A further look to AmBe data, and calibration for saturation

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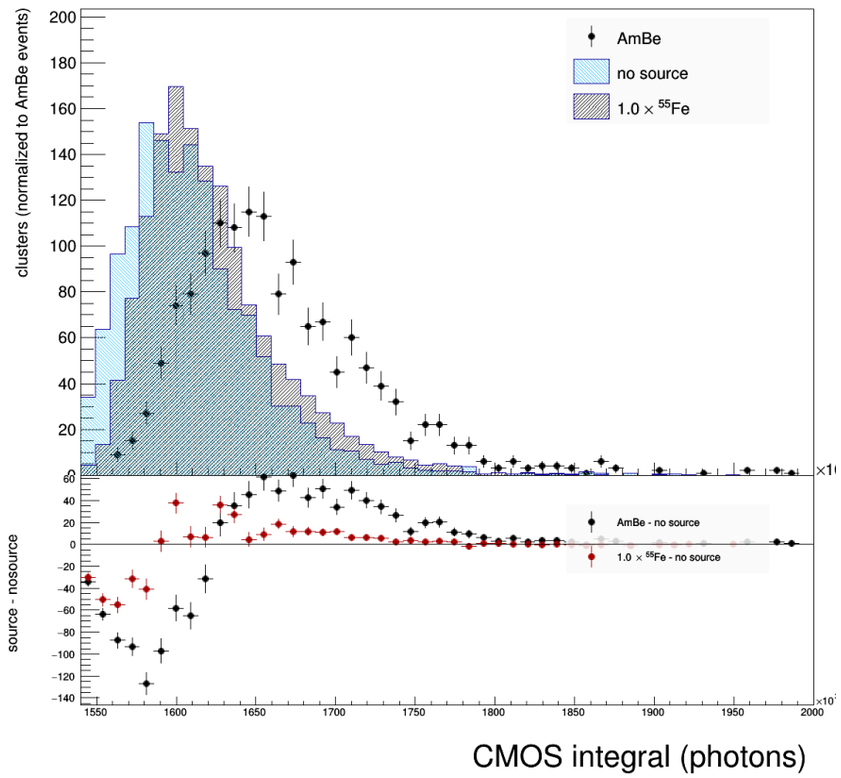
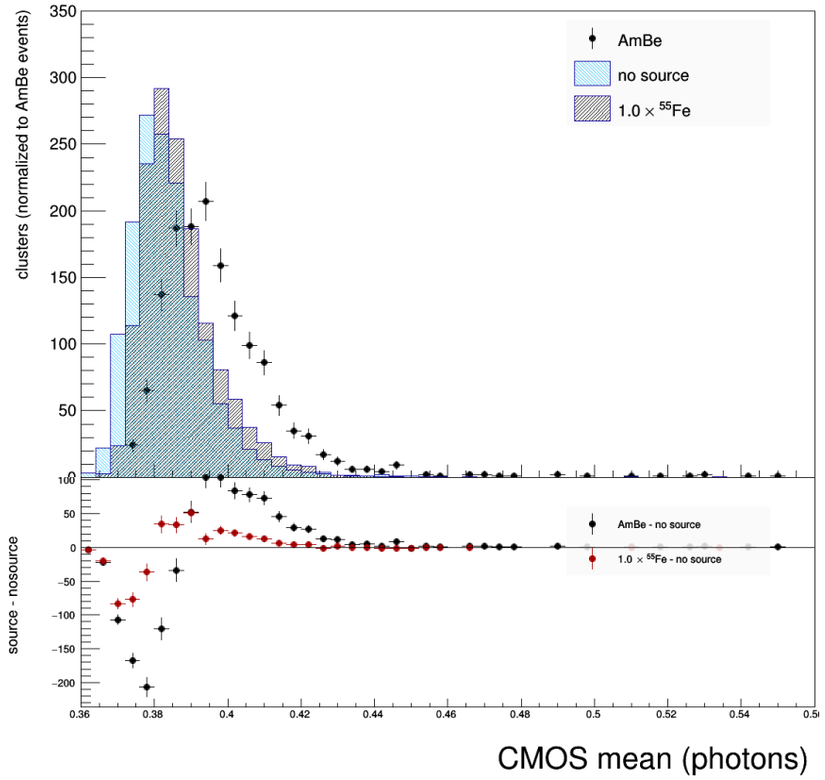
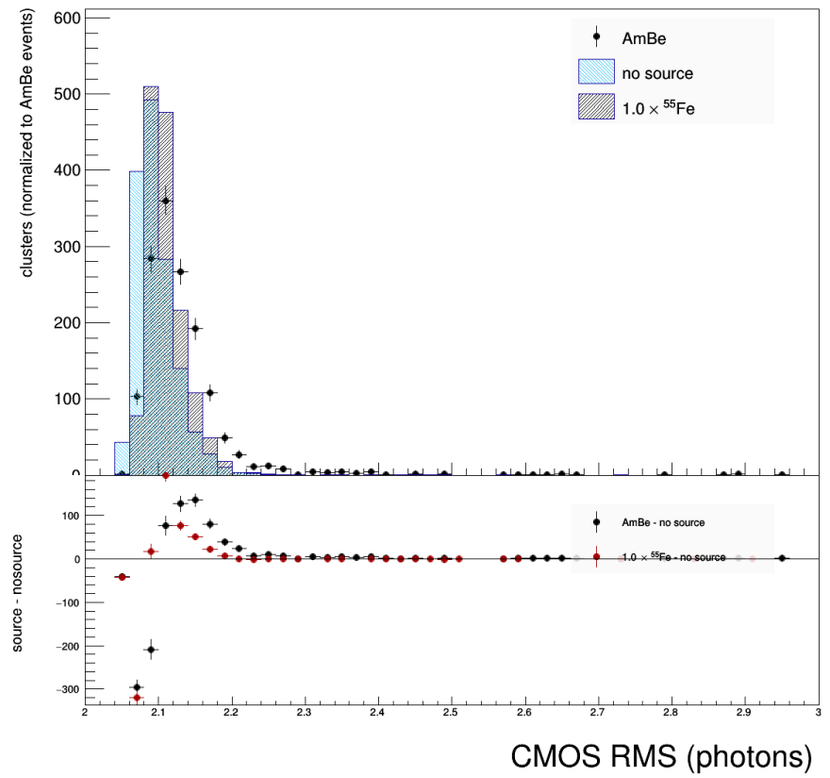
News wrt last update

- Introduced a fix for the multiple filling of the ROOT tree. This fixed a normalization issue when comparing different runs
- Found better runs for background - only (2156-2159). The one we used had some clear issues



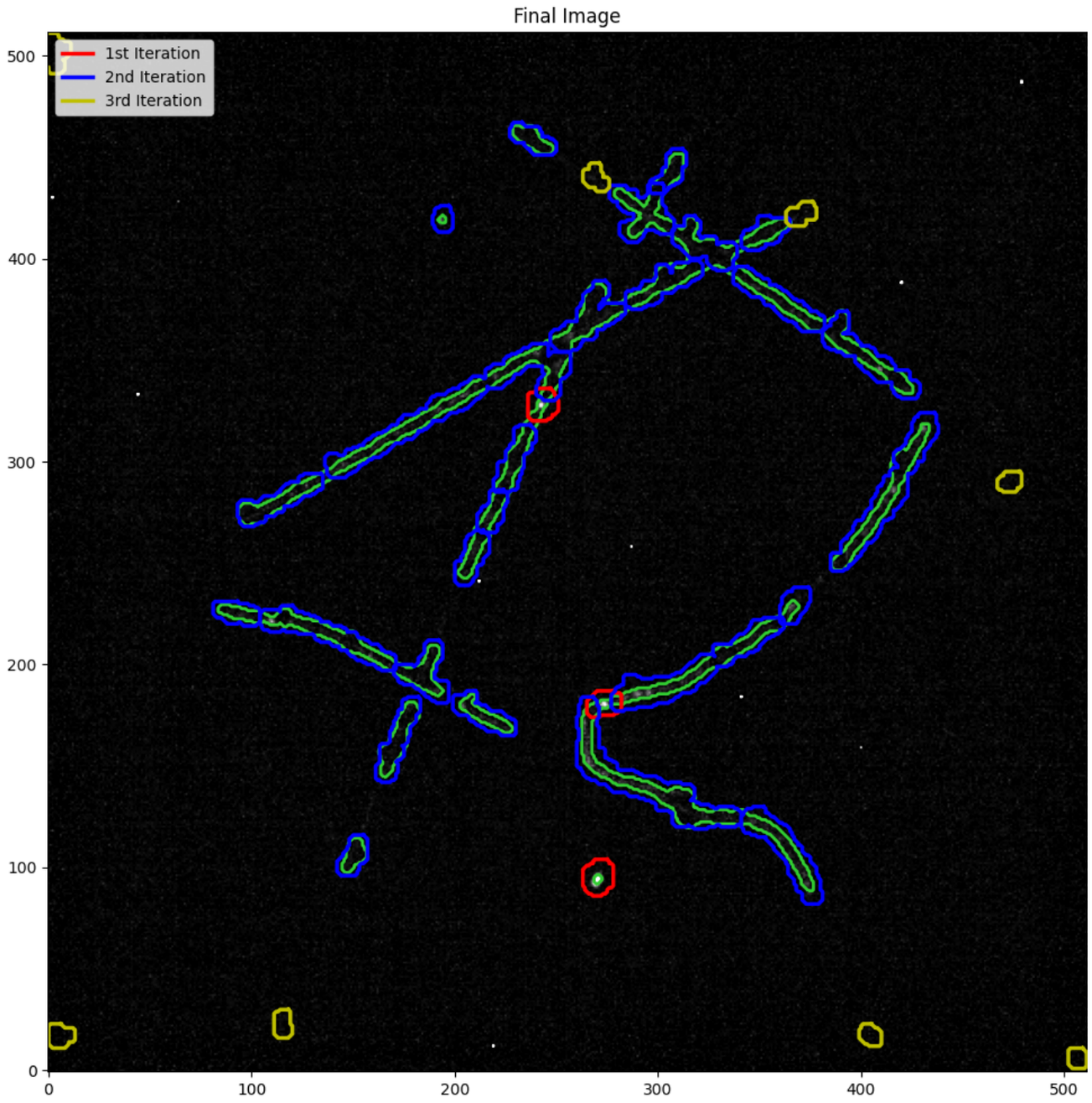




CMOS integral quantities seem reasonable.
Activity in bkg-only<Fe<AmBe

superclusters, not clusters

- always use superclusters seeded by iteration1+2 basic clusters to make plots (because they manage to “contain” a full track, both for recoil candidates, Fe spots and especially cosmic-induced long tracks)



example image:

superclusters are the green

N.B. basic clusters (red/blue) are only used to identify the interesting regions of the image

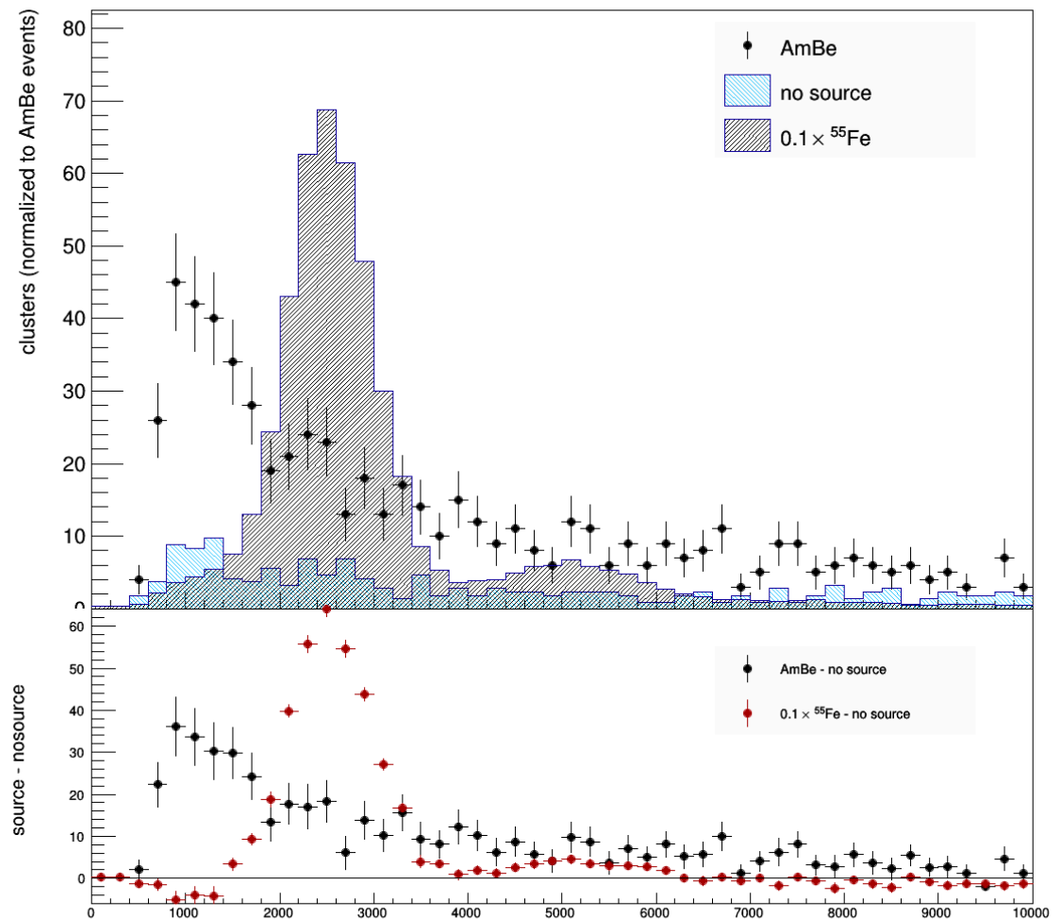
Yellow (it3 clusters) are not used

Also improved the shrinking of the supercluster around the track

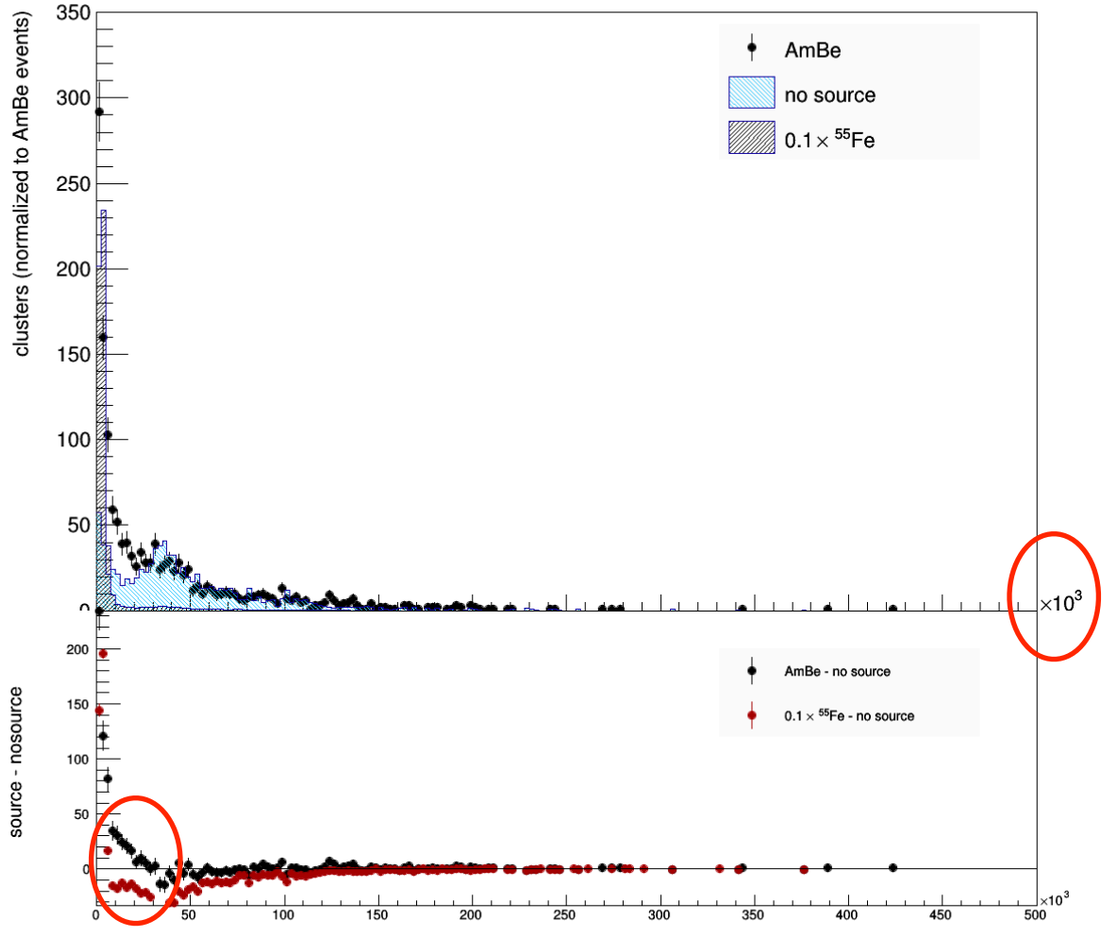
supercluster variable comparison

- N.B. in the following the AmBe and no-source are normalized to the same live-time. Fe55 is scaled by 1/10 because the activity is much larger
- Bottom plot shows the difference (=> it makes sense for AmBe - no-source)

integral (#photons), zoomed and full range



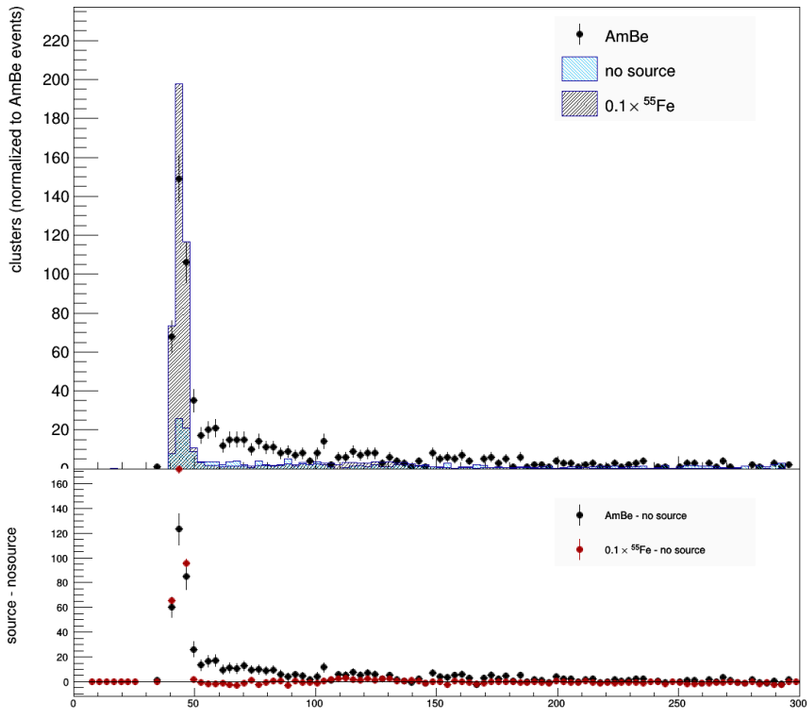
AmBe produces a lot of low-energy (3 KeV) deposits

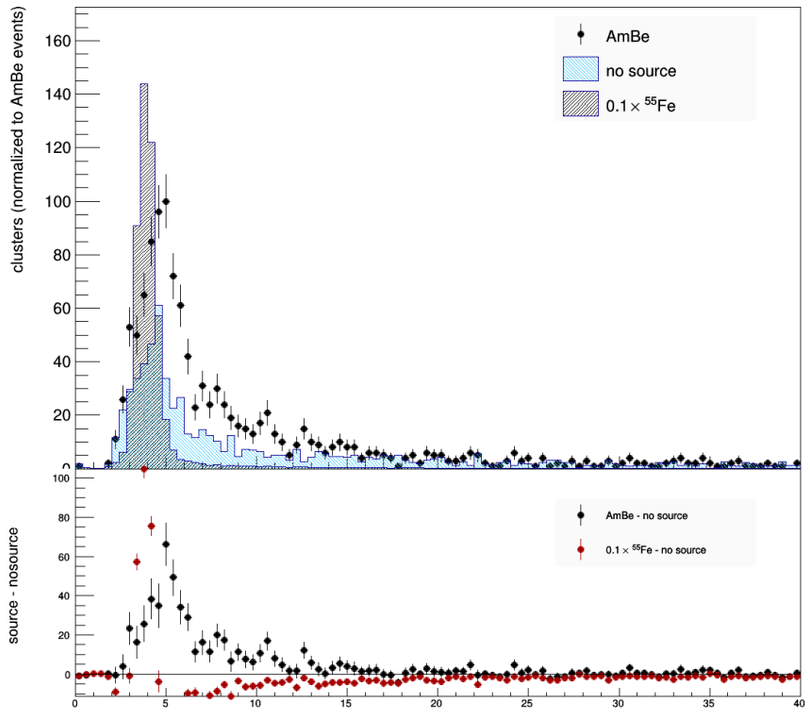


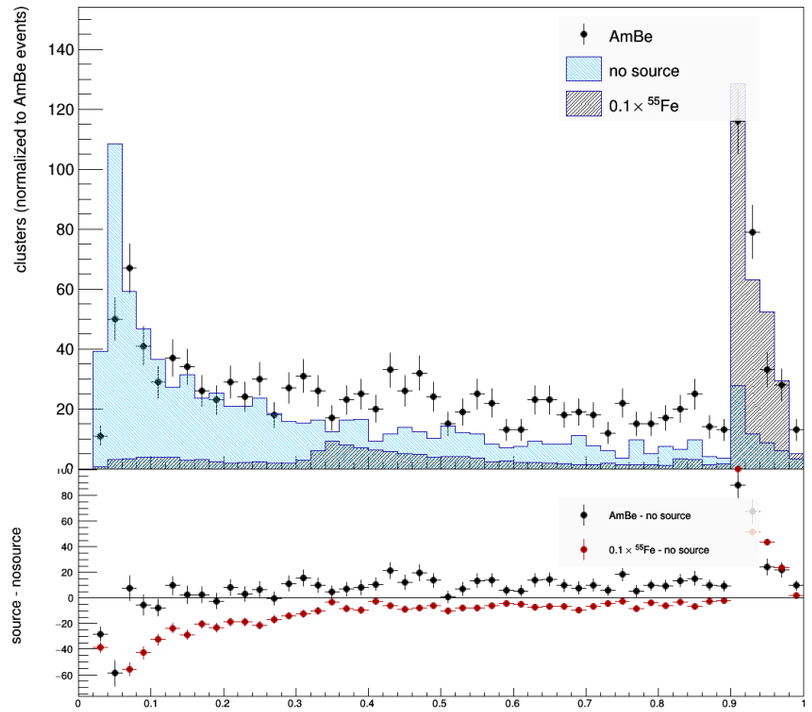
also deposits with around [30-70] keV. Saturation may shrink the distribution

supercluster shapes

- Most of AmBe clusters are round spots. Then another component with length 50-100 pixels, i.e. up to 1.5 cm. No longer than that.
- Transverse Gaussian sigma is larger than Fe spots (5 vs 4 pixels)

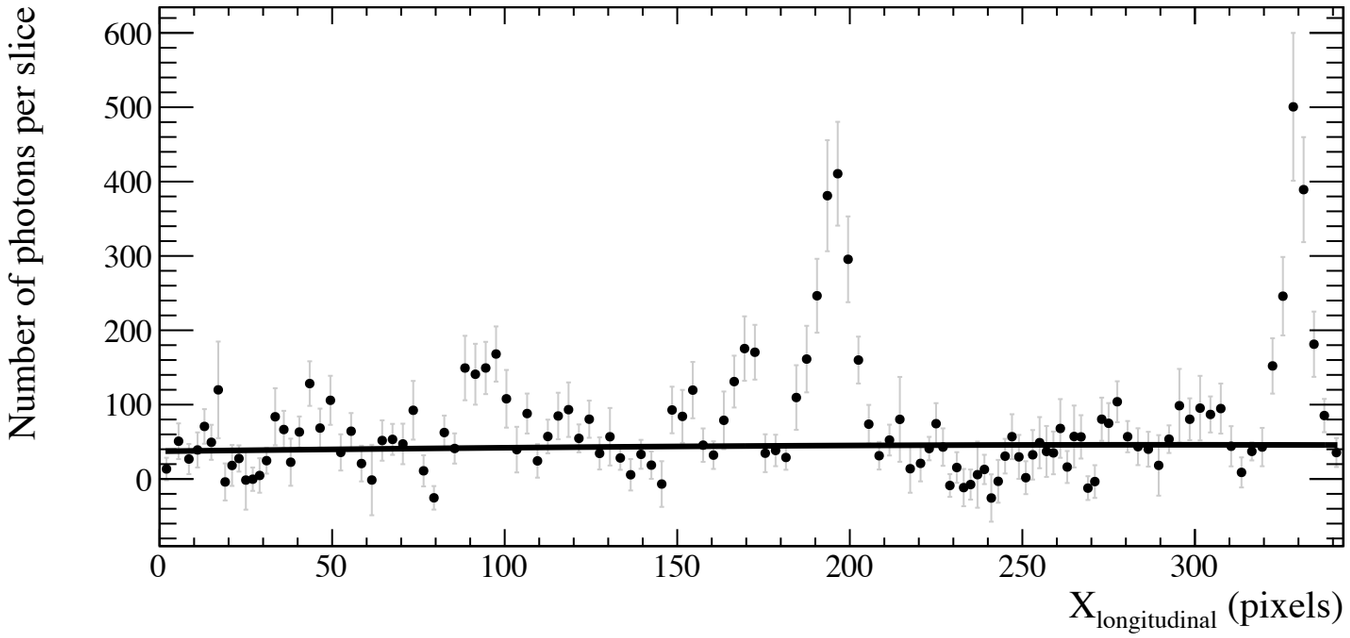




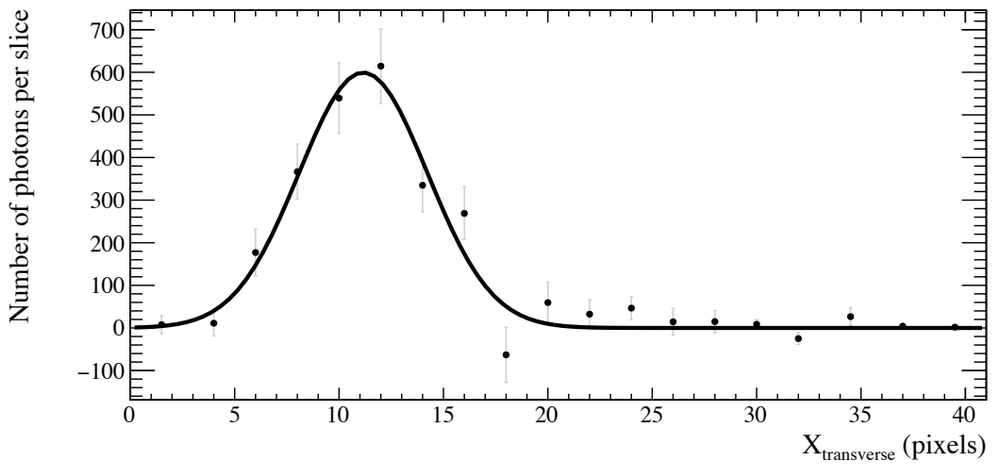


Examples of cluster profiles

- Very clear clusters along tracks from cosmics. Fixed the code to find peaks along the track profile (don't use it yet, but may be used later to check head-tail asymmetry)
- σ_{Gauss} = 4-pixels is extracted from the fit of the transverse profile.
  - N.B. the width as we always defined (i.e. length of the minor axis of the cluster "ellipse") is about 5*2 σ_{Gauss}



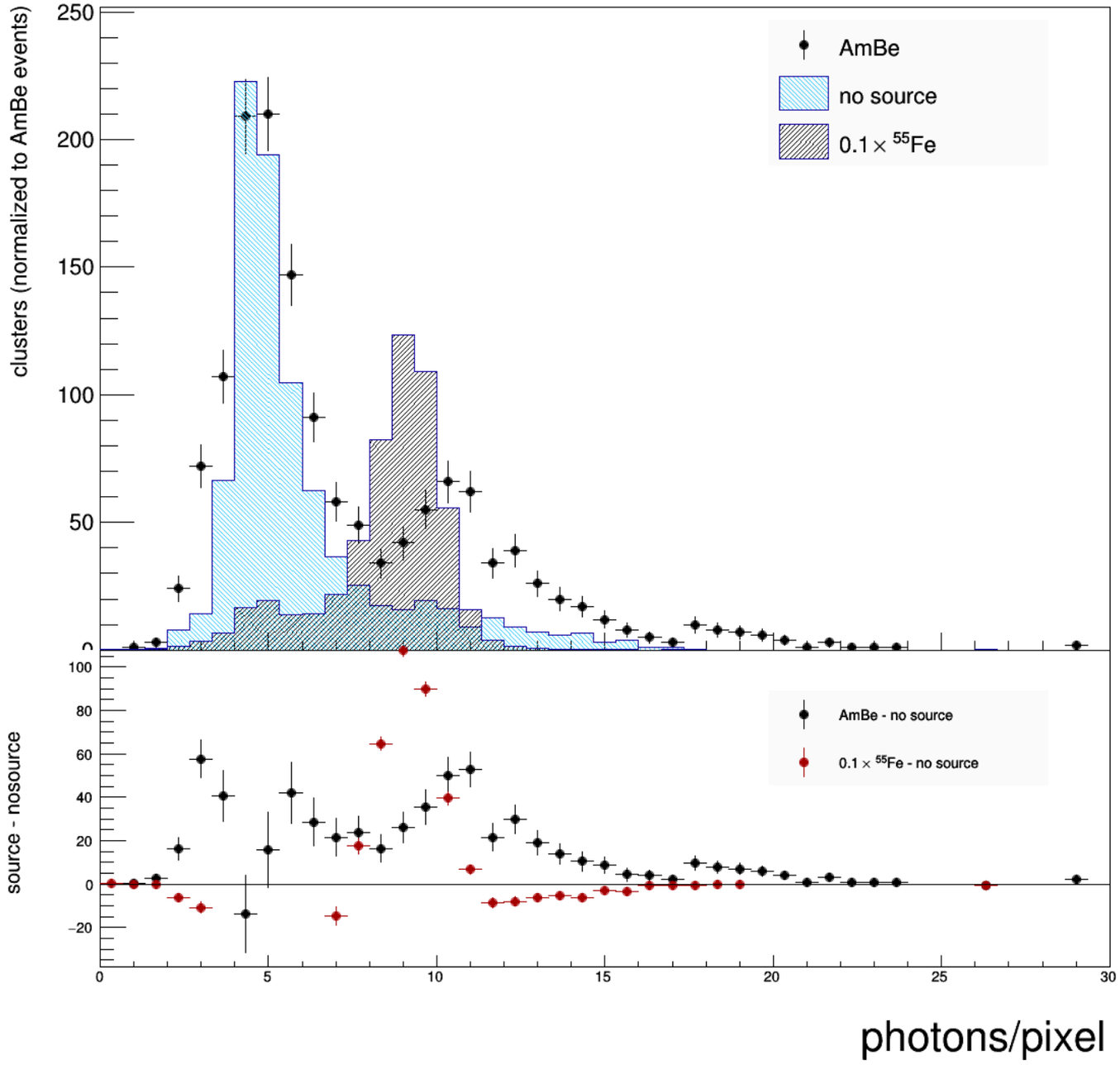
longitudinal profile



transverse profile

supercluster density

- This is the variable that seems to discriminate more the “cosmics” background (# photons / #hits above threshold)

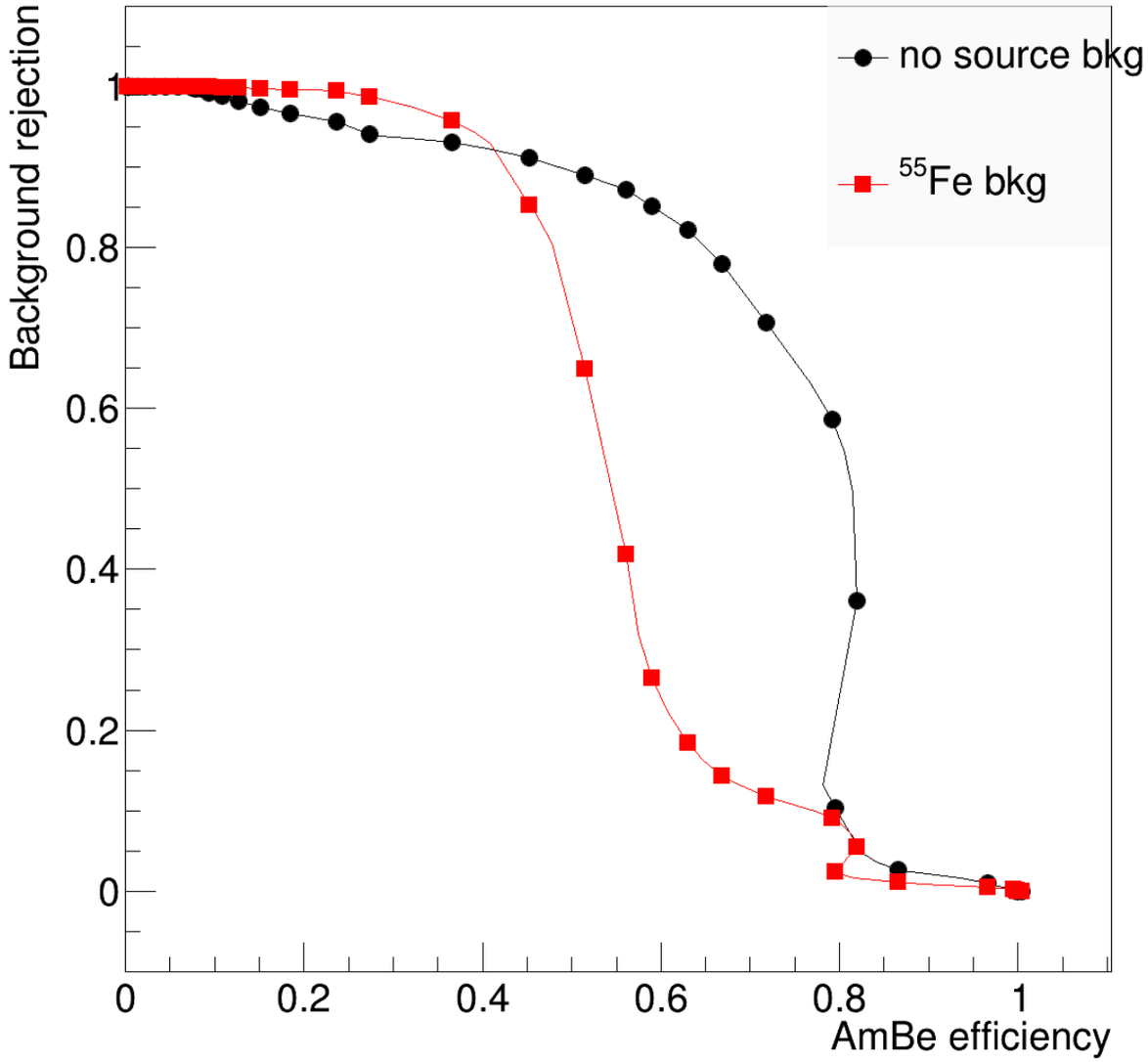


3 populations evident

- ~4: overlapping cosmics background. It seems consistent in rate also
- ~10: these are often “spots”-like dense deposits
- ~18: these are very bright tracks up to 1.5 cm long

Signal eff. vs bkg rejection

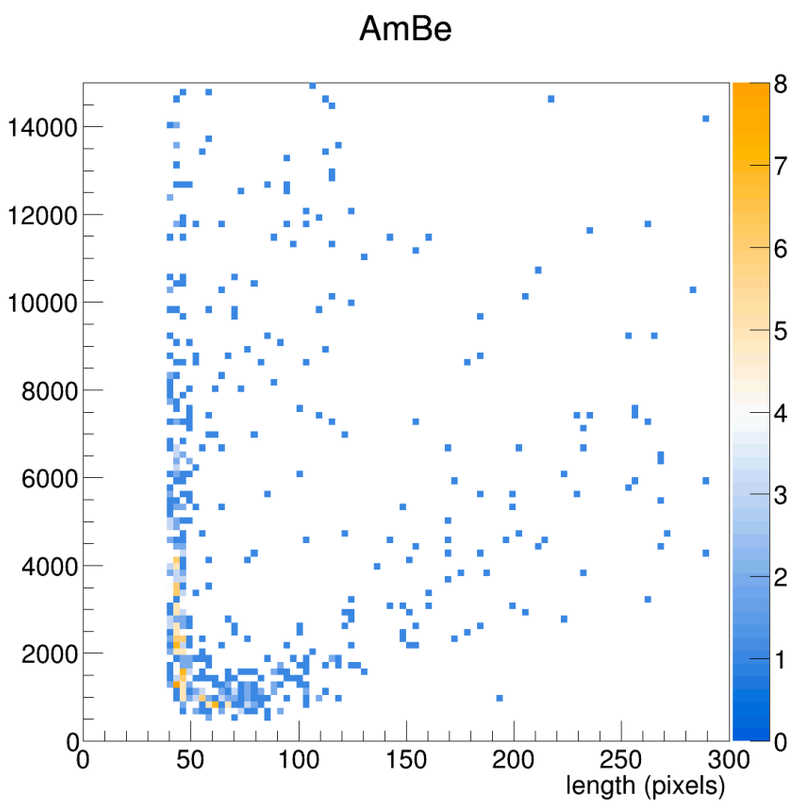
- Take the density as discriminating variable
- Bakground rejection from no-source sample
- Signal efficiency from “AmBe - no-source” (background subtracted density distribution). Same when considering Fe as background (to remove cosmics)

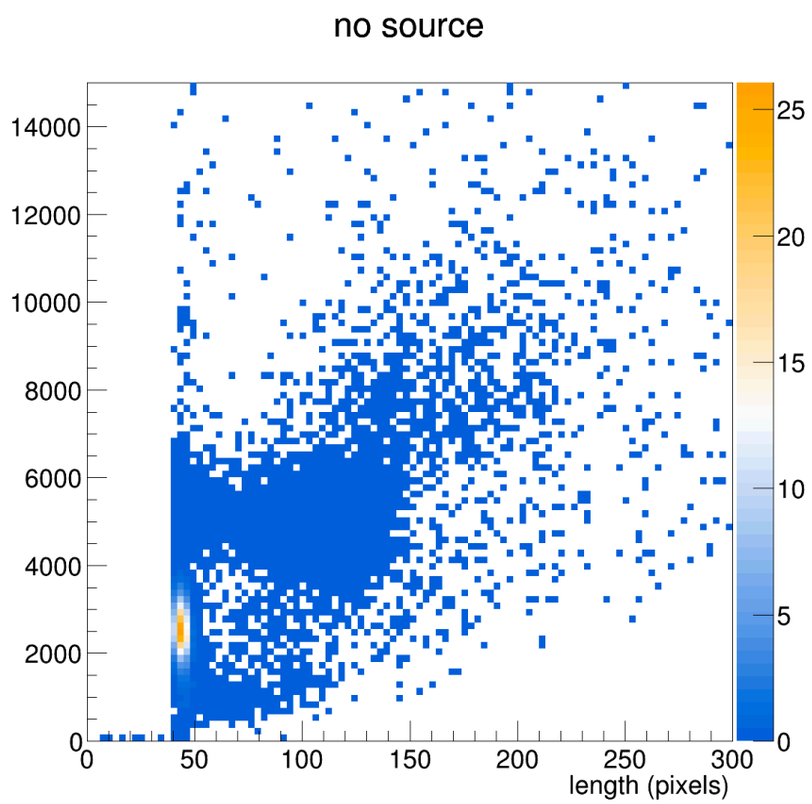


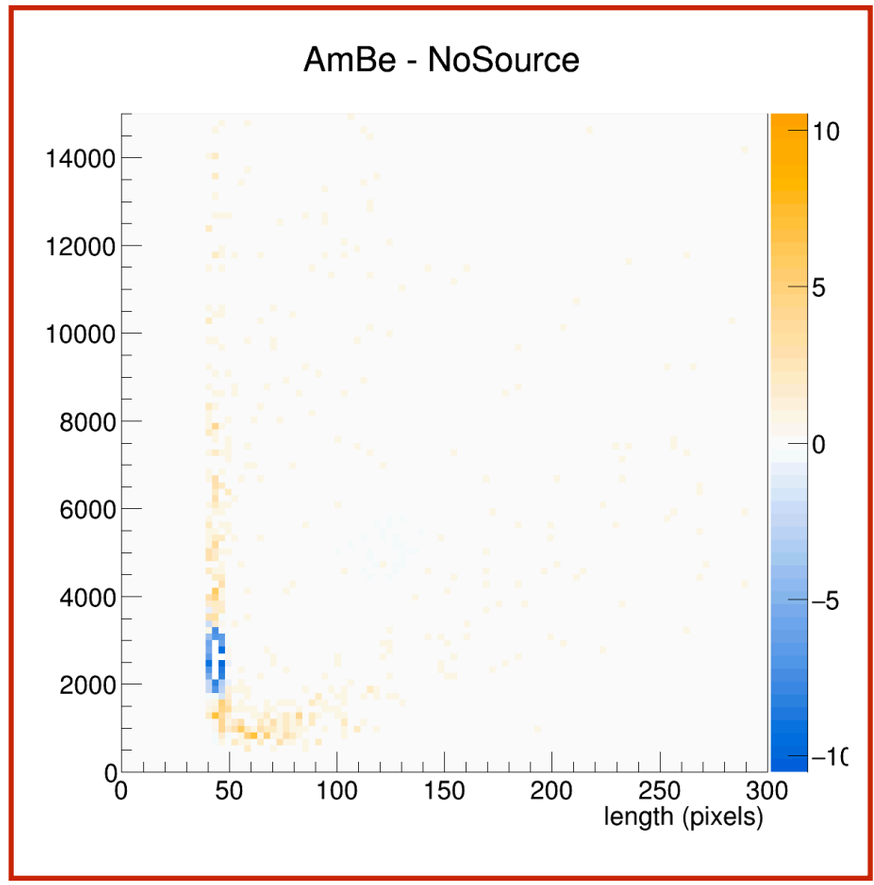
Eg. For 50% efficiency on AmBe:
=> 90% rejection of “cosmics” bkg
=> 80% rejection of “Fe” bkg (this is much lower because the peak at ~10 almost overlaps between AmBe and Fe

Ev(i)L plot

- Can do a energy vs length plot, after subtracting the background from no-source





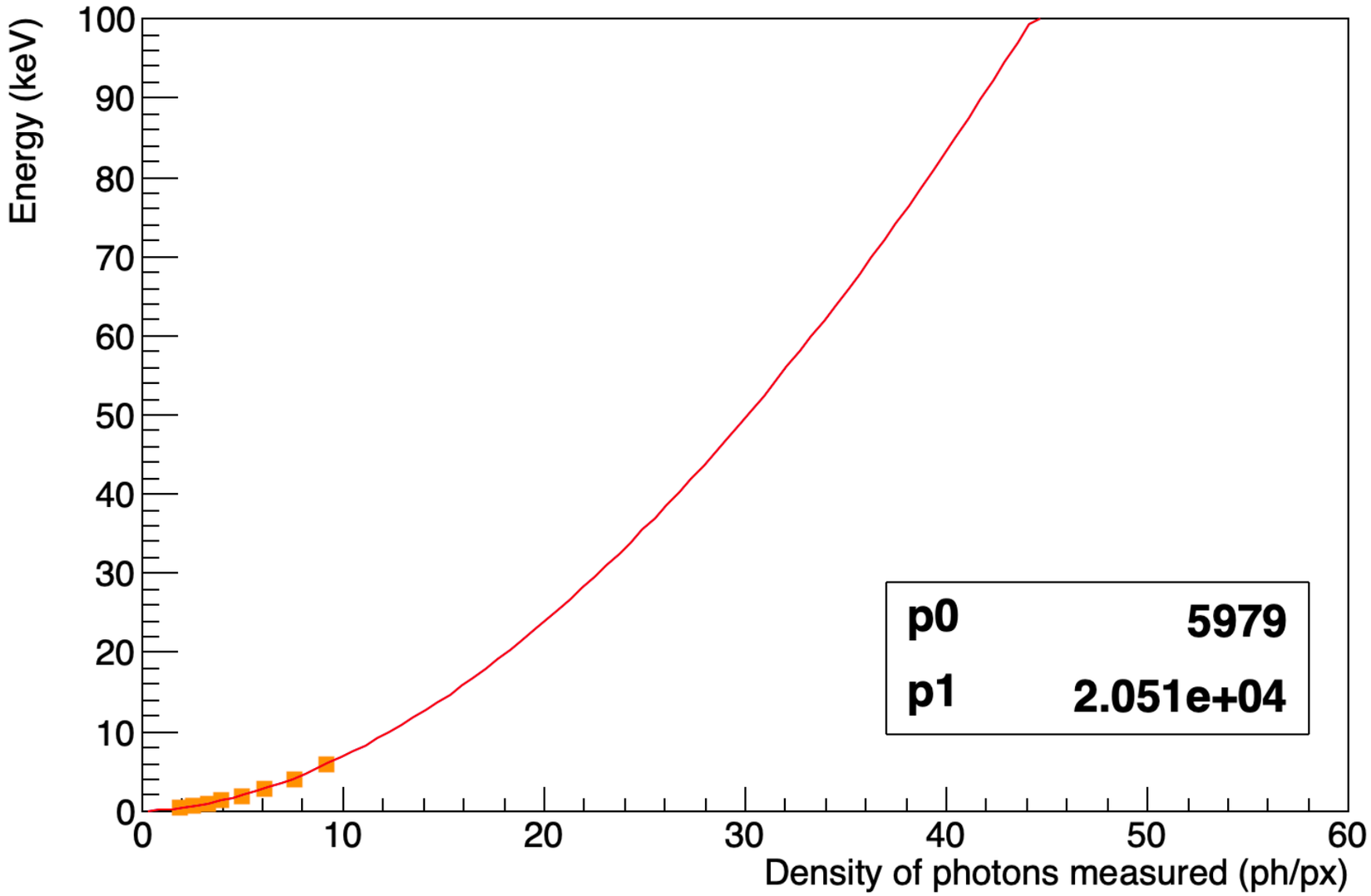


A component with low energy and up to 1.5 cm

Not very large energy, but this may be due to the saturation

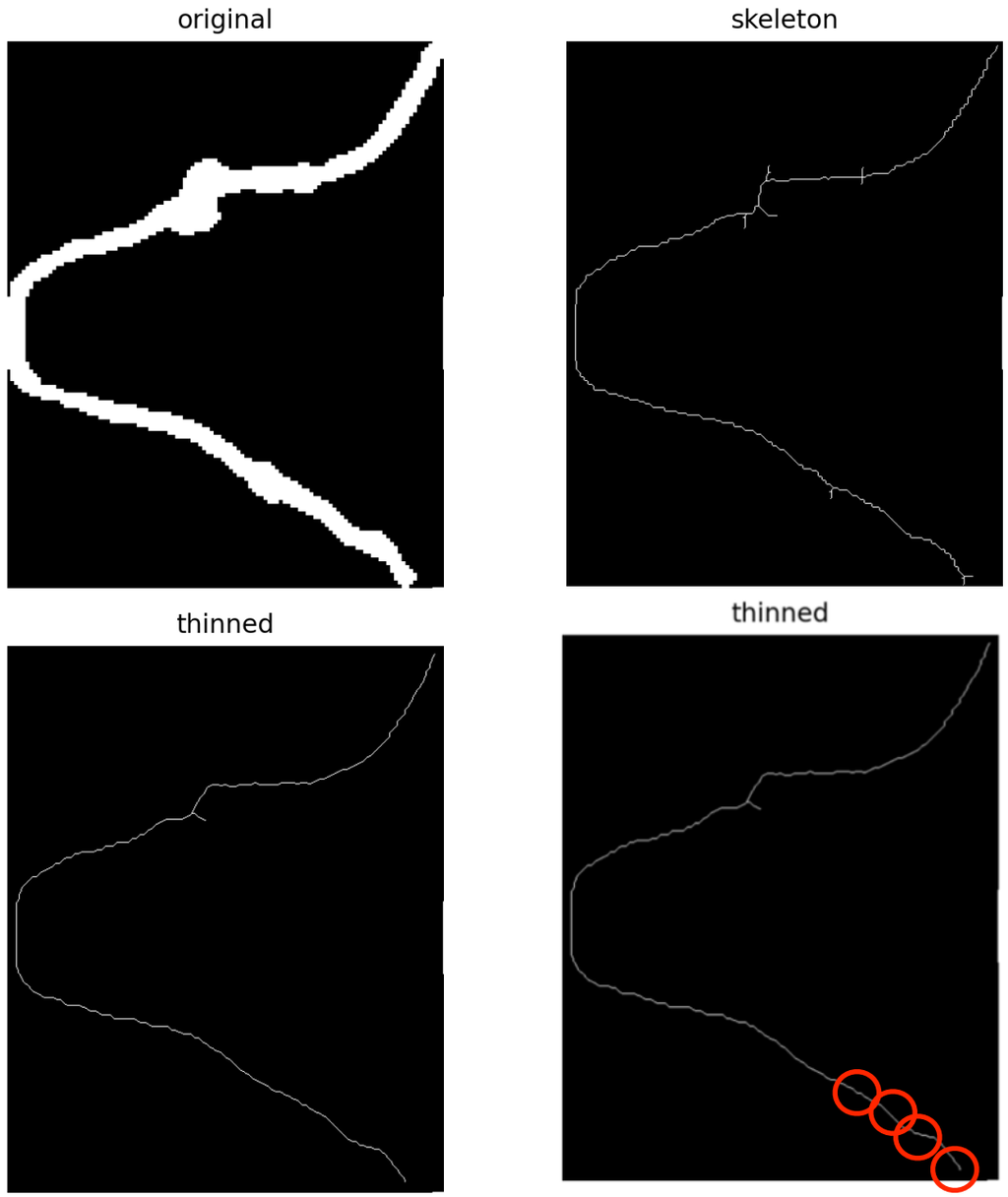
Correction for saturation

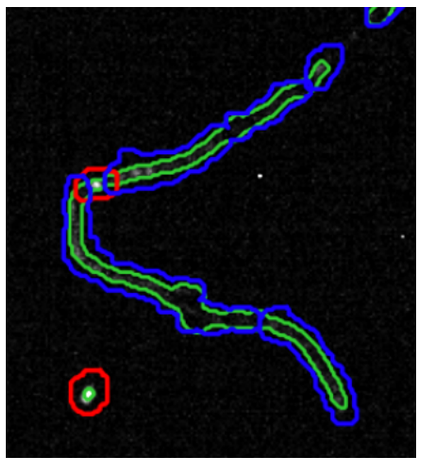
- From Davide, got a correction curve with Fe: energy vs density.
  - the density for Fe arrives to <10, extrapolate with a function (since AmBe arrives up to 30)
  - the idea is to get a calibrated energy from the **local** density along the cluster. Local means in “slices” of the cluster comparable to the Fe spots. Need to be done during reconstruction



correction algorithm

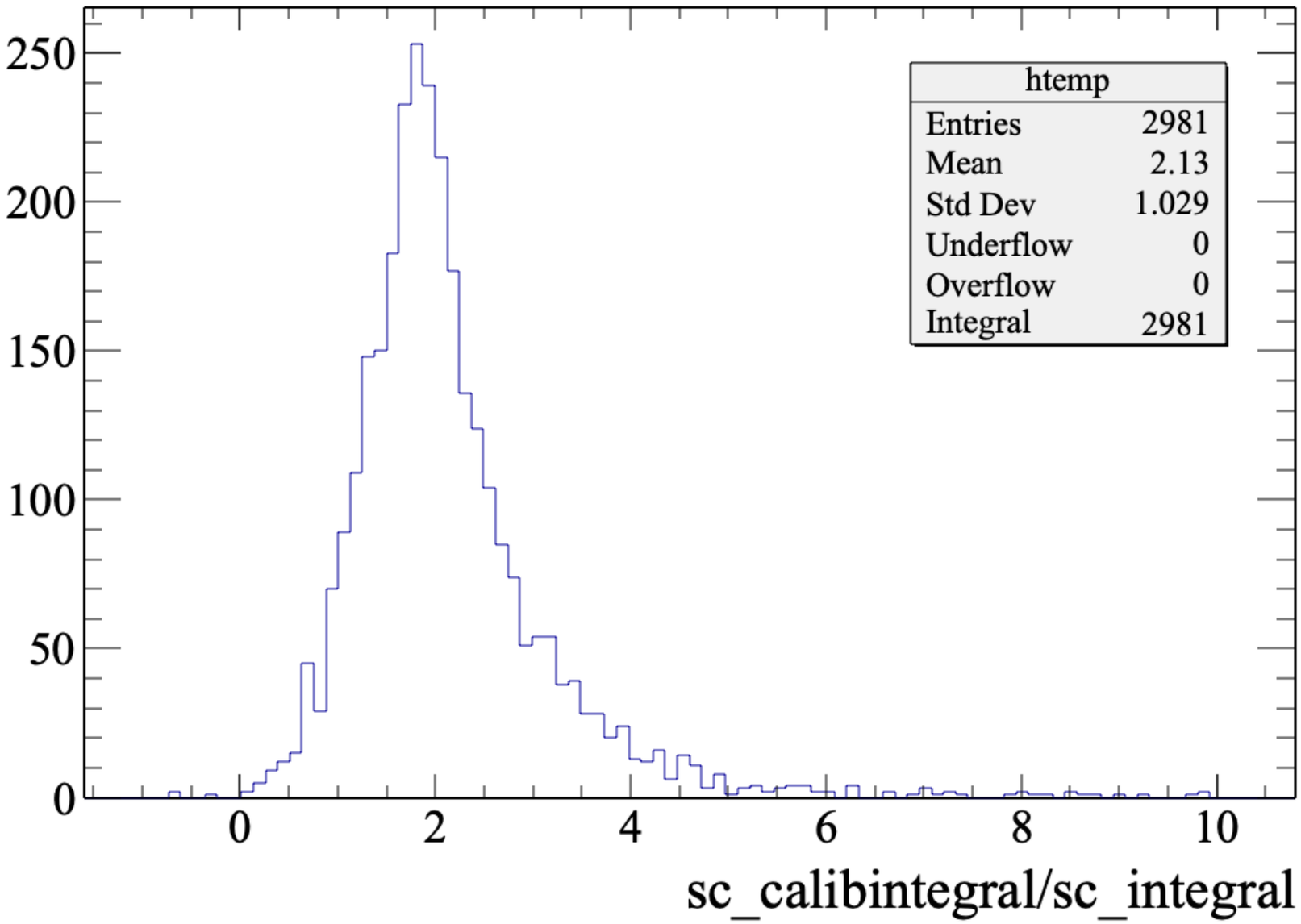
- Take the supercluster. Make it's "skeleton", i.e. a 1-pixel wide crest of the supercluster.
- thinning procedure applied to remove small branches in the skeleton
- make circles of radius=15pixels with centers along the skeleton to gather the slices
- compute the calibrated energy with Davide's curve for each slide and finally sum-up to get supercluster calibratyed energy





Very fresh plot

- Will redo spectra with calibrated energy today. For now showing the calibration constants distribution in the AmBe runs.
- Average of 2, but with tails up to 10. Can be negative (if a slice happens among 2 clusters)…



The End