

# shower initial part reconstruction

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# Introduction

Reconstruction of the 3D initial part of the cascades gives us information about:

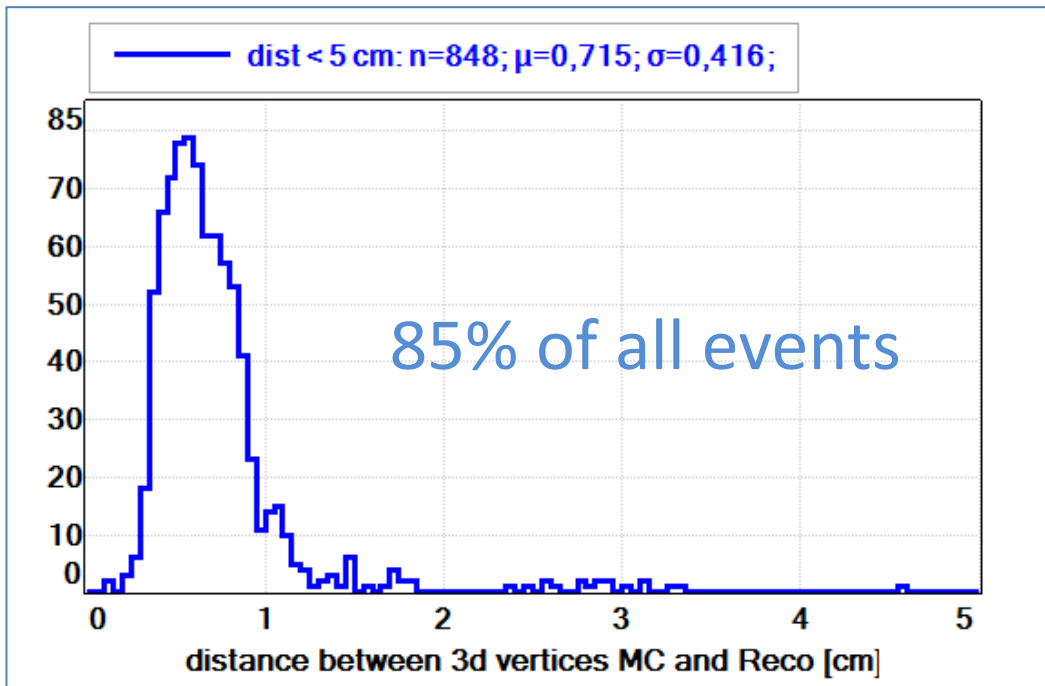
- 3D position of the shower start point.
- 3D shower direction for:
  - testing compatibility of the shower and  $\pi^0$  decay vertex candidate or locating intersection of two shower directions
  - merging fragments of clusters that belong to a single EM shower.



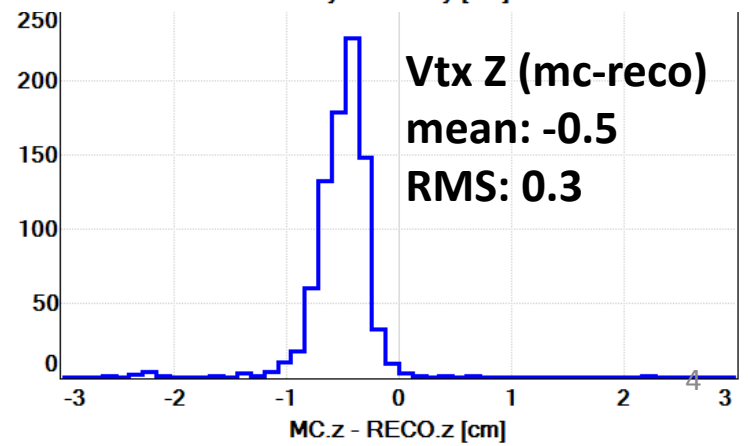
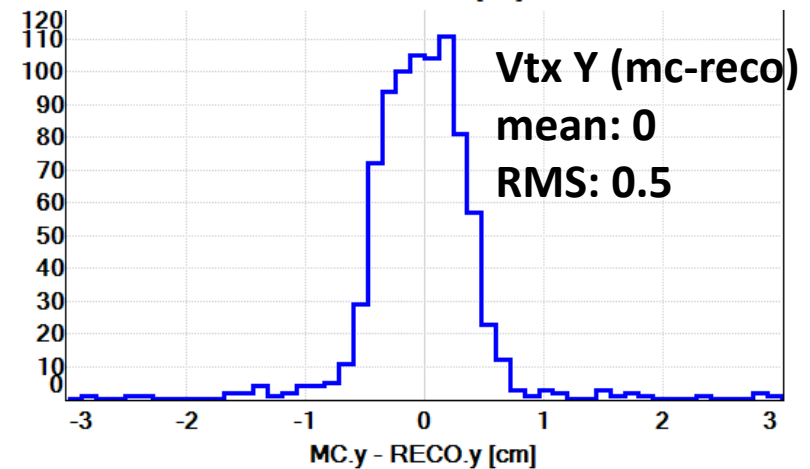
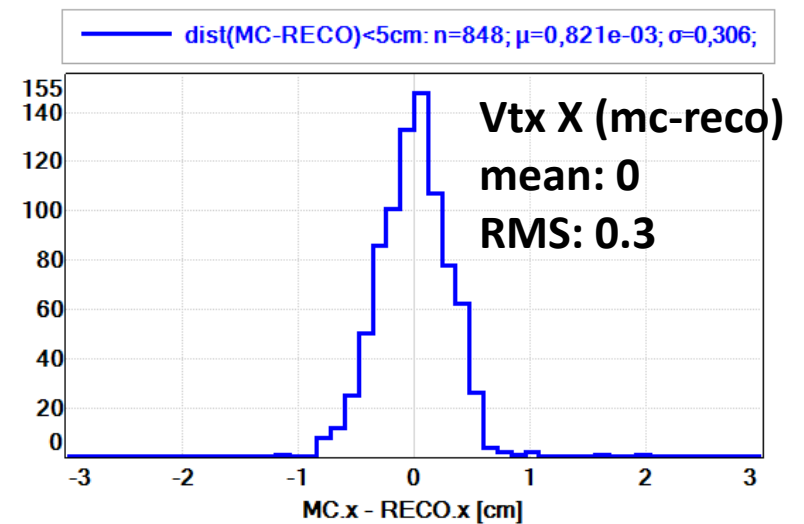
$\pi^0$   
events  
studies

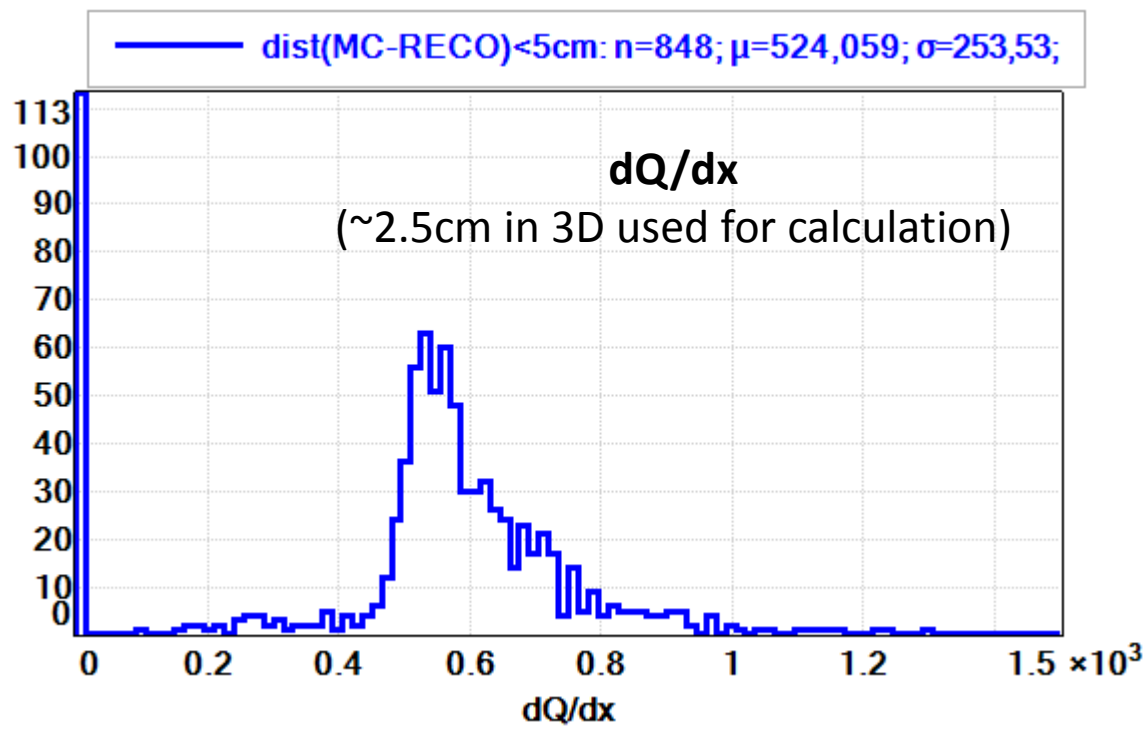
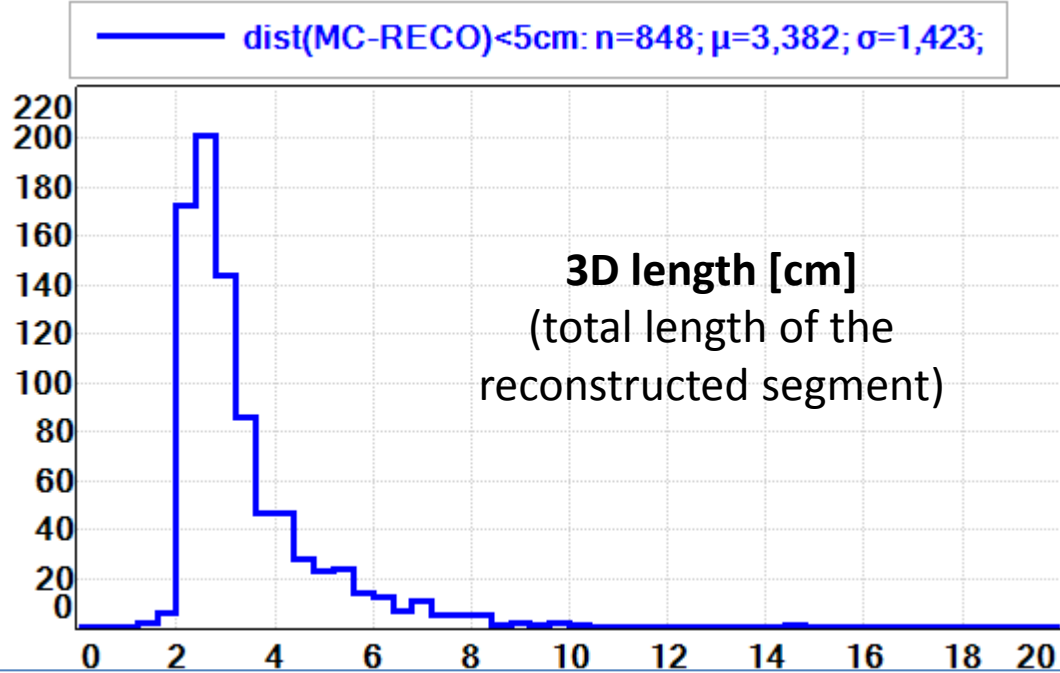
# Data and algorithm

- 1000 of simulated photons at position (100, 20, 5) cm, with uniform distribution with  $\text{SigmaThetaXZ } 45^\circ$ ,  $\text{SigmaThetaYZ } 45^\circ$ . Momentum of showers: 500 MeV/c.
- Use 3 views, assumption: we can estimate charge from any view.
- Gauss hits  $\rightarrow$  simplified clusters.
- Search for 2D starting point and 2D initial part of cascades in each view independently (algorithm described before).
- Match showers from two views. The smallest difference in drift of their 2D starting points decides which views to choose. (to do: validation in 3rd view)
- 3D segment reconstruction using PMA.
- 3D segment used to find: a) 3D start point b) direction and c) compute  $dQ/dx$  of the first part  $\rightarrow$  results on the next slides.

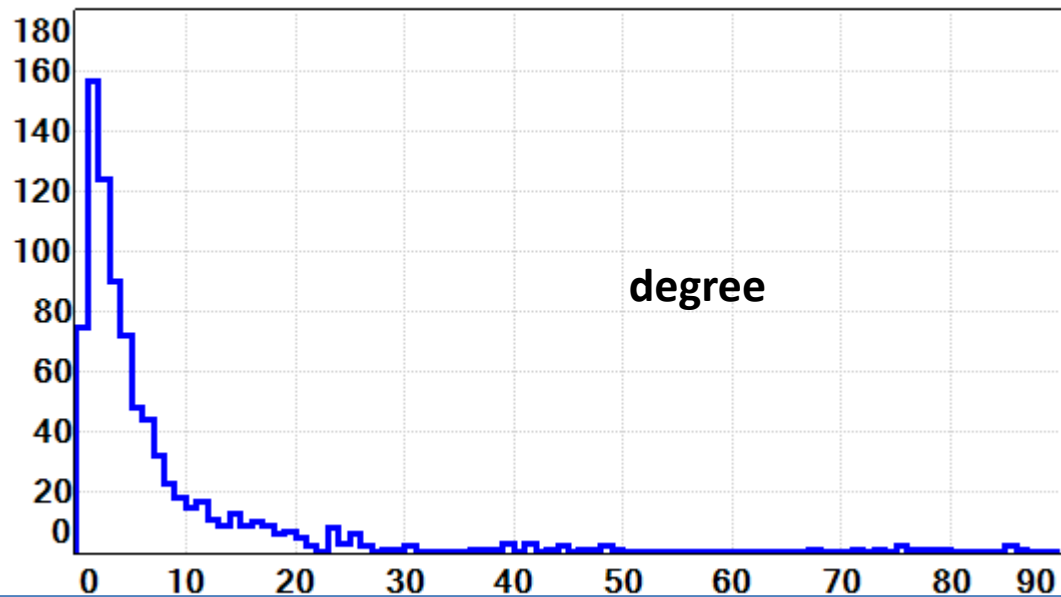


Systematic shift for distance of vtxZ - RECO. Requires checks.

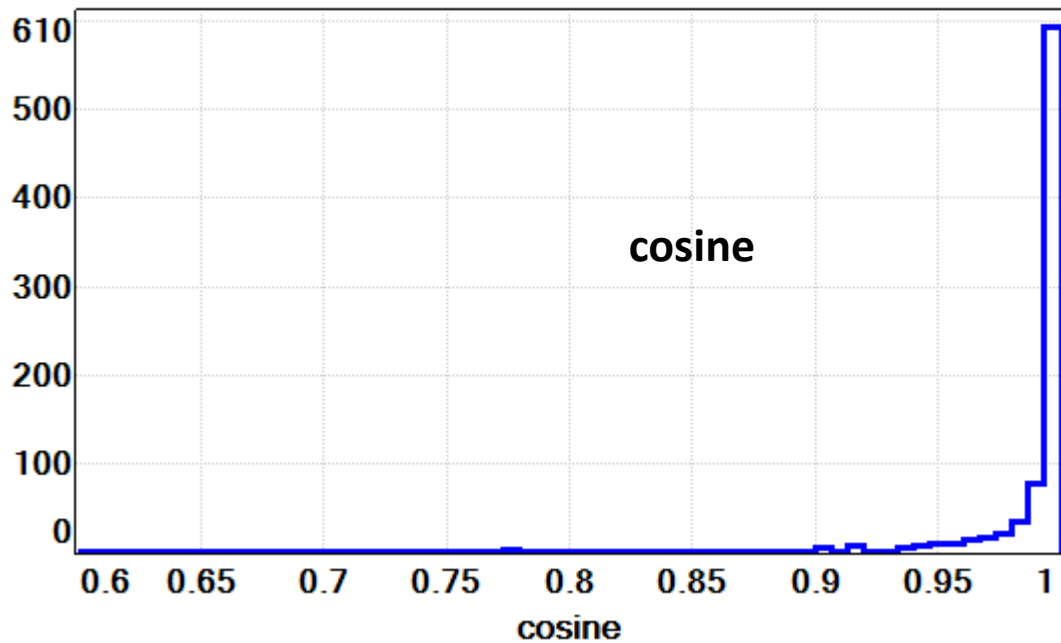




- 2D initial parts within 5 cm w.r.t. starting point of the cascades in both views and:
  - a) > 2 hits
  - b) < 10 hits
- 3D reconstructed length of the initial part: 2-10 cm, in average: 3.4 cm; depends on the cascade inclinations.
- dQ/dx was calculated only based on the charge from Collection, to do: add use of Induction planes for dQ/dx.

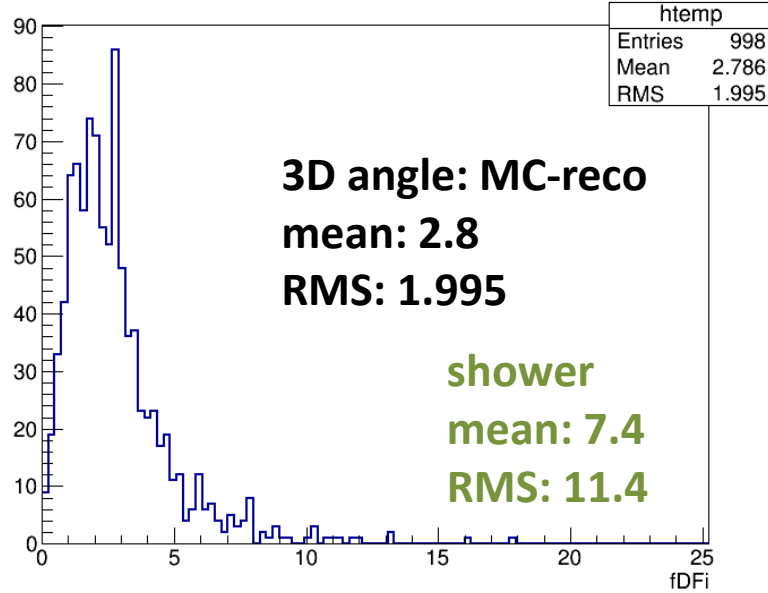


- 3D angle between MC and RECO directions.
- Possible improvement: add linearity condition to select hits used in the 3D segment reconstruction.

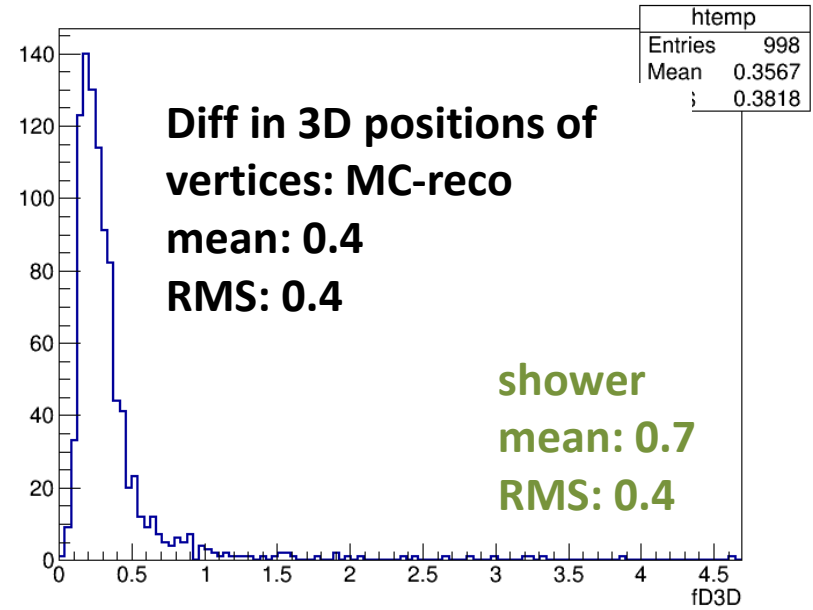


# results of low momentum muons, for comparison

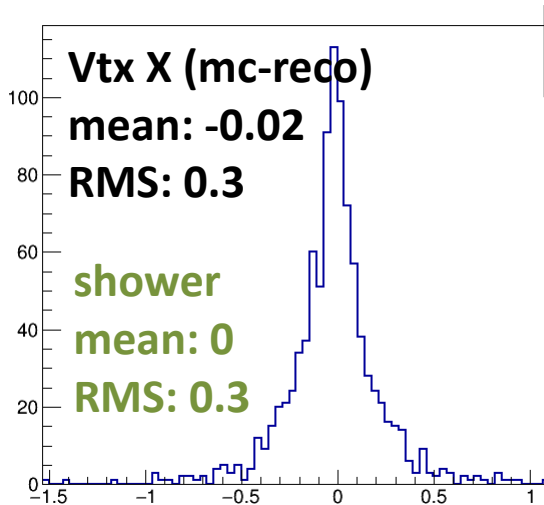
fDFi



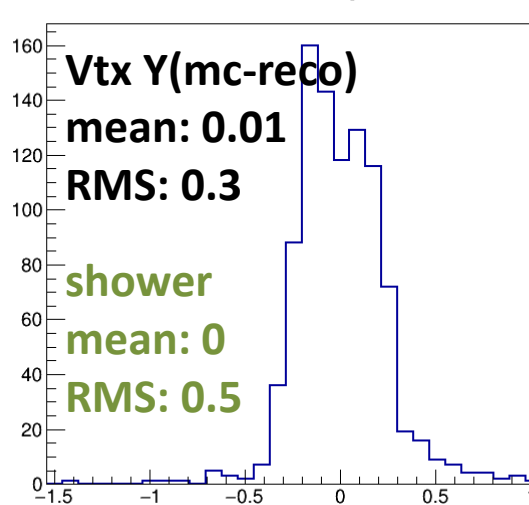
fD3D



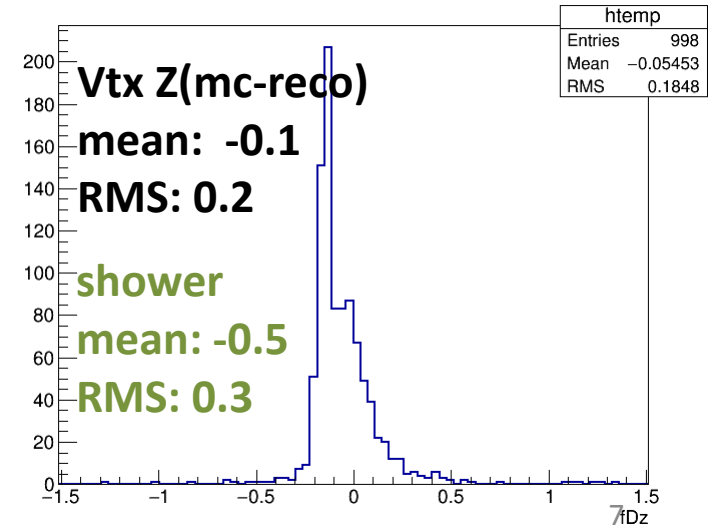
fDx



fDy



fDz



# Next steps

- Reconstruction of 2-cascade events:
  - angle between two showers from  $\pi^0$
  - use 3D direction to collect cascade parts