

# Simple muon reconstruction in Water pool

Qing He

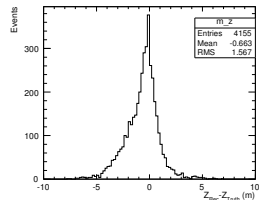
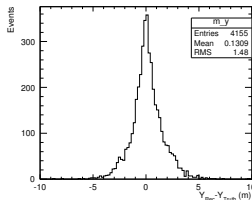
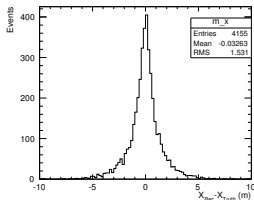
Princeton University

Dayabay Collaboration

# Simple muon reconstruction

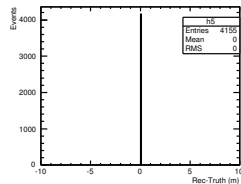
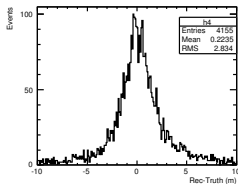
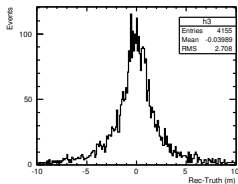
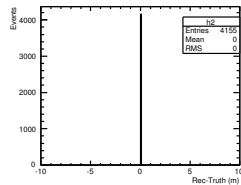
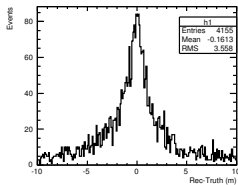
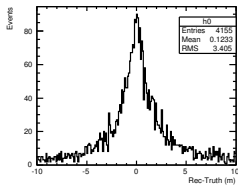
- Minuit fit algorithm for muon reconstruction is too CPU intensive. A simple muon reconstruction is preferred.
- Simple muon reconstruction idea: Find the largest hit PMT in both IWS and OWS and connect these two points. (NO reconstruction if there is only one trigger.)
- FMCP11a muon events display: see the EventDisplay.pdf file. Each page corresponds a muon event, the larger the time value, the earlier it was hit (to match the color of charge).

# Simple muon reconstruction



- Comparing the reconstructed and truth closest point (x,y,z) to the center of water pool.
- Z position is biased.

# Simple muon reconstruction

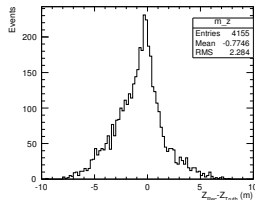
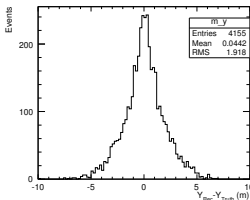
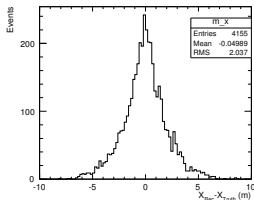


- Comparing the  $(x,y,z)$  positions at  $z=5\text{m}$  and  $z=-5\text{m}$ .

# How about Weighted center

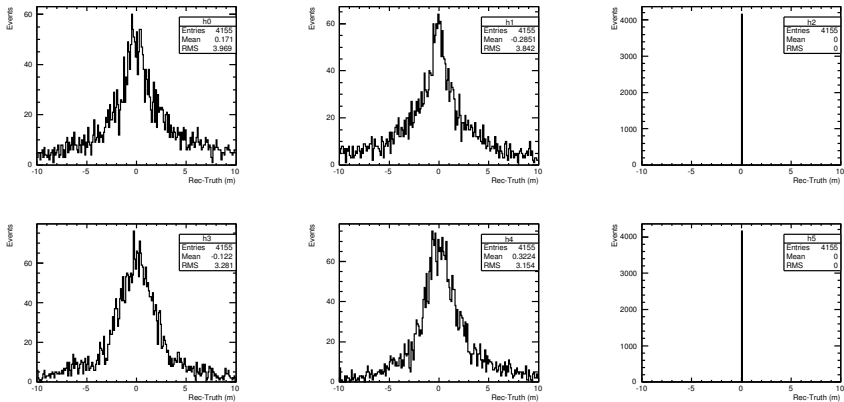
- How about using weighted center instead of just the largest hit PMT position?
- For each PMT, define a cluster of PMTs with distance less than 2 meter. Calculate the total charge and weighted position based on charge.

# Simple muon reconstruction using weighted positions



- Comparing the reconstructed and truth closest point  $(x,y,z)$  to the center of water pool.
- Resolution is worse than not using weighted positions.

# Simple muon reconstruction using weighted positions



- Comparing the  $(x,y,z)$  positions at  $z=5\text{m}$  and  $z=-5\text{m}$ .
- Resolution is worse than not using weighted positions.

- A simple muon reconstruction using charge information is presented.
- Using charge center doesn't improve the result.
- Such a method can extend to include RPC information, and the resolution would rely on the more precise RPC hit point reconstruction.
- Muon reconstruction using timing information may have trouble if time resolution is larger than 2 ns (see Pedro's talk Doc 6454).