Beam monitoring with E-CAL inside KLOE only?

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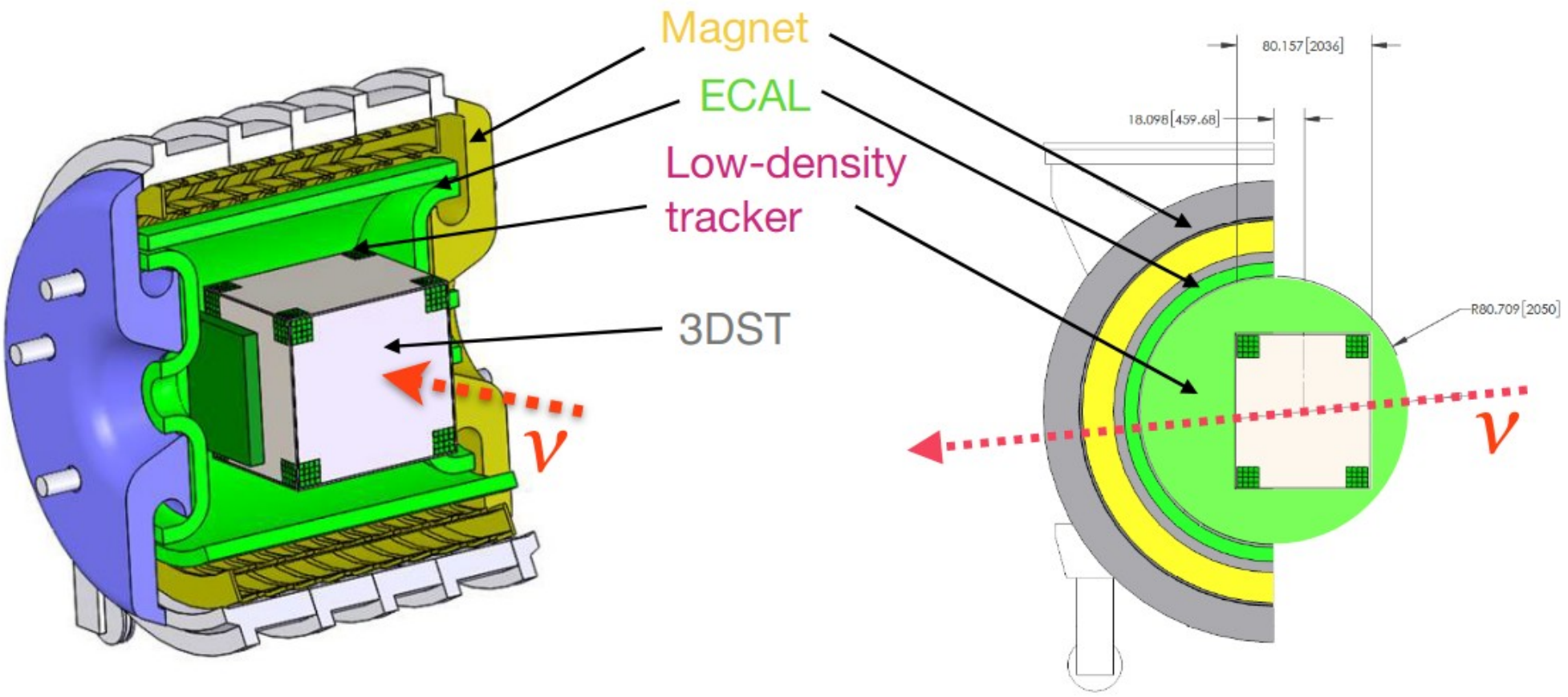
Introduction

- I was told that stage 1 in LBNC's mind might be only KLOE+ECAL.
- Question: Can we do beam monitoring with ECAL-only?

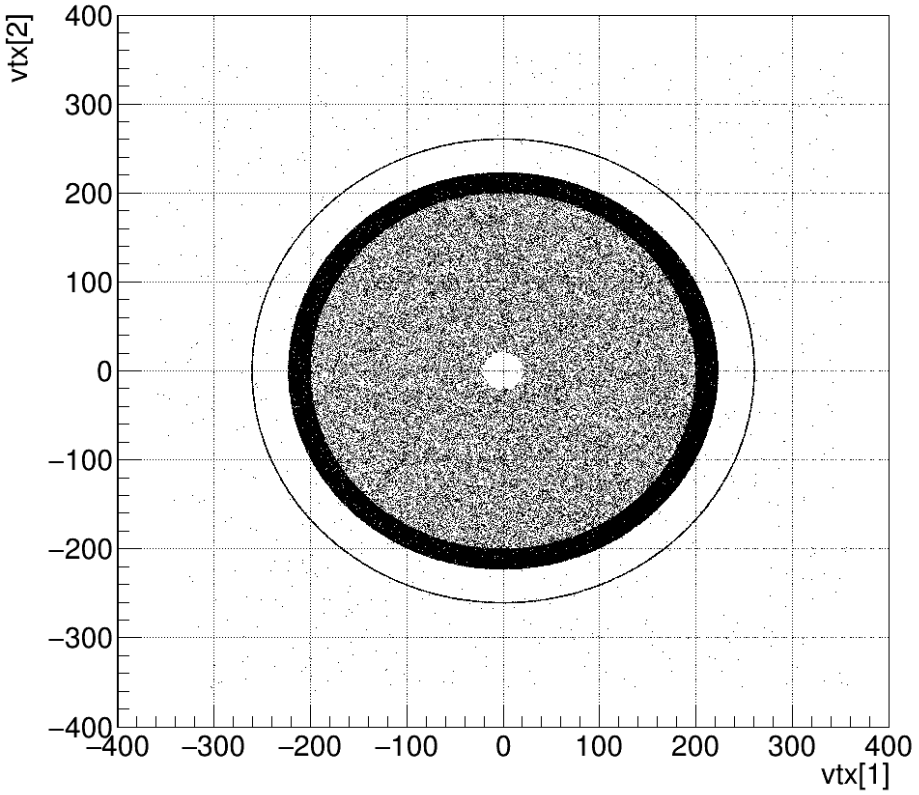
  - From a quick look, I would say pretty likely, no.

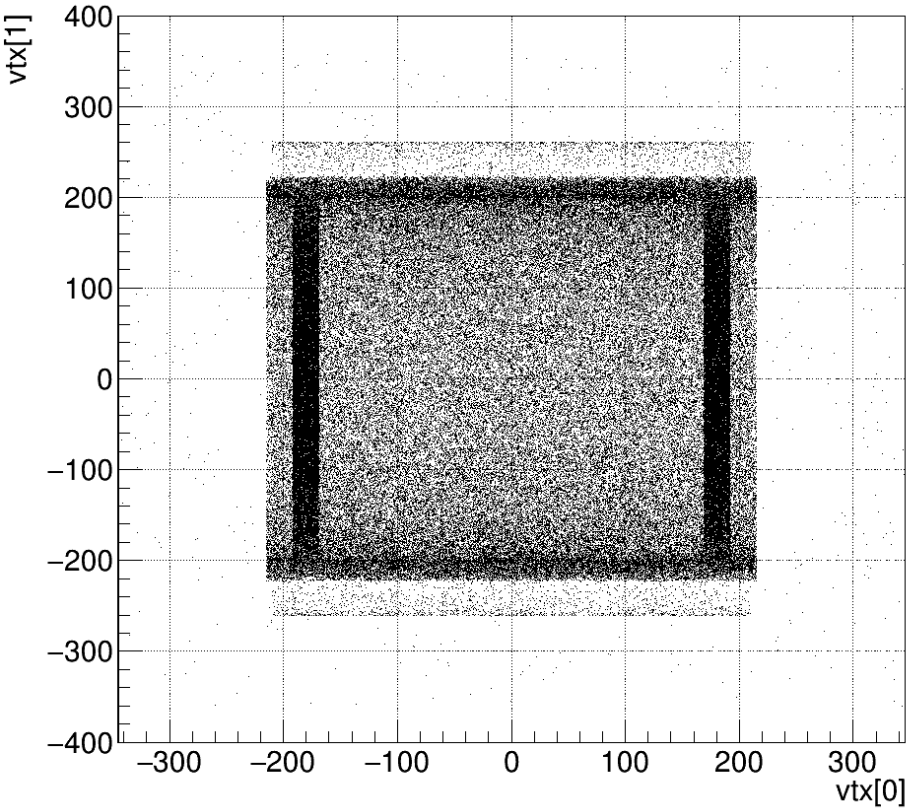
Full SAND reference design



Dedicated sample

- Interactions only in the ECAL in KLOE

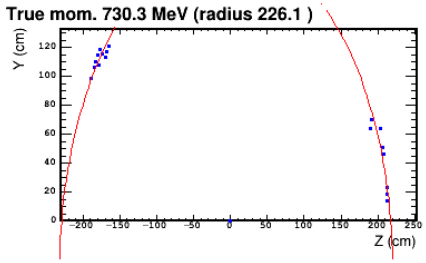


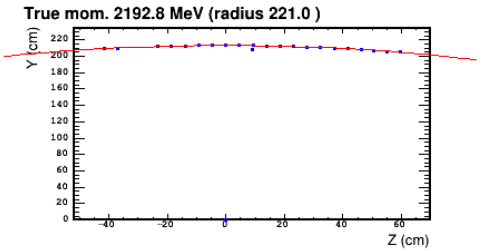


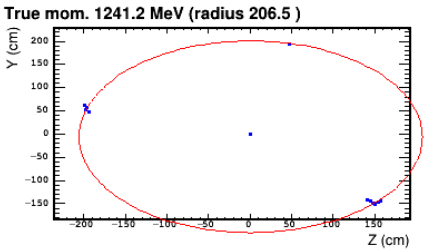
Processing

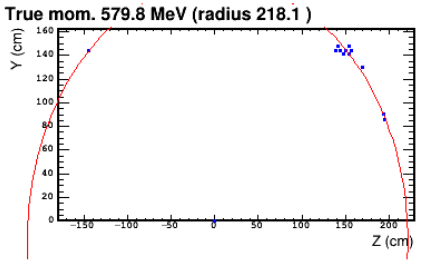
- On the YZ plane, assume 4.4 cm^2 square space cube (ECAL bar cross section size) and corresponding spatial resolution
- Applied 0.6 T B-field
- Looking at muon hits only
- Fit circle on the YZ plane
- Not considering any out-fiducial background (no muon tag, very optimistic)

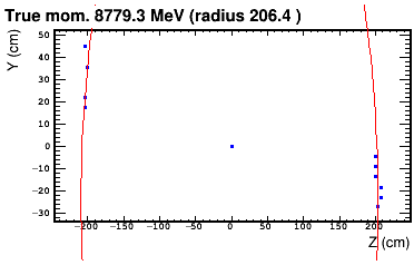
Fitting the curves with those discrete hits

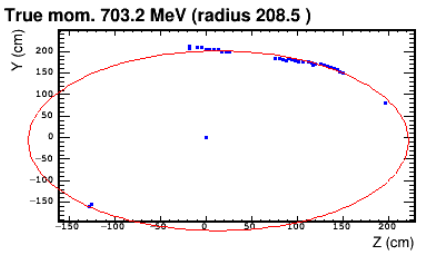


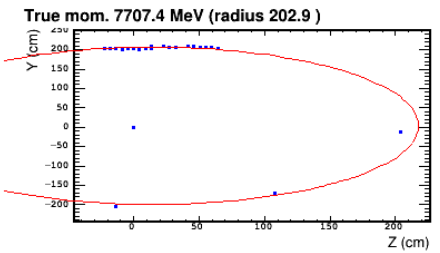


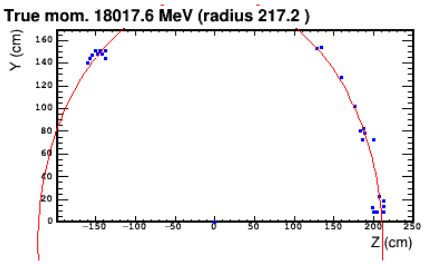


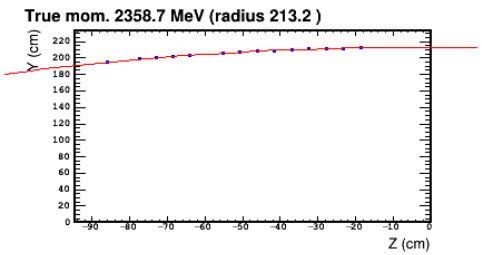


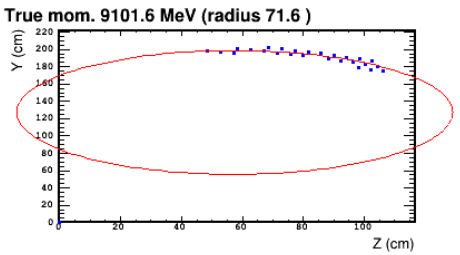


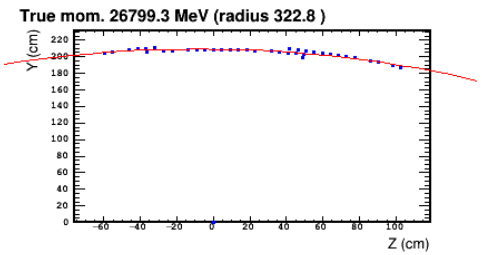


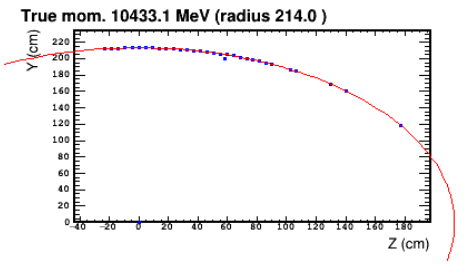


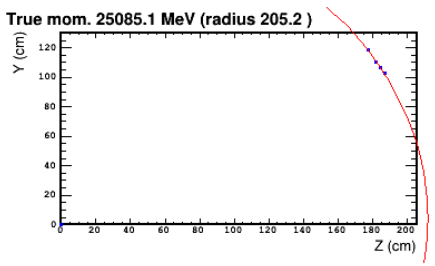


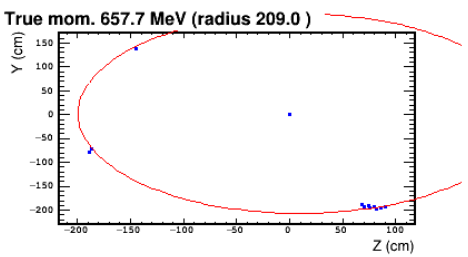


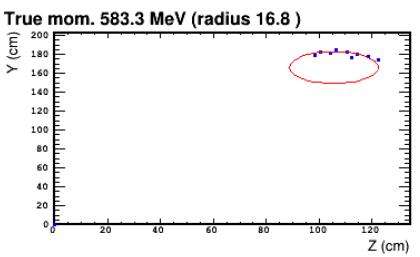


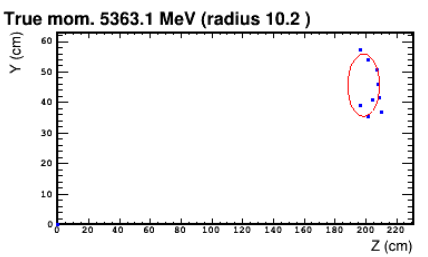




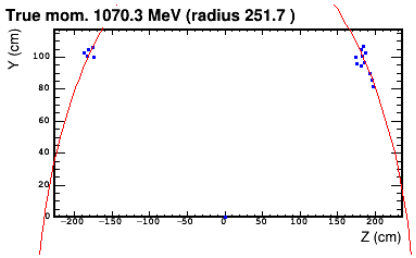


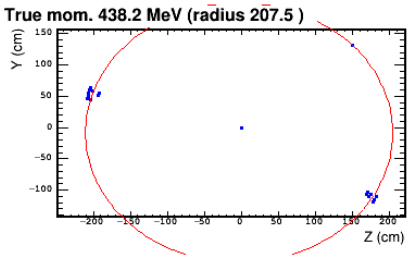


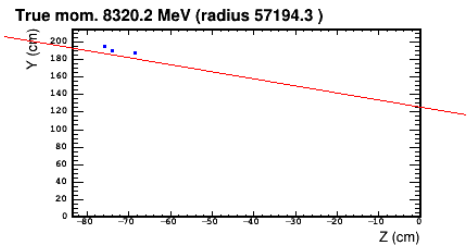


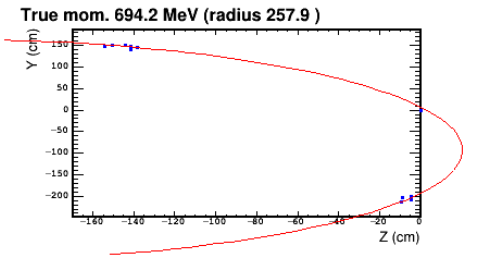


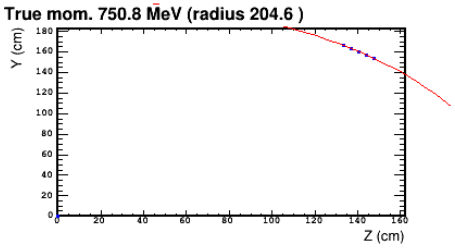
Fitting the curves with those discrete hits

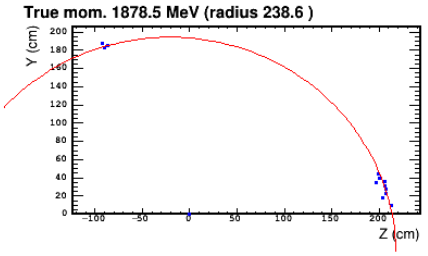


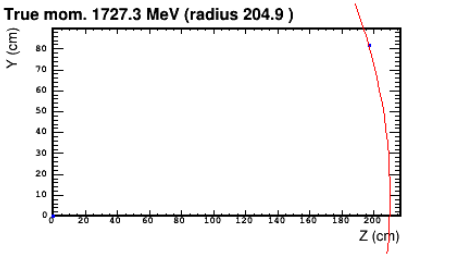


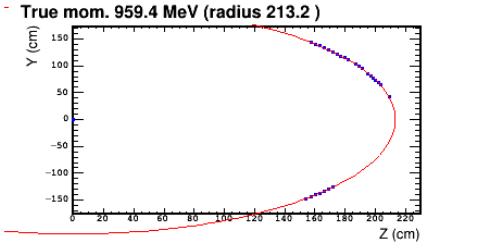


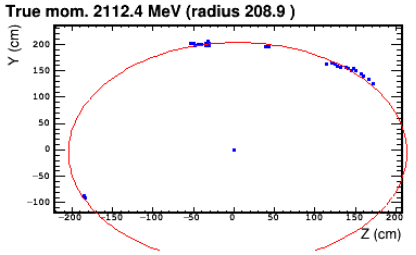


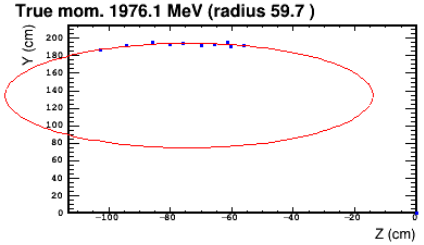


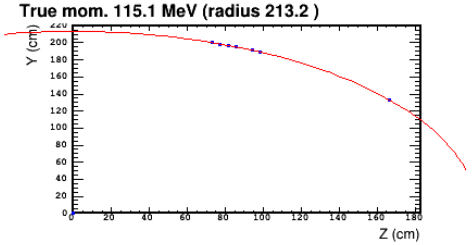


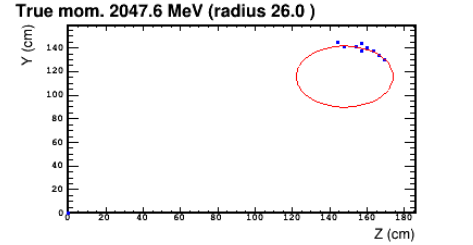


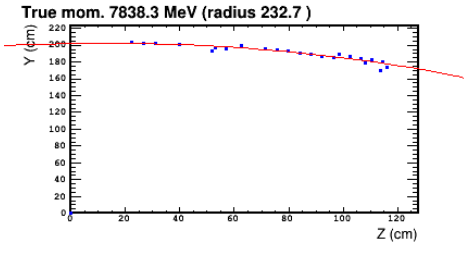


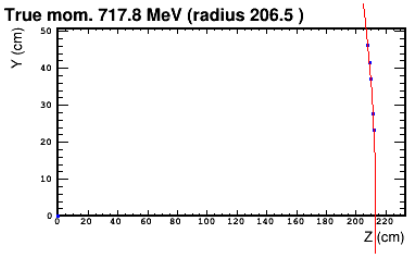


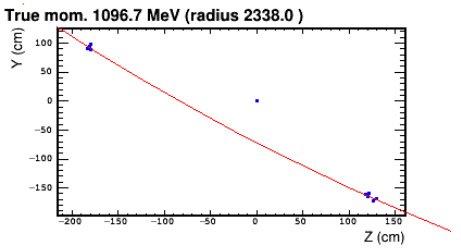


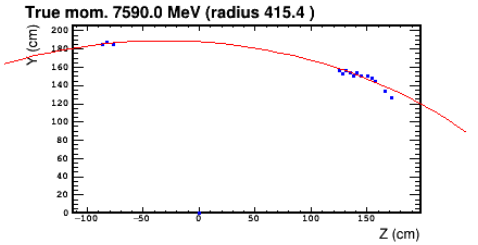






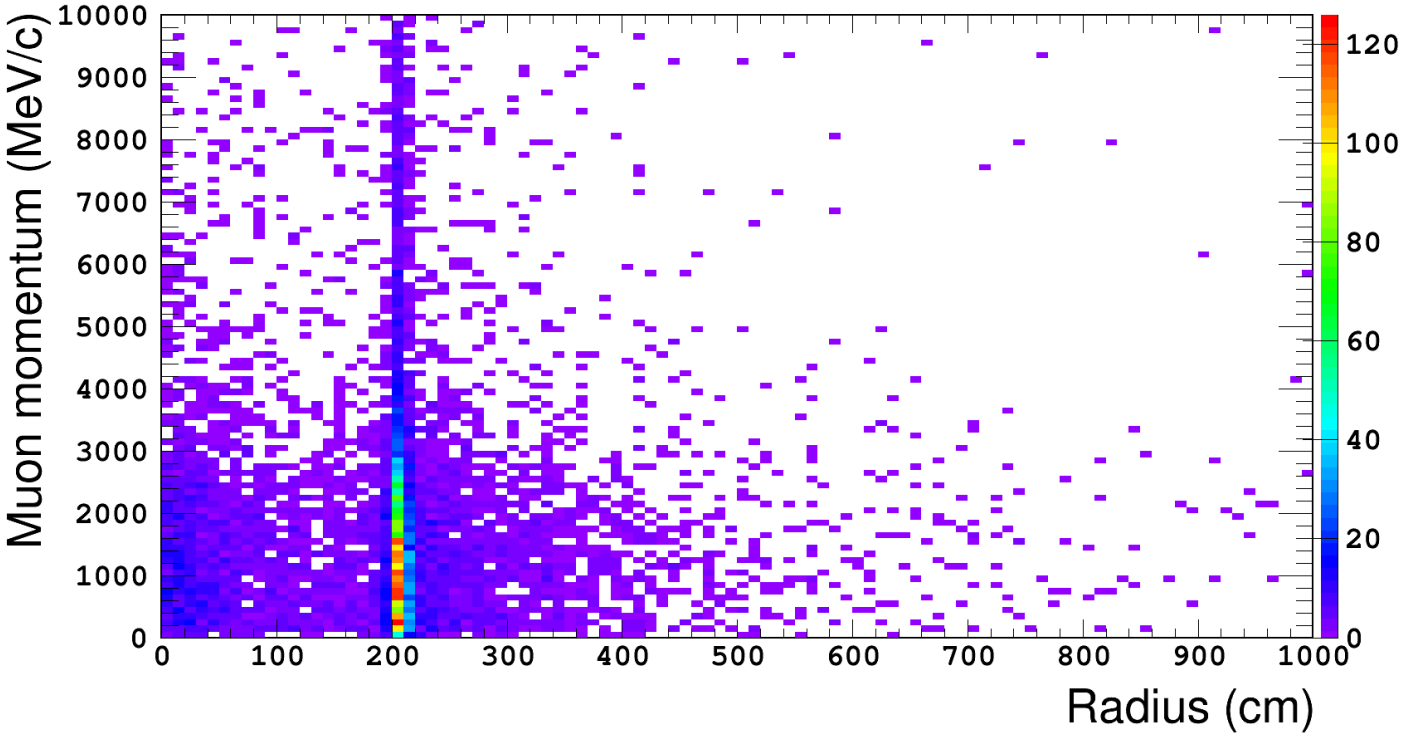






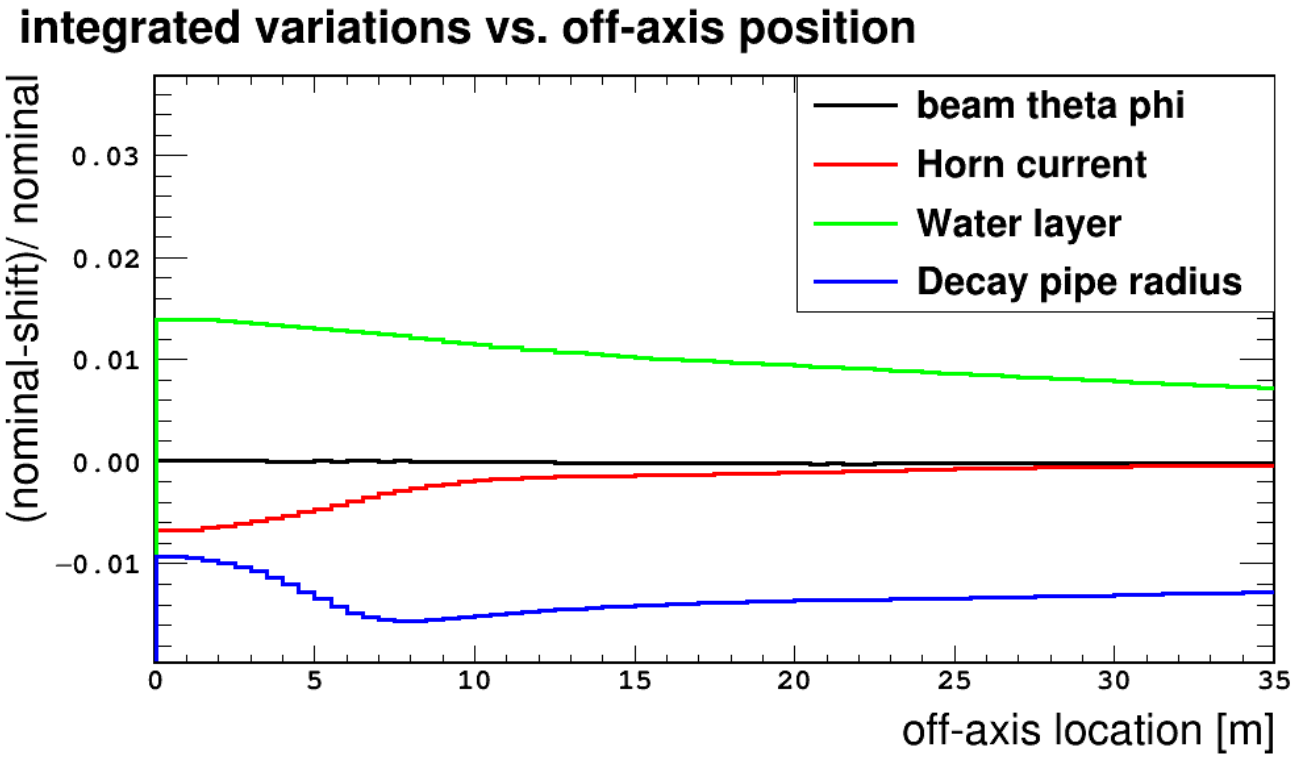
More events

- Once two clusters of hits appear, a result of 2 m radius is preferred.
- No correlation between momentum and radius observed.



Can we do rate-only?

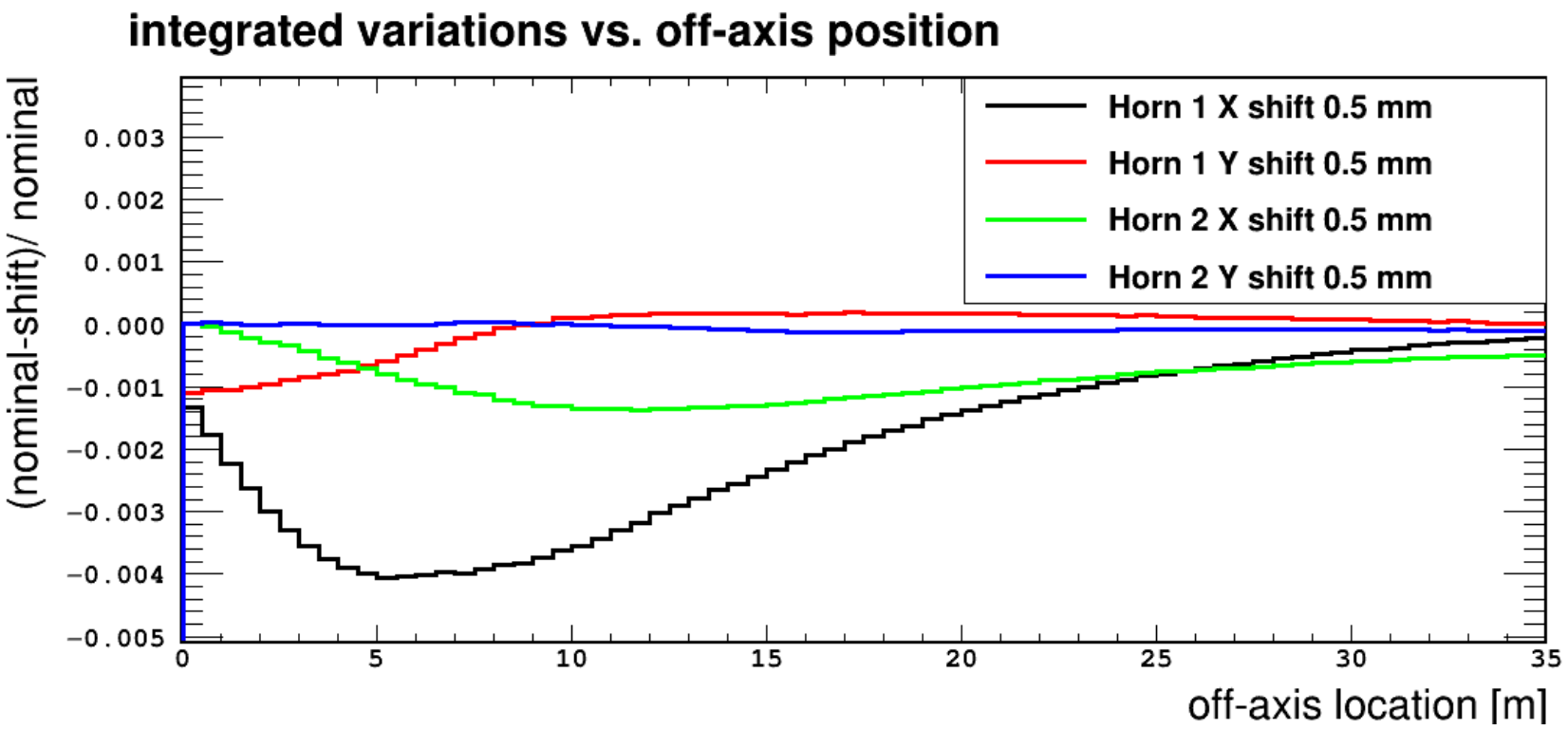
- POT daily uncertainty could be 1-2%. (based on beam experts)
- All on-axis beam parameter variations are well within 2%.

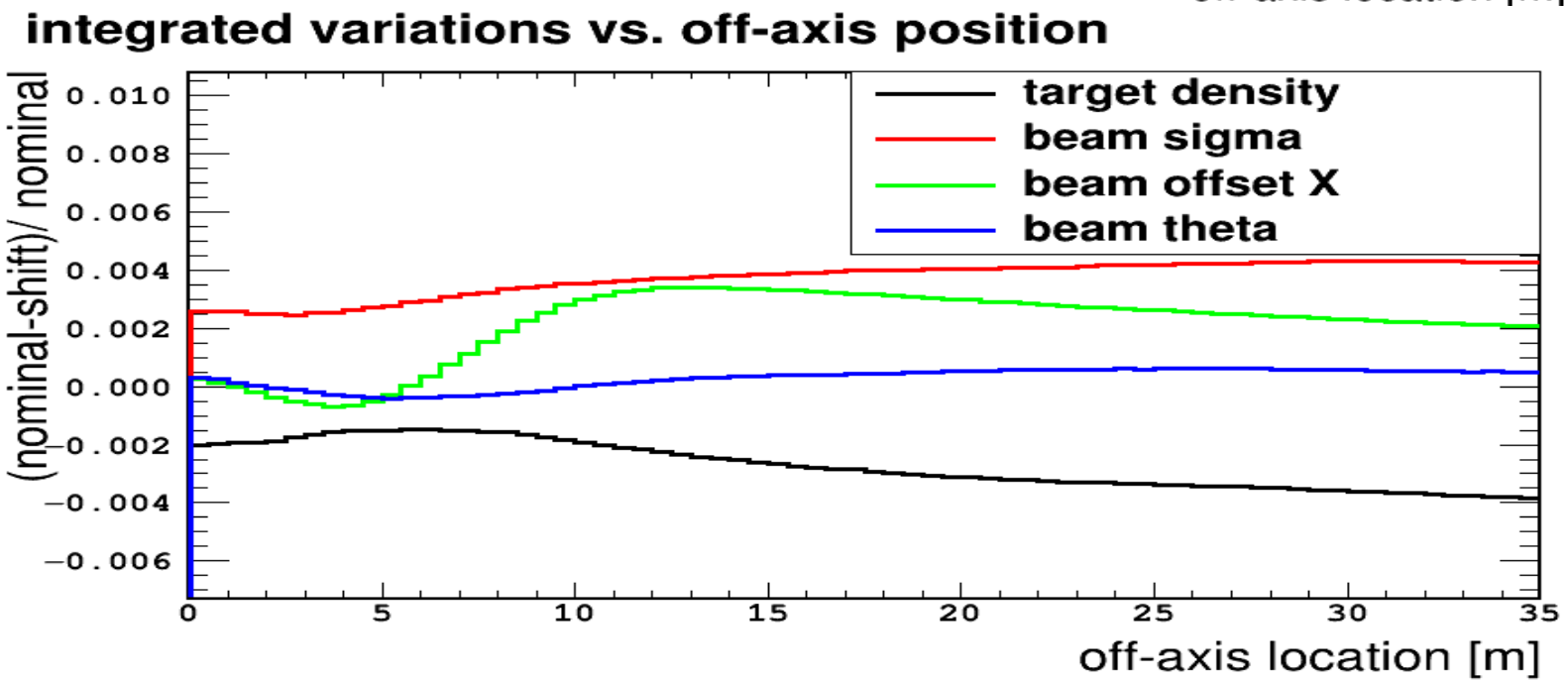


Summary

- From a simple circle fit, I don’t see correlation between radius and muon momentum.
- If above stands, we can’t do spectral monitoring with ECAL. We will have things inside KLOE.

Backups


integrated variations vs. off-axis position
(nominal-shift)/ nominal
off-axis location [m]
Horn 1 X shift 0.5 mm
Horn 1 Y shift 0.5 mm
Horn 2 X shift 0.5 mm
Horn 2 Y shift 0.5 mm


integrated variations vs. off-axis position
(nominal-shift)/ nominal
off-axis location [m]
target density
beam sigma
beam offset X
beam theta