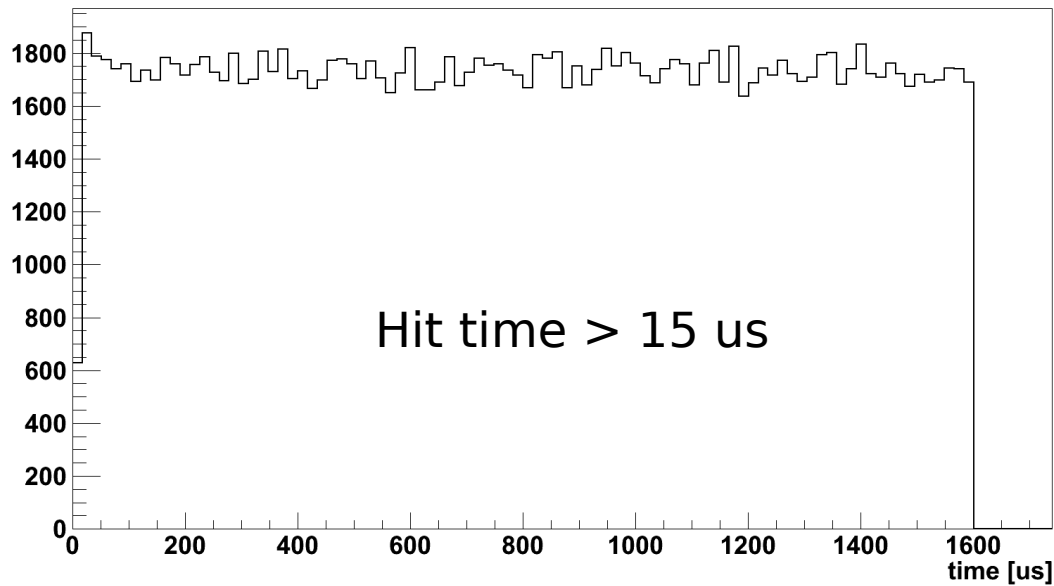
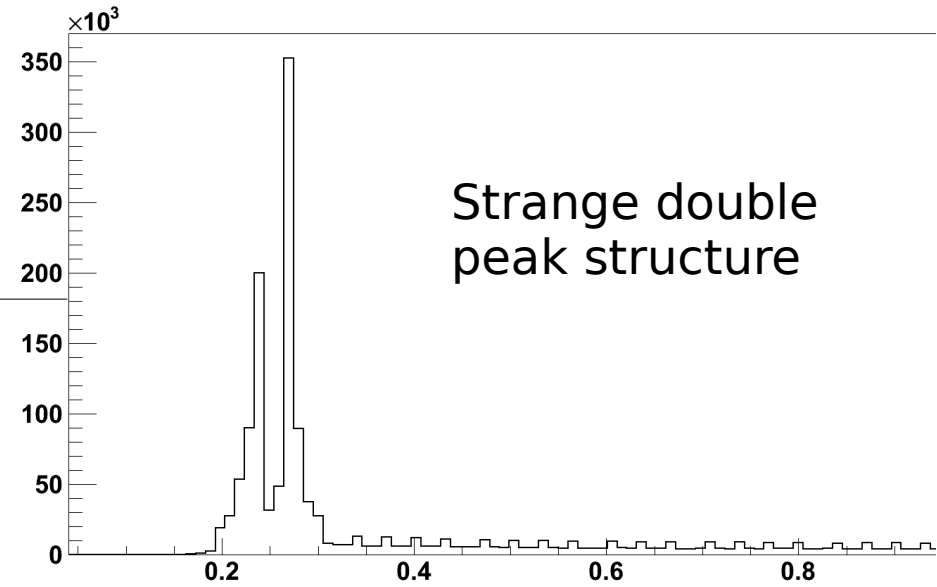
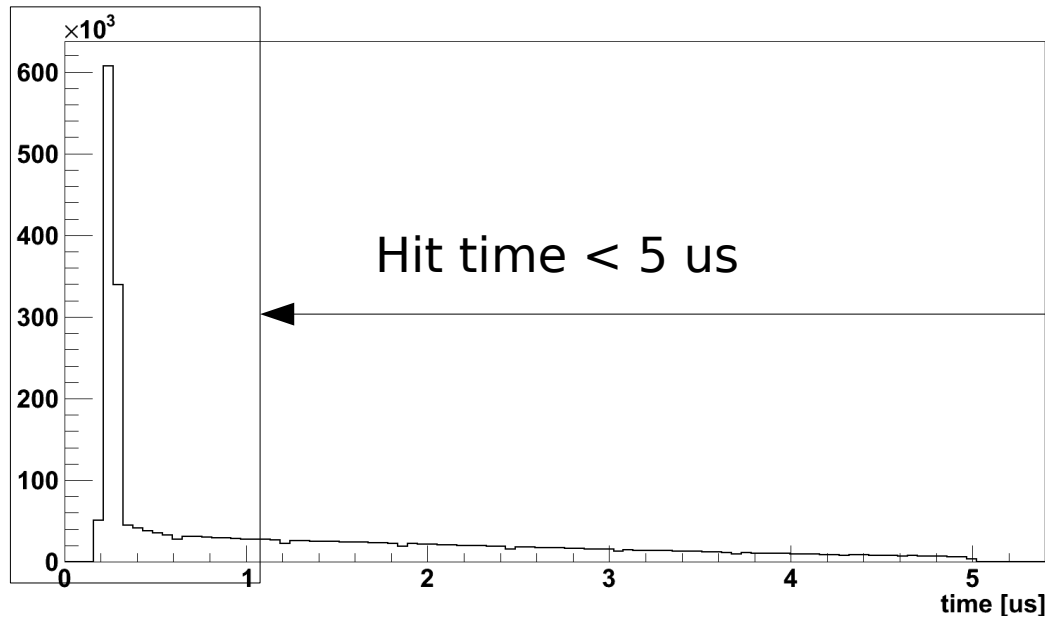
This is how a waveform looks like (1 OpChannel, 1 event)



OpHit time distribution



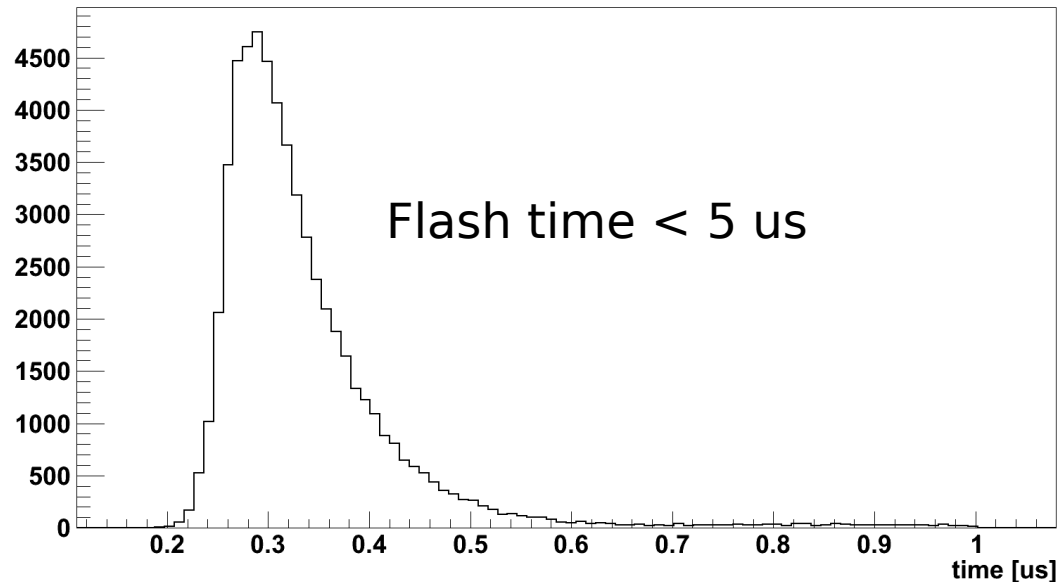
OpHit time distribution



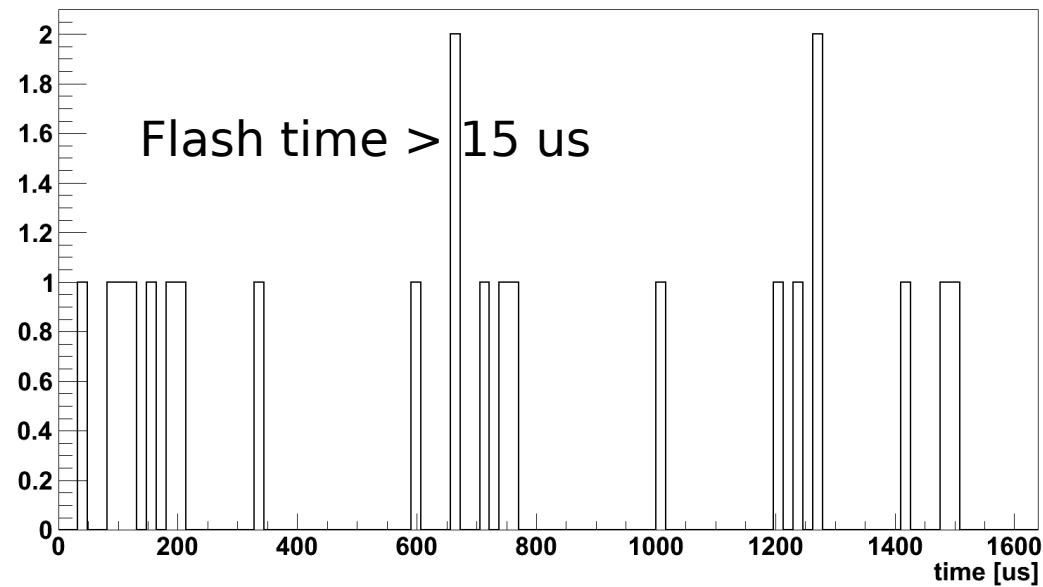
Dark noise

udy

OpFlash time distribution



Better peak



Dark noise

Next steps

- Quantifying time resolution
- Estimating efficiency for different energy values as function of distance from APAs

Backup slides

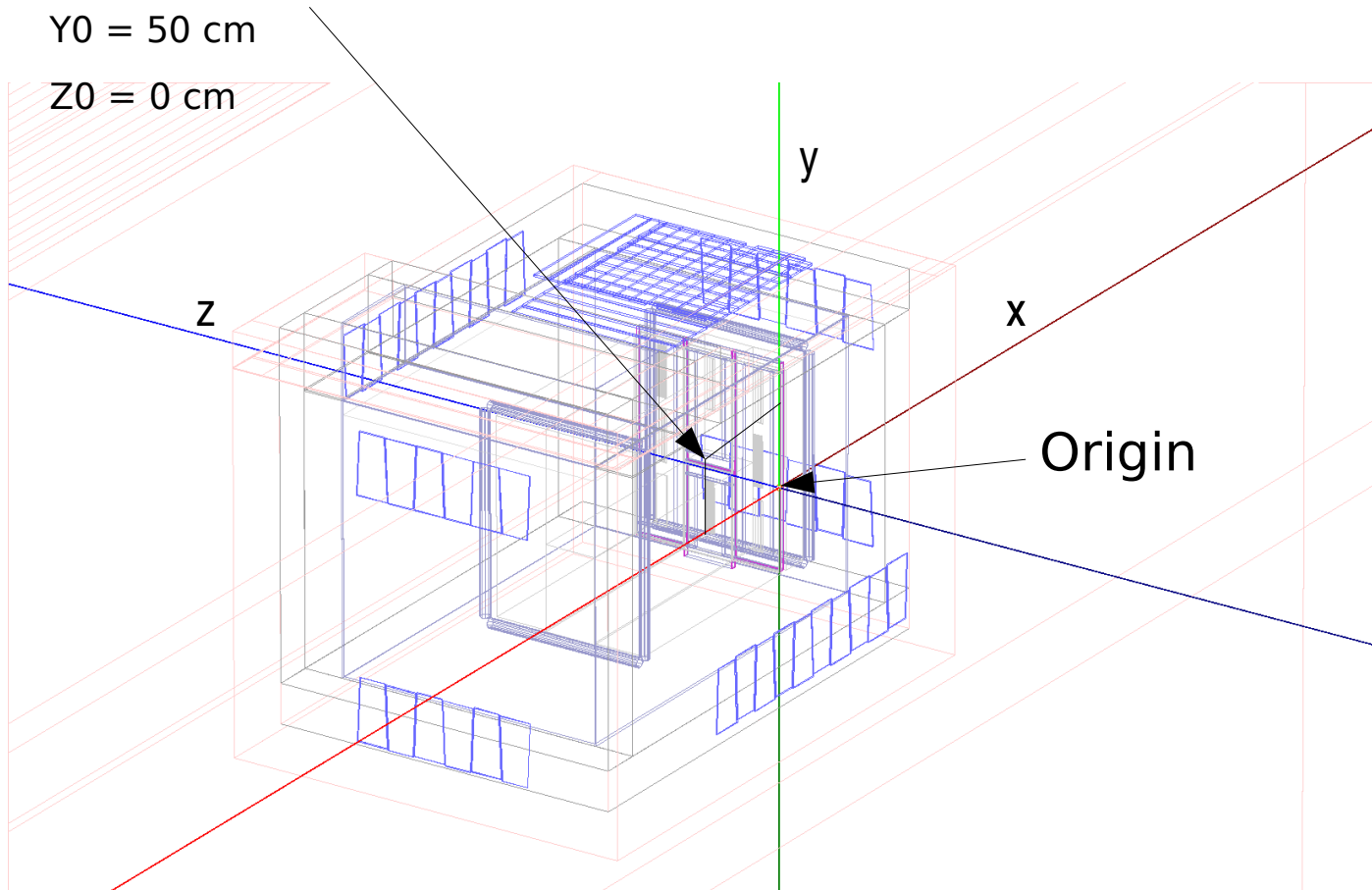
Figuring out DUNE 35t geometry

Default vertex

$X0 = 100 \text{ cm}$

$Y0 = 50 \text{ cm}$

$Z0 = 0 \text{ cm}$



Standard simulation generates particles on the edge of the active volume

Why? Is it because it is supposed to be a cosmic ray event?