Summary of reconstruction and analysis

E. Di Marco

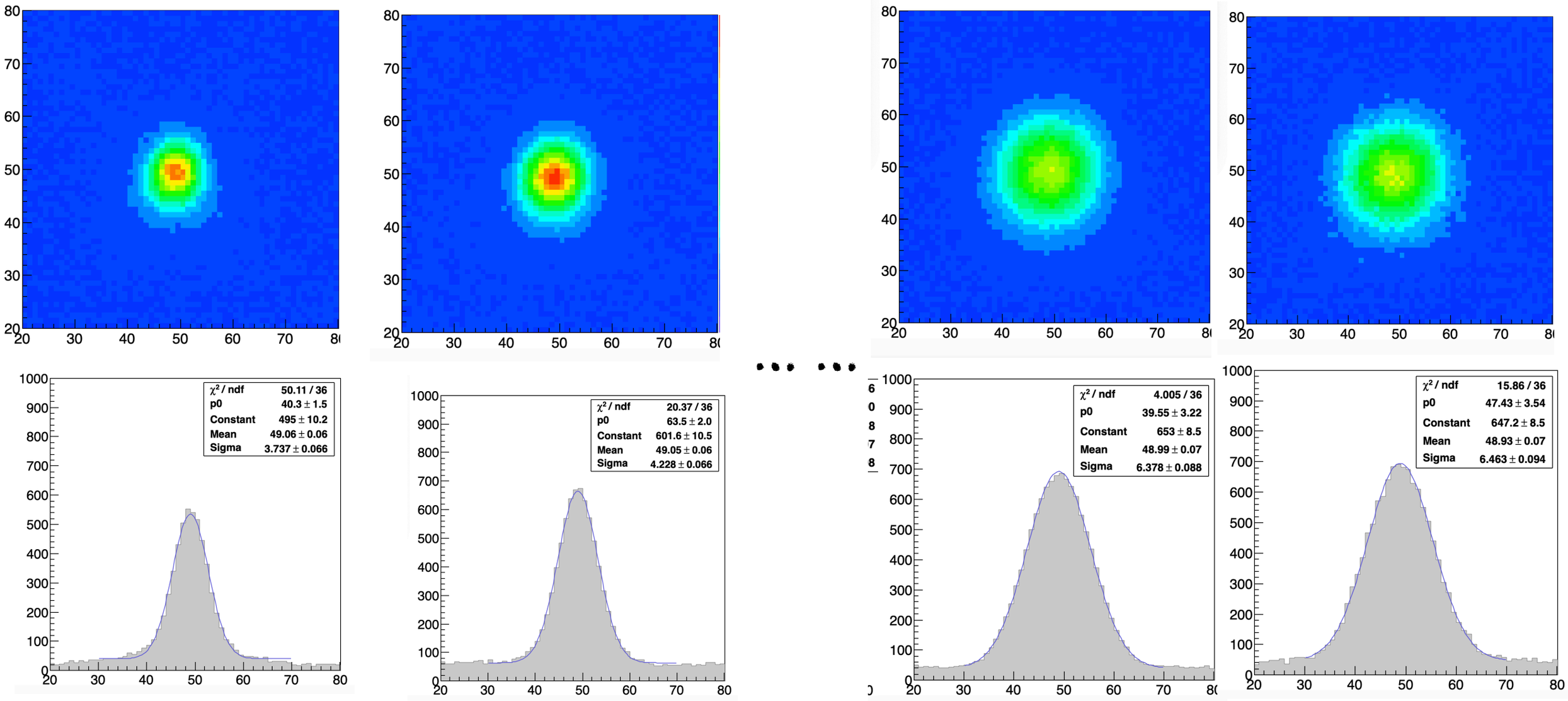
CYGNO meeting,

10 December 2020

saturation studies

^{55}Fe spots at increasing distance from GEMs: transverse, but also longitudinal diffusion helps against saturation [the spot is a sphere in 3D]

D. Pinci

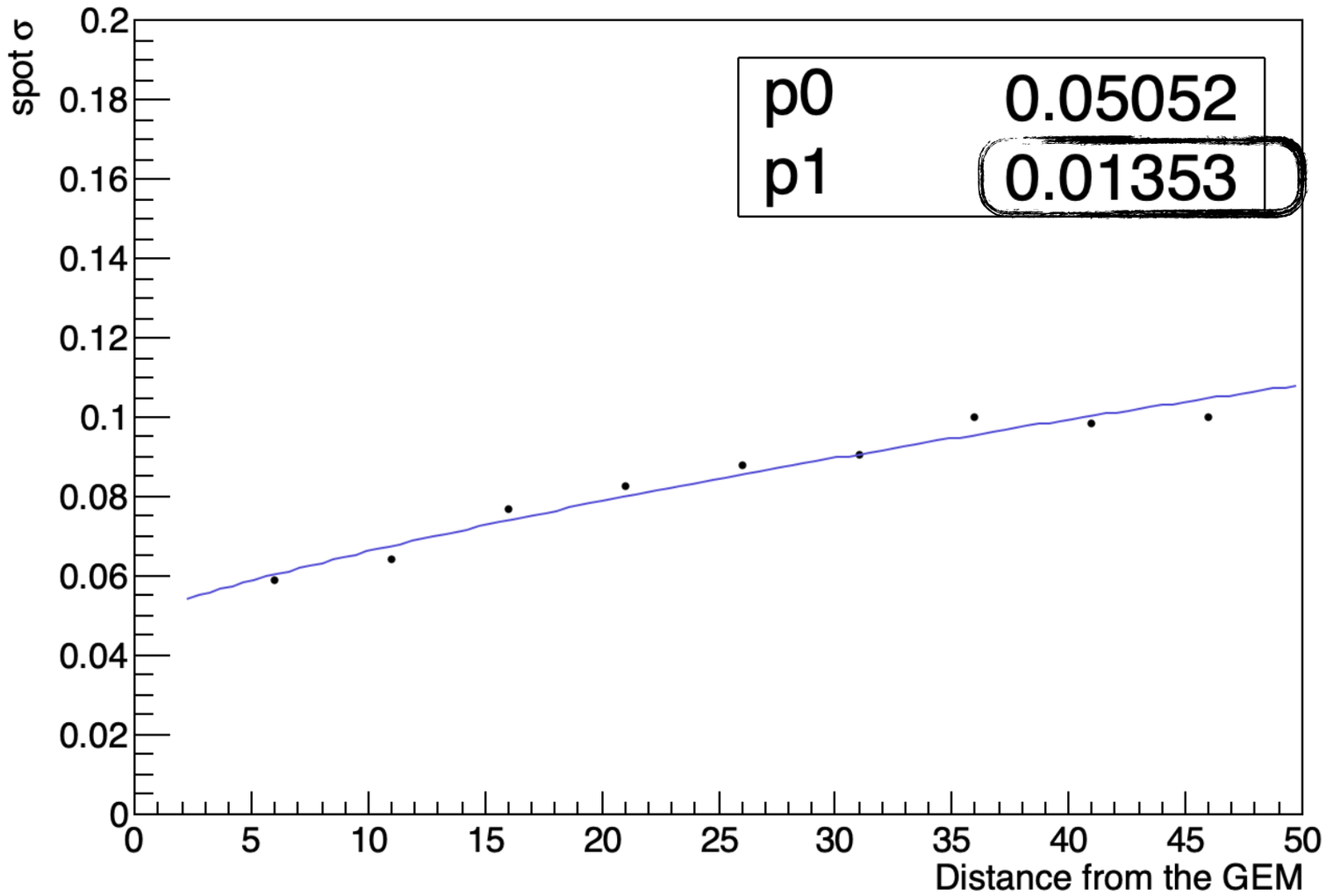


6 cm - light = 4635 | **11 cm - light = 6373** | **41 cm - 10436** | **46 cm - 10480**

comparison with sim

transverse diffusion 0.14 mm/cm similar to value predicted from simulation (0.12mm/cm)

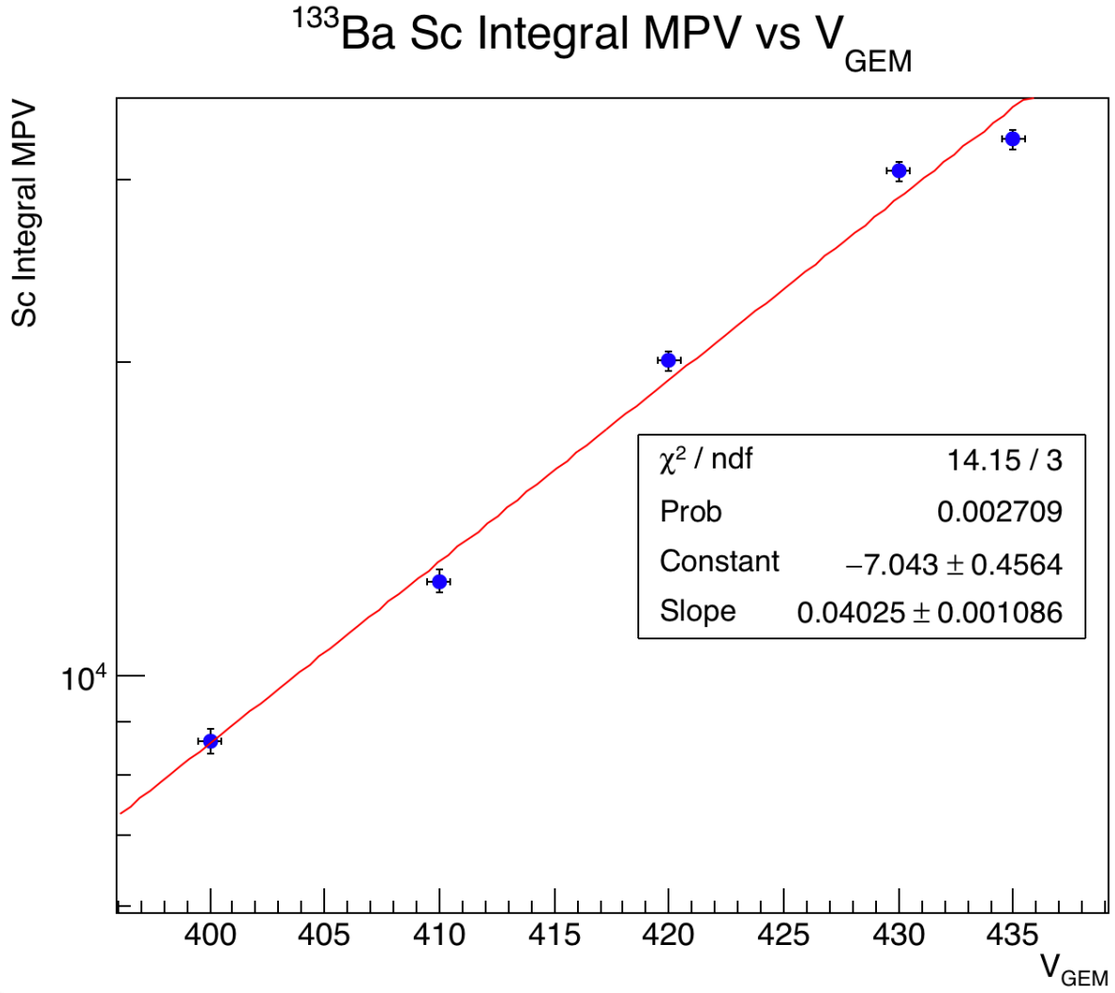
D. Pinci

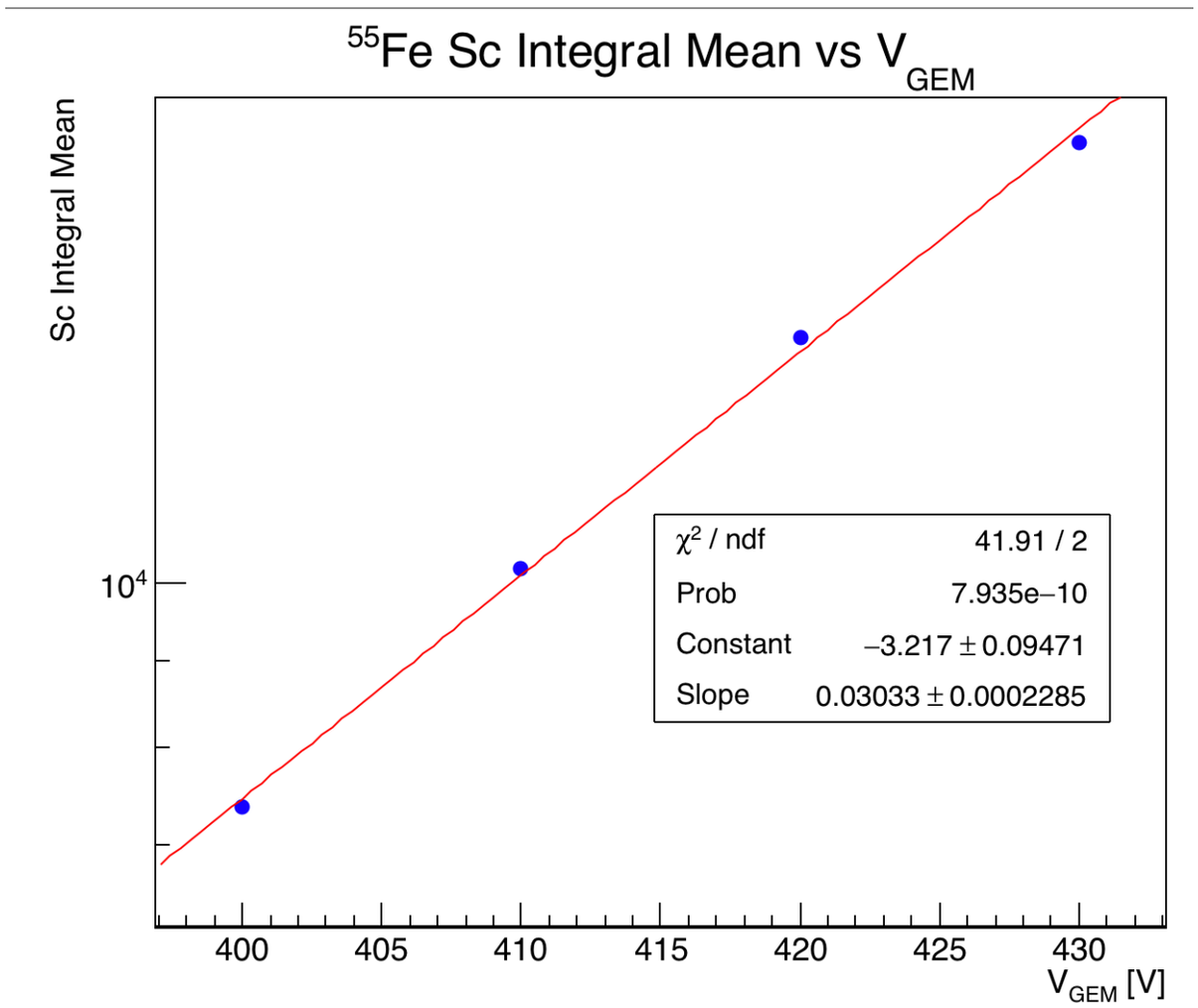


V_{GEM} scan with MANGO

Initially used ^{133}Ba source, then got ^{55}Fe source and performed a V_{GEM} scan.

E. Baracchini et al.



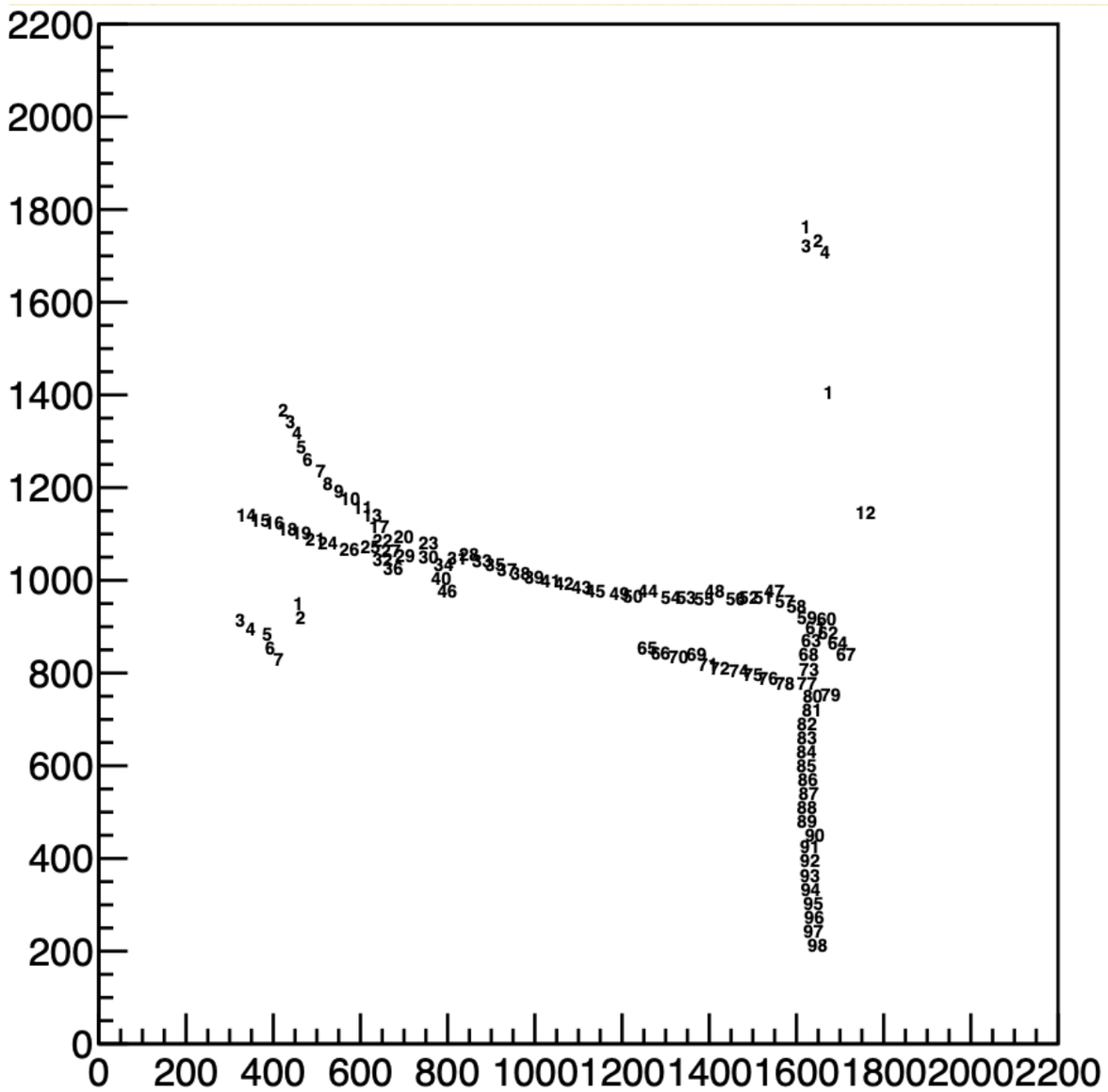


Expected behavior observed

Head-Tail studies

Ongoing preparatory development for head-tail studies: improving the algorithm to follow the pattern of curly / branched tracks

S. Torelli

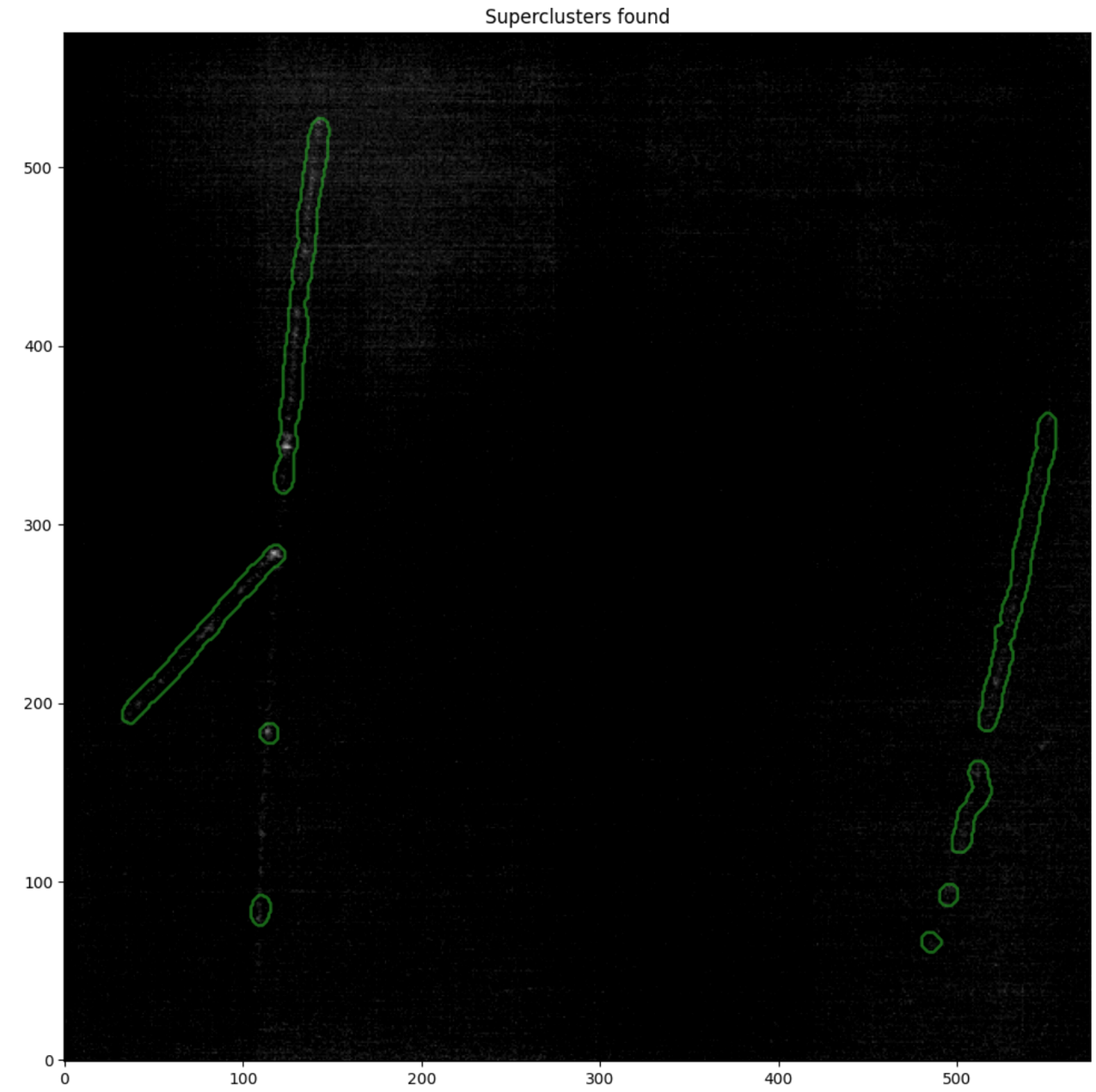


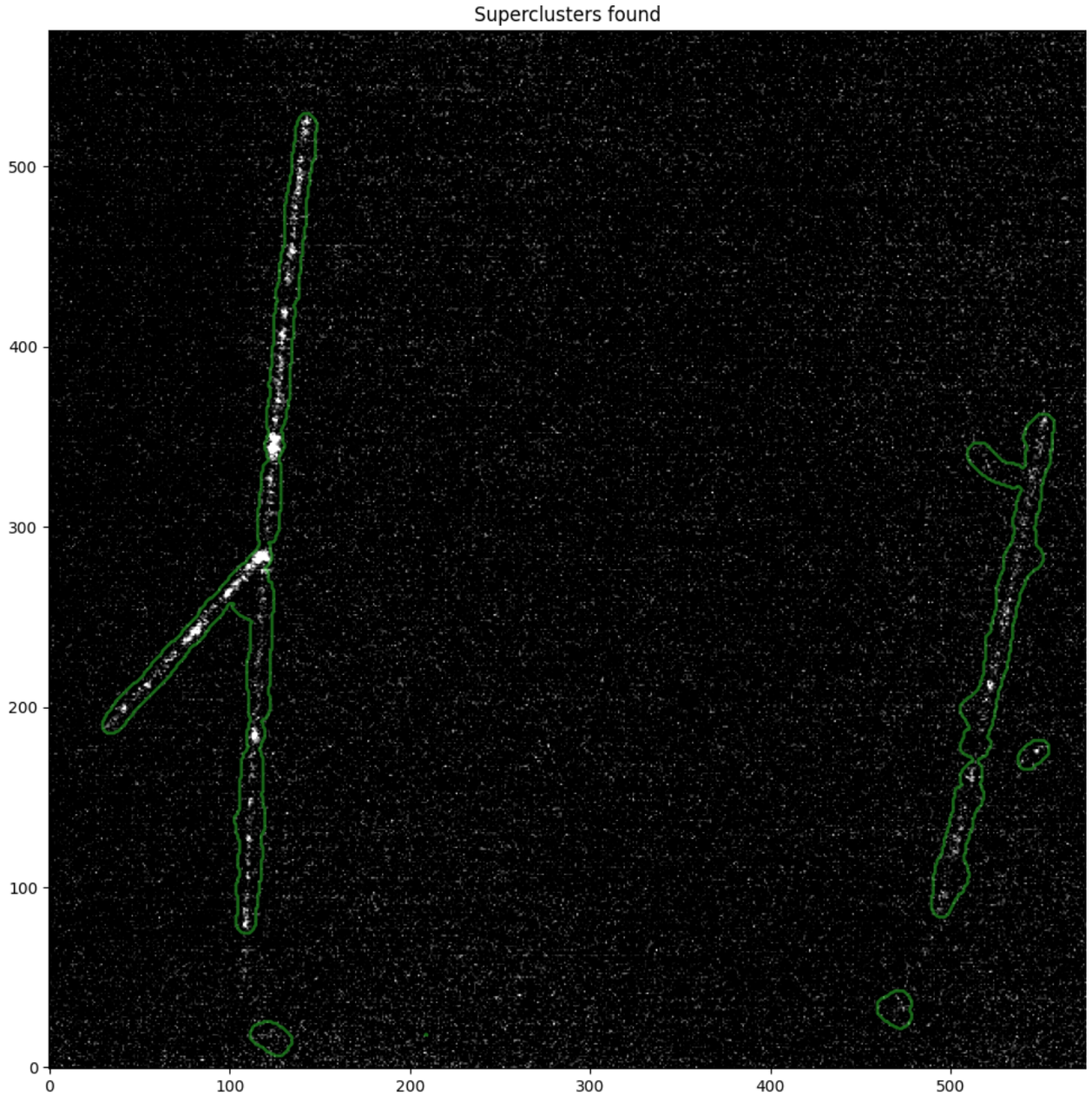
For long tracks, developing an algorithm to better handle branches in the track / overlapping tracks

For the time being, use what is there in the reco. Focus on the simple tracks, reducing the slices sizs.

AmBe @ LIME update

Improved noise filtering applying it to full-resolution images



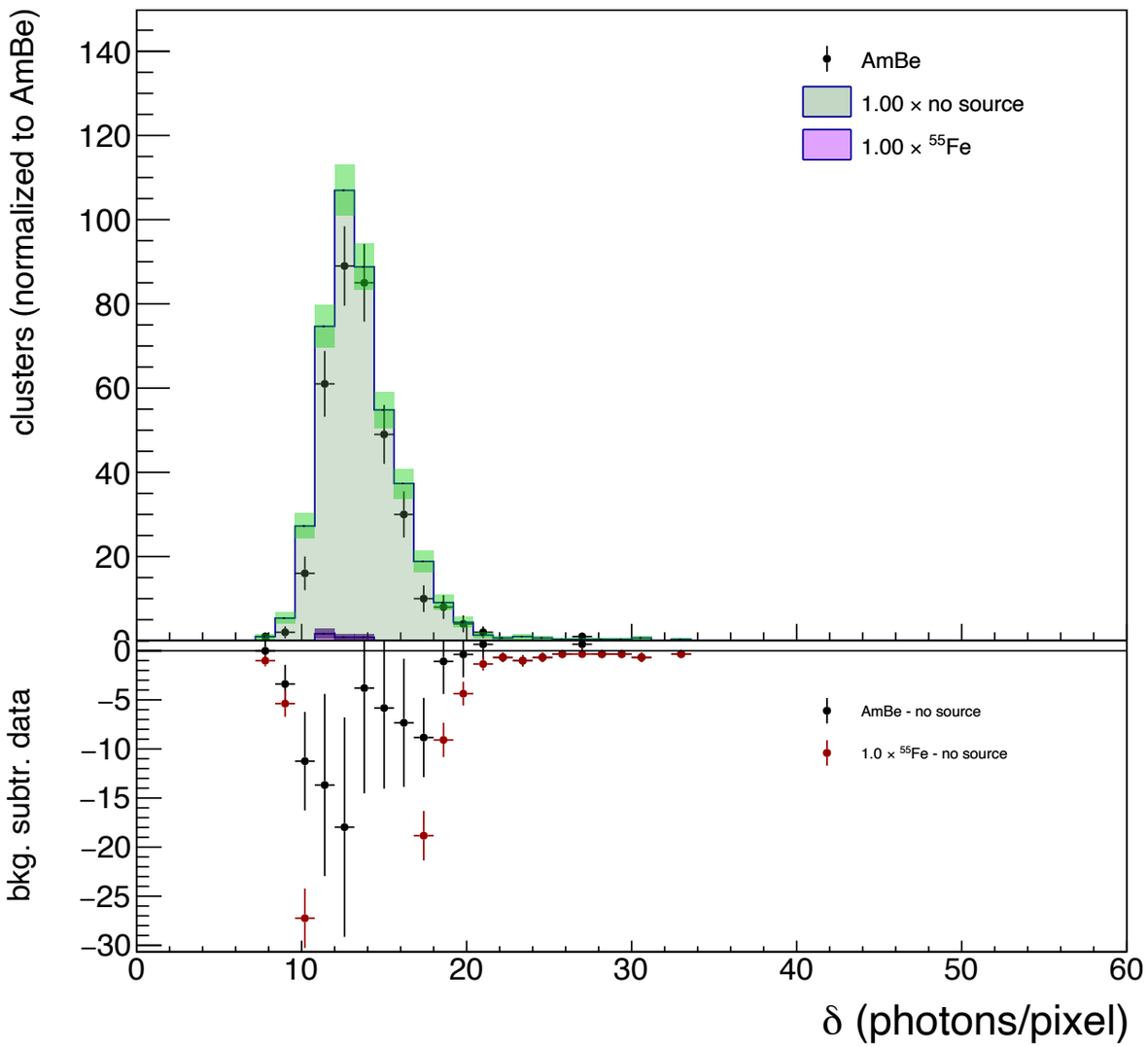


old noise filtering

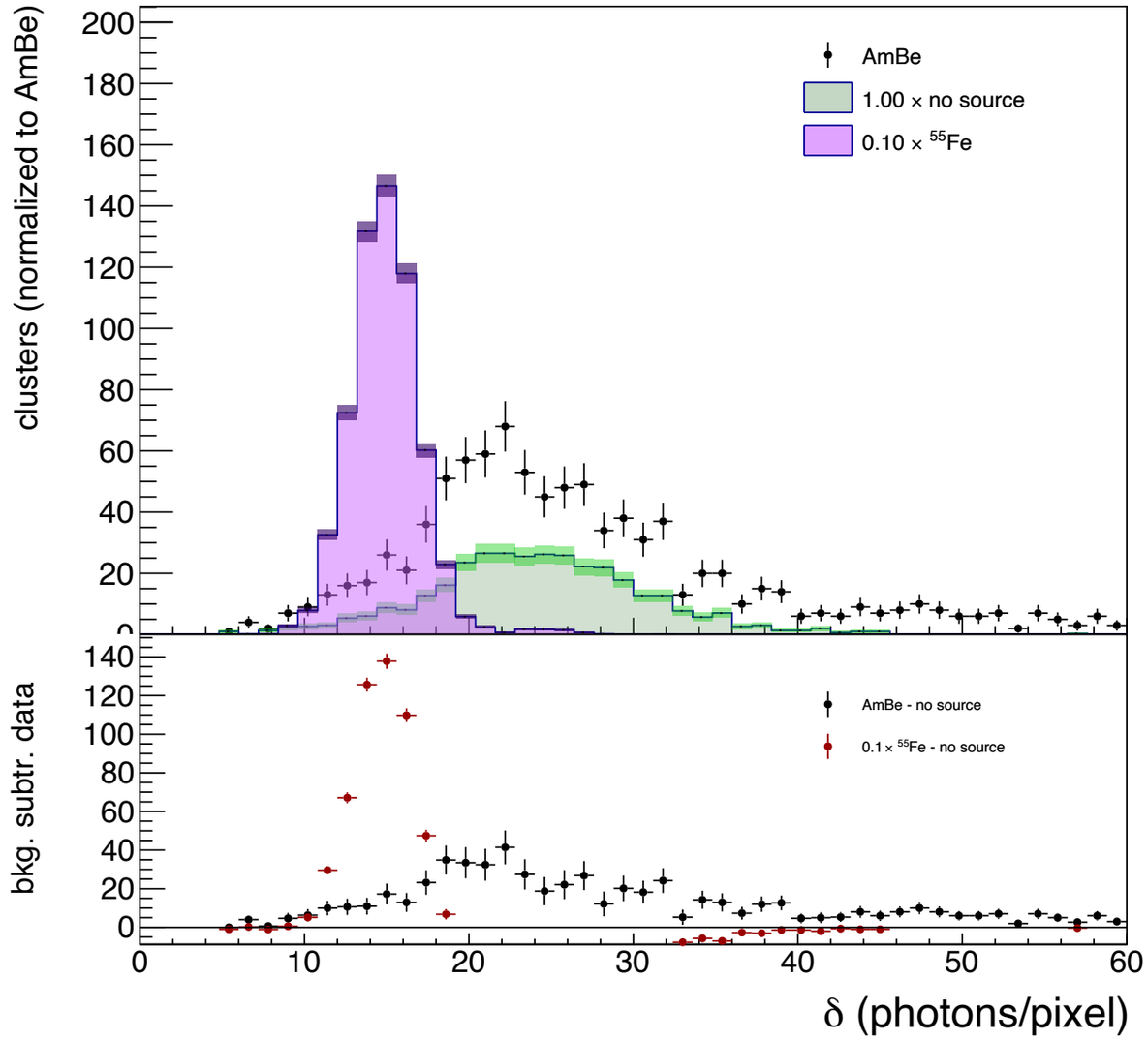
new noise filtering

applied to AmBe / ^{55}Fe

Solved partially the high density of long tracks, due to added noise, but...



Long (>12 cm) slim tracks



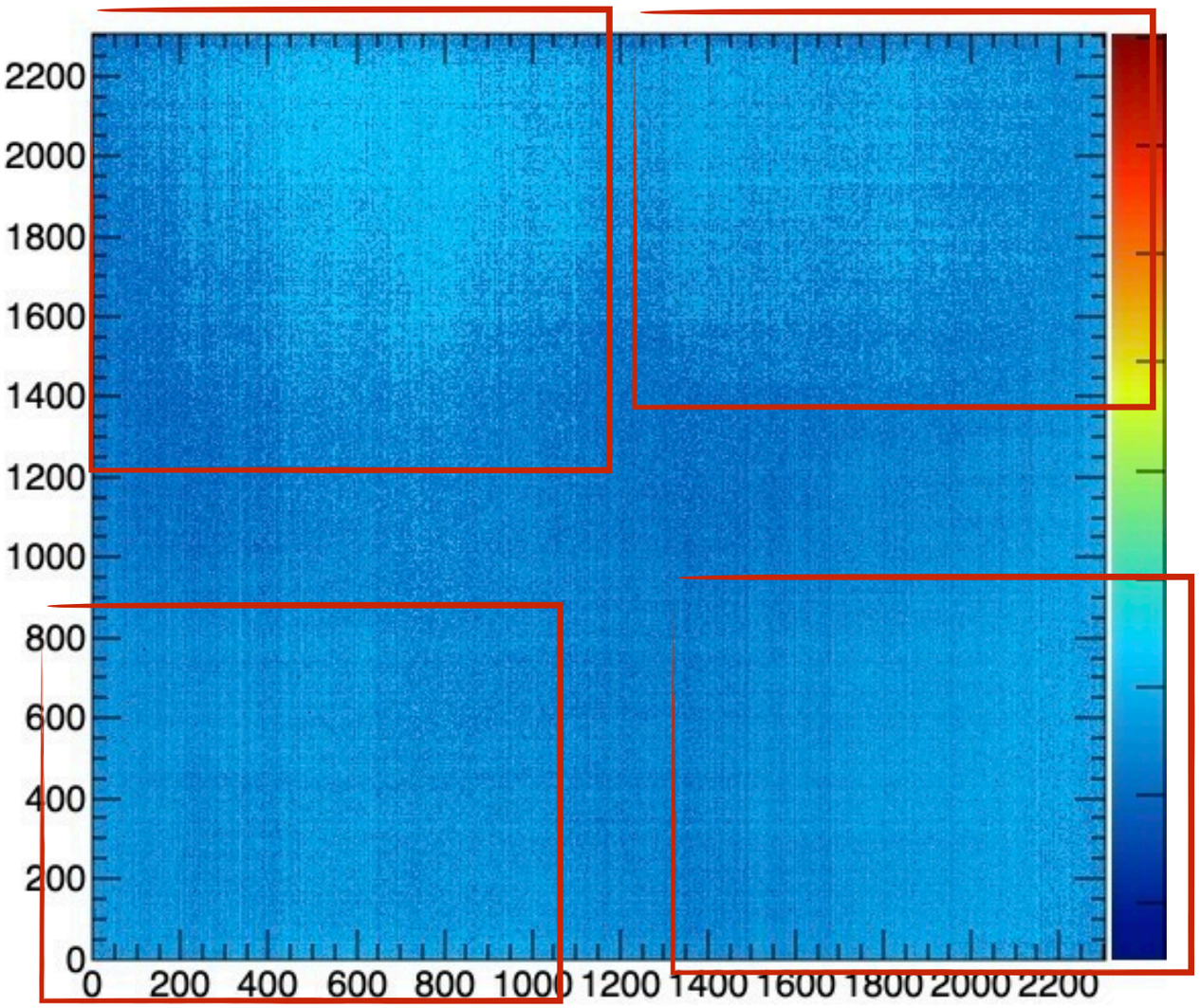
short tracks (<1cm)

δ of cosmics now < Fe. Still high...

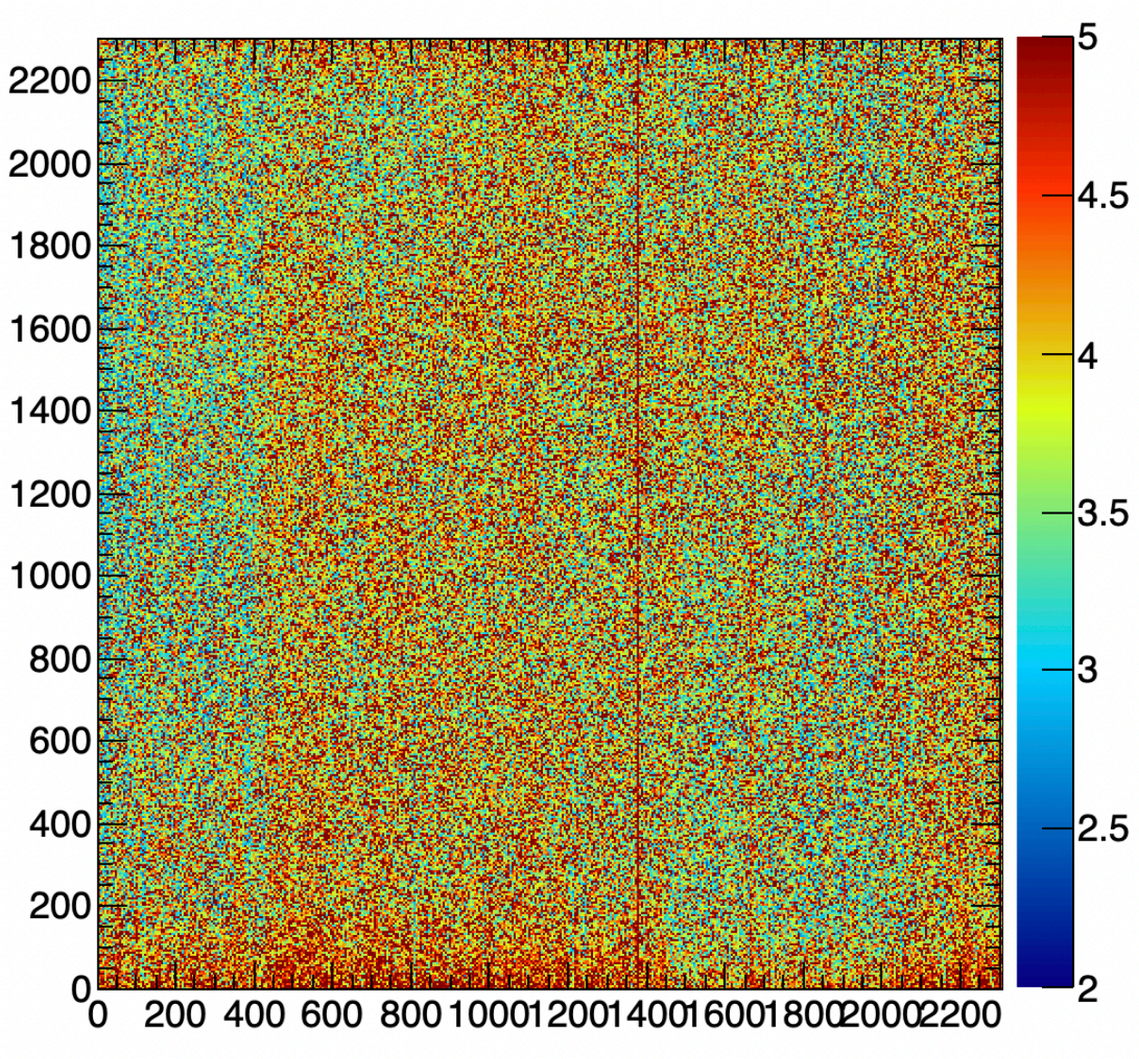
pattern sensor noise

Pedestal value, but also noise of the sensor is not random. It goes along strips and is different in 4 areas.

pedestal run with camera on LIME and HV OFF



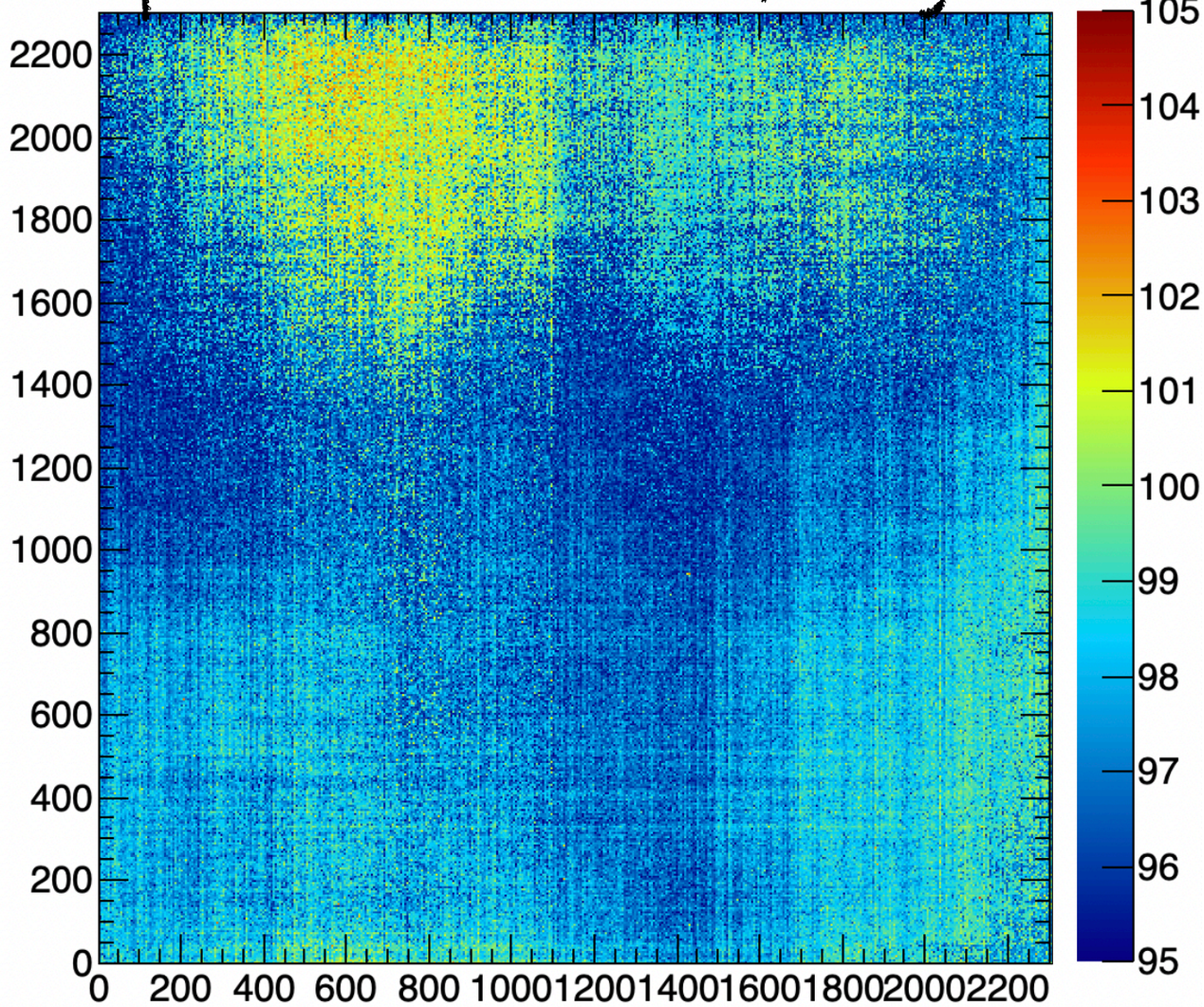
pedestal mean



pedestal RMS

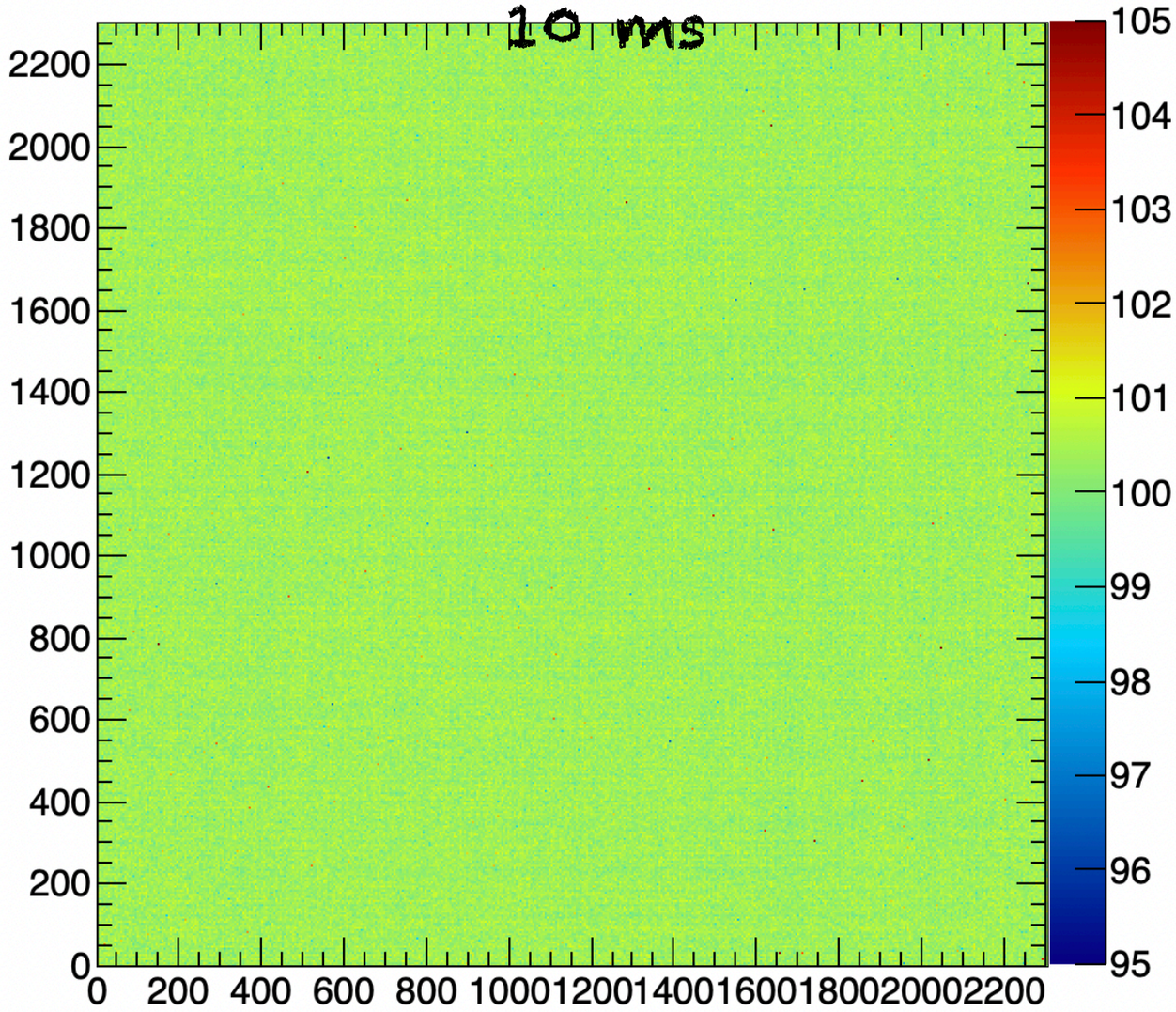
Pedestals?

pedestal on LIME, July 17



patterns at the borders
up to 10% local variations

pedestal with cap, 27 Nov
10 ms



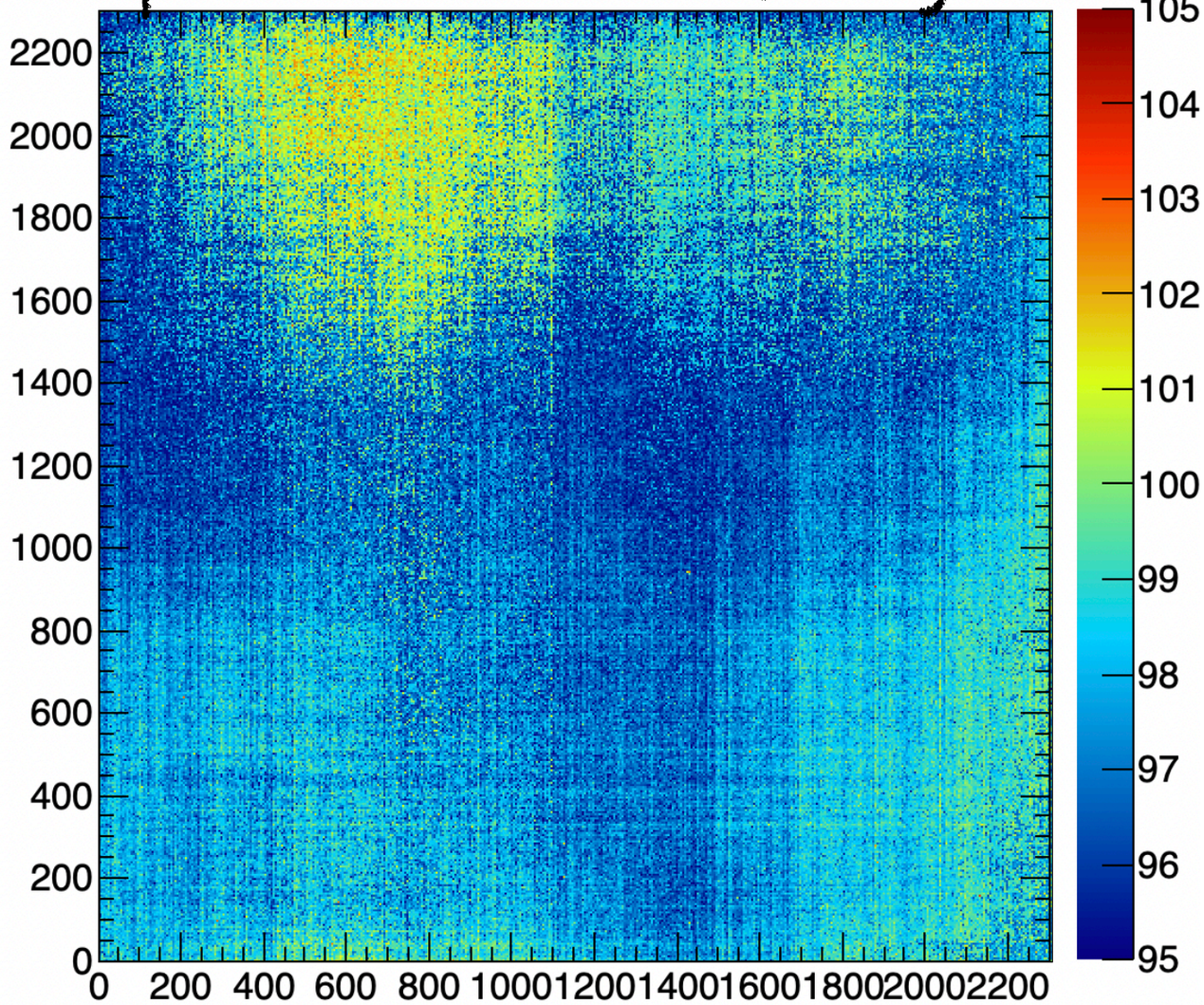
no patterns at all

LIGHT entering LIME during AmBe and Cs runs ?!?

This adds large fake energy in different zones

Pedestals?

pedestal on LIME, July 17



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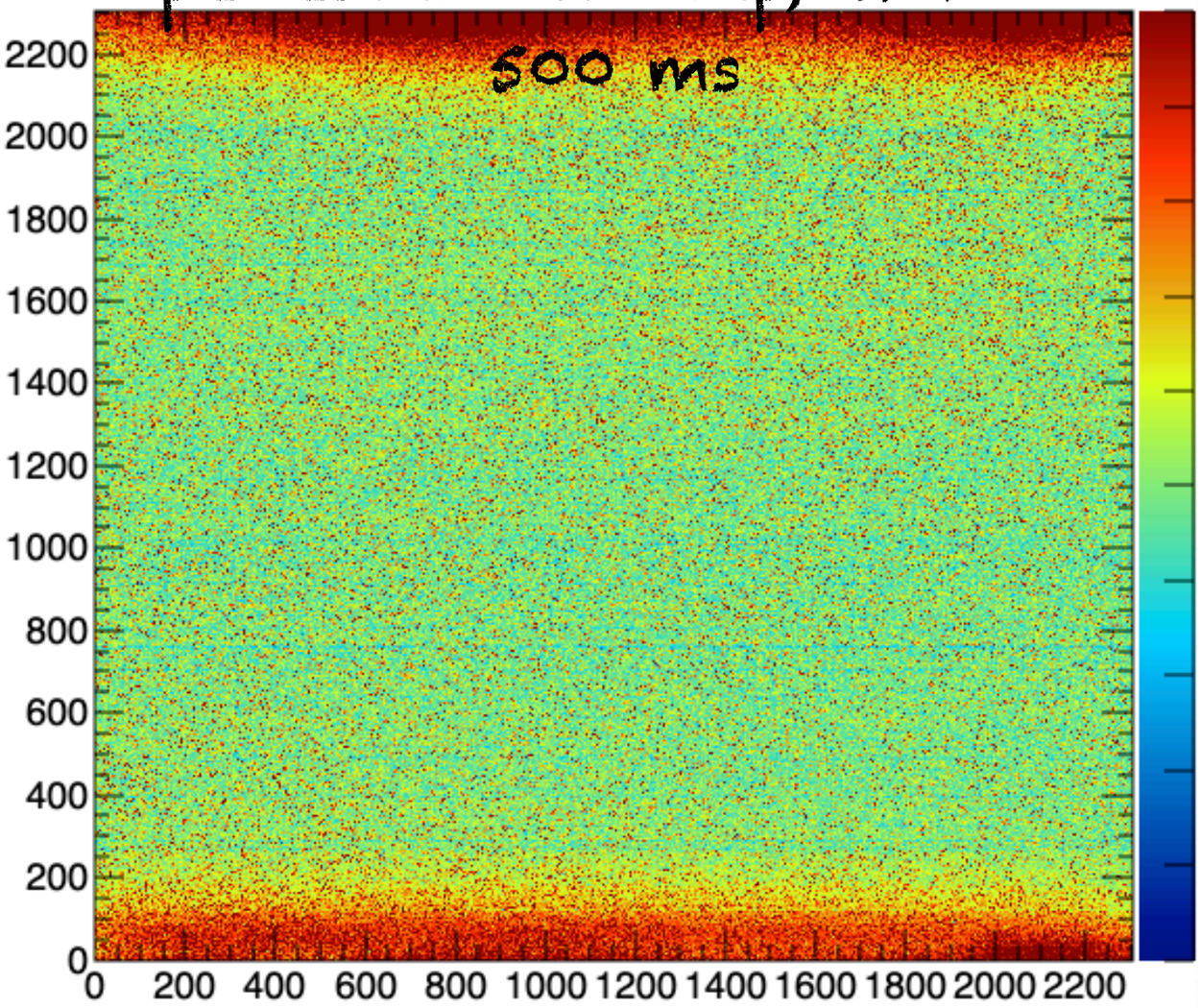
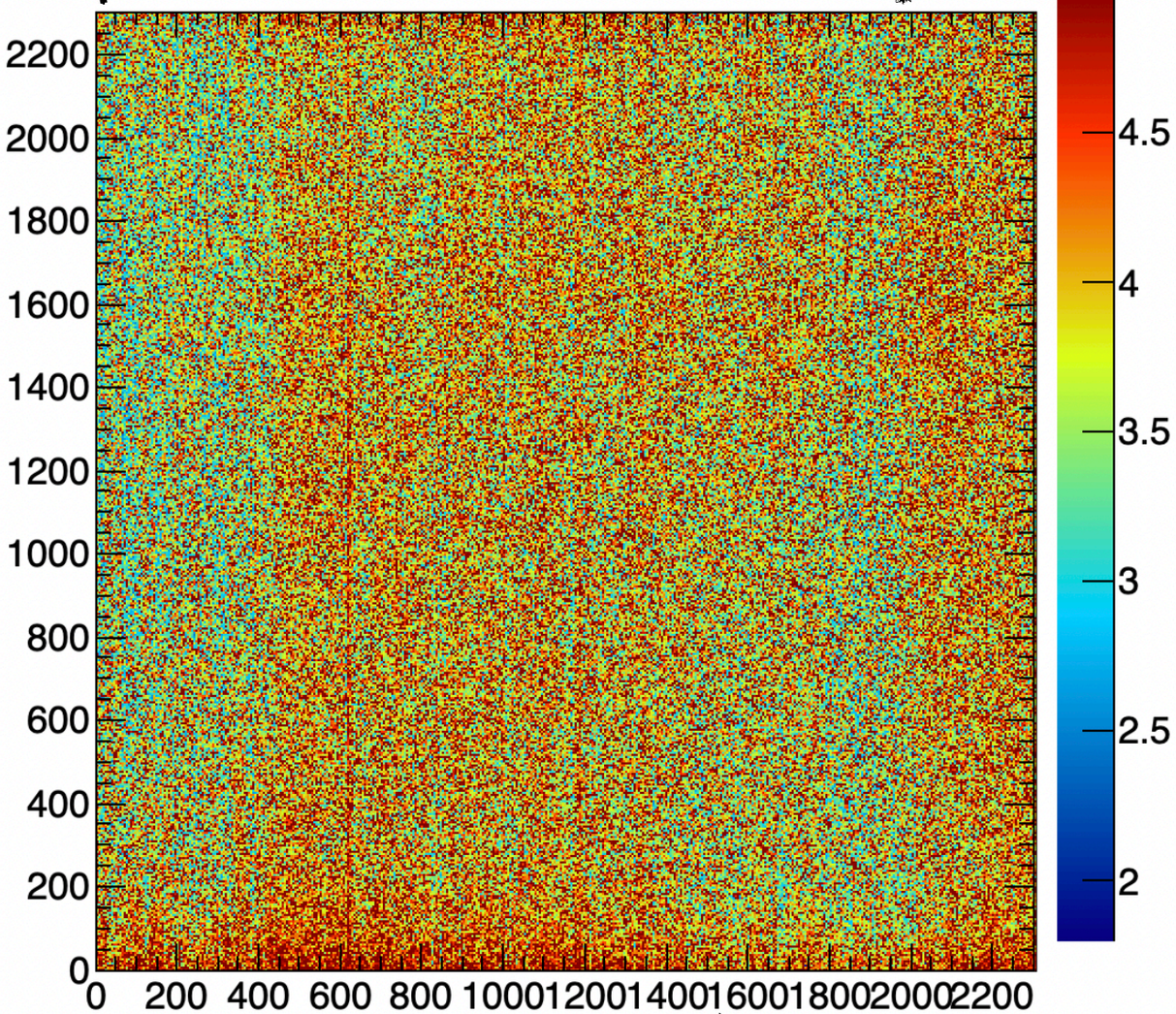


no patterns at all,
apart noise arising for aperture
longer than 500 ms

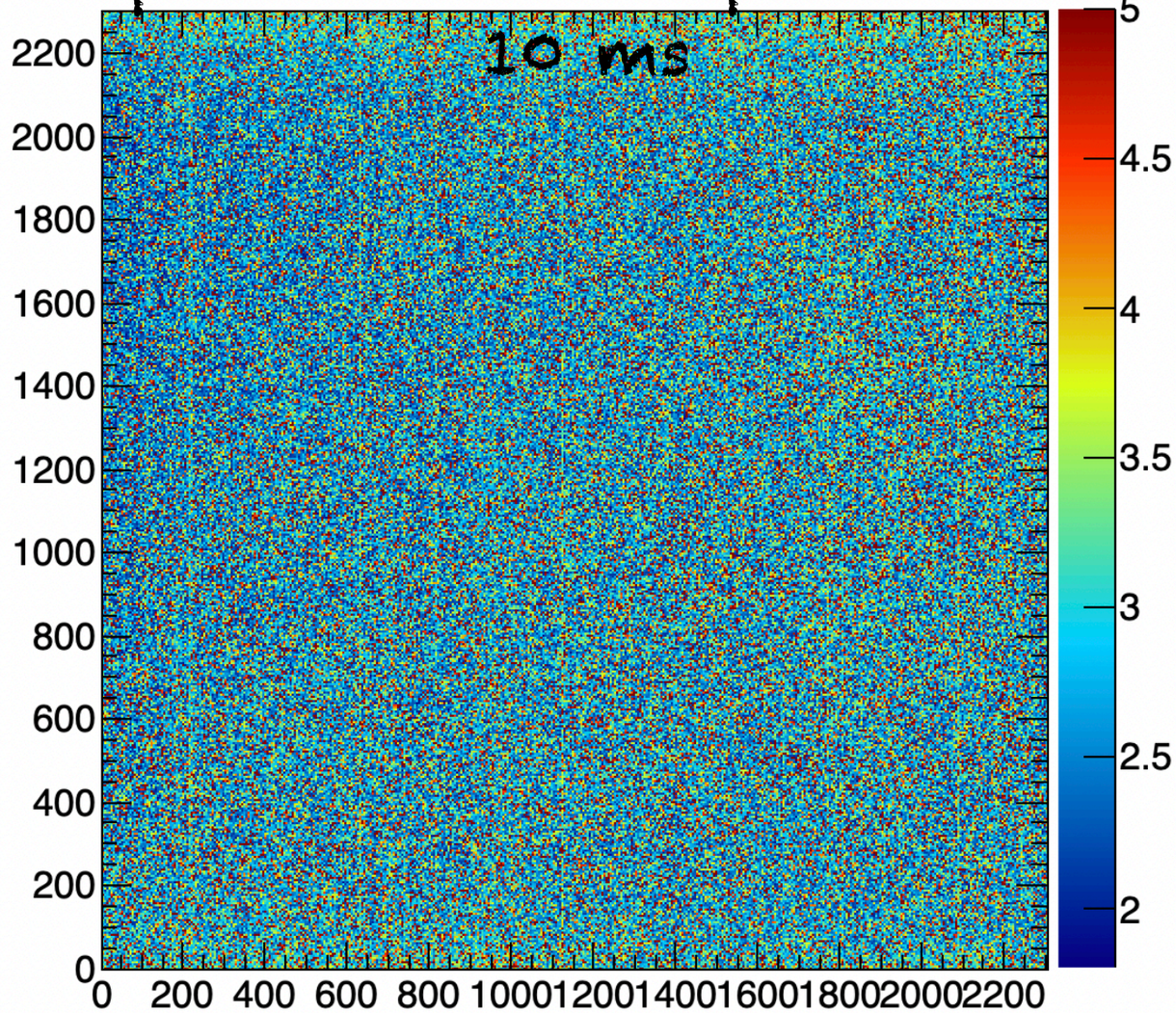
Pedestals RMS

pedestal on LIME, July 17



higher at the bottom
can be light variations?

pedestal with cap, 27 Nov

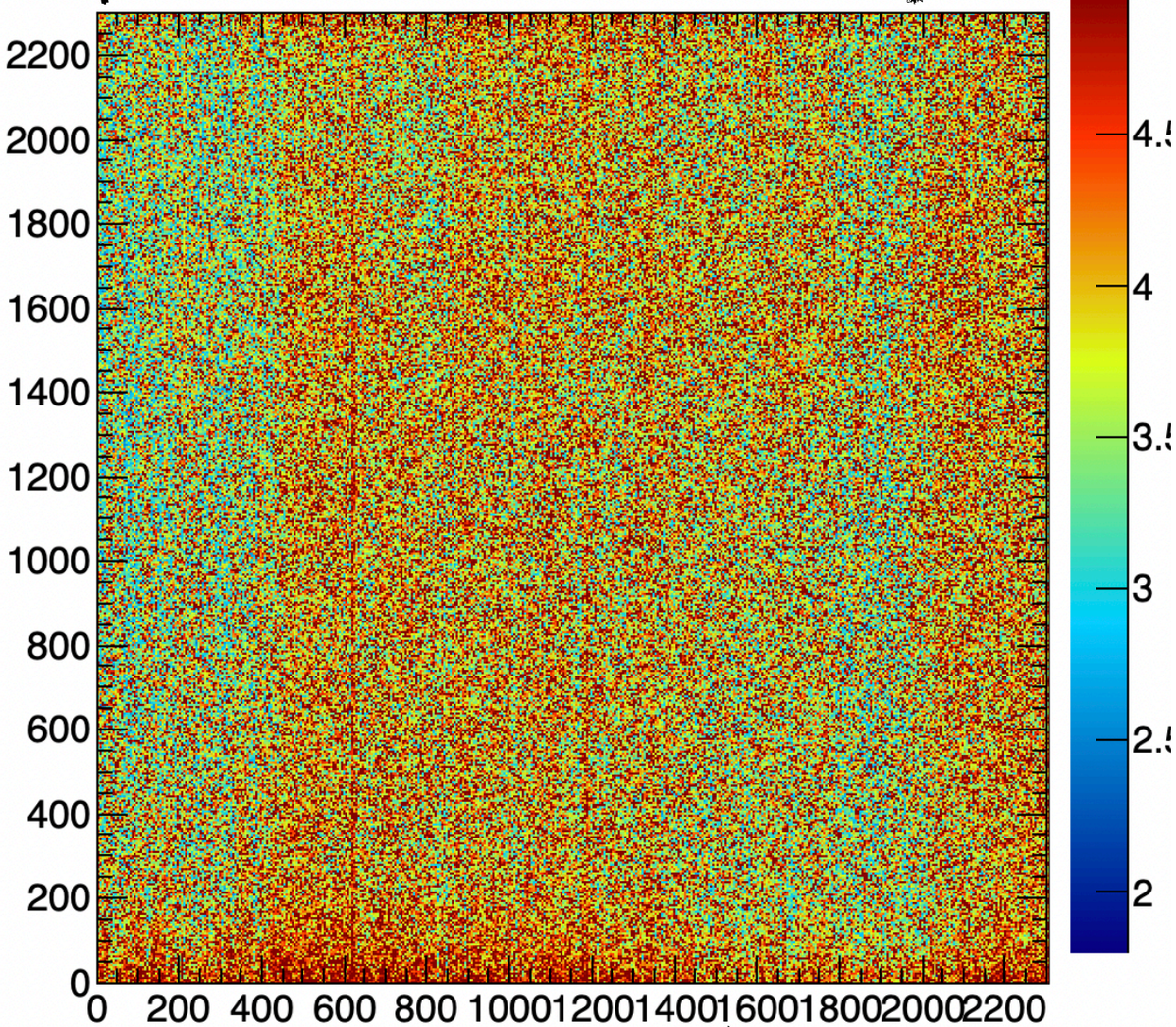


only a bit higher at the top/bottom

it means that 1.5σ cut of the ZS
is in reality 2σ cut

Pedestals RMS

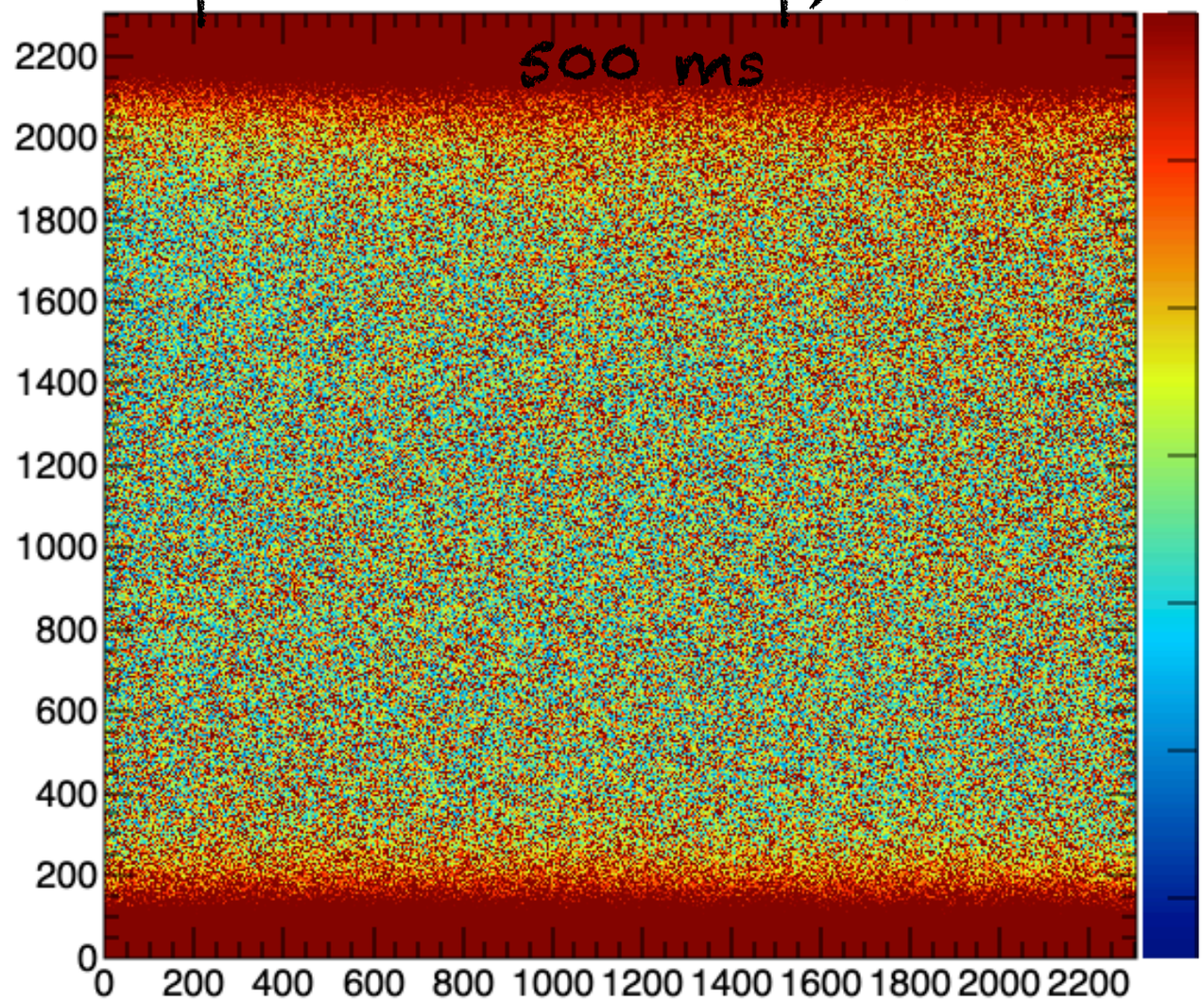
pedestal on LIME, July 17



higher at the bottom

can be light variations?

pedestal with cap, 27 Nov

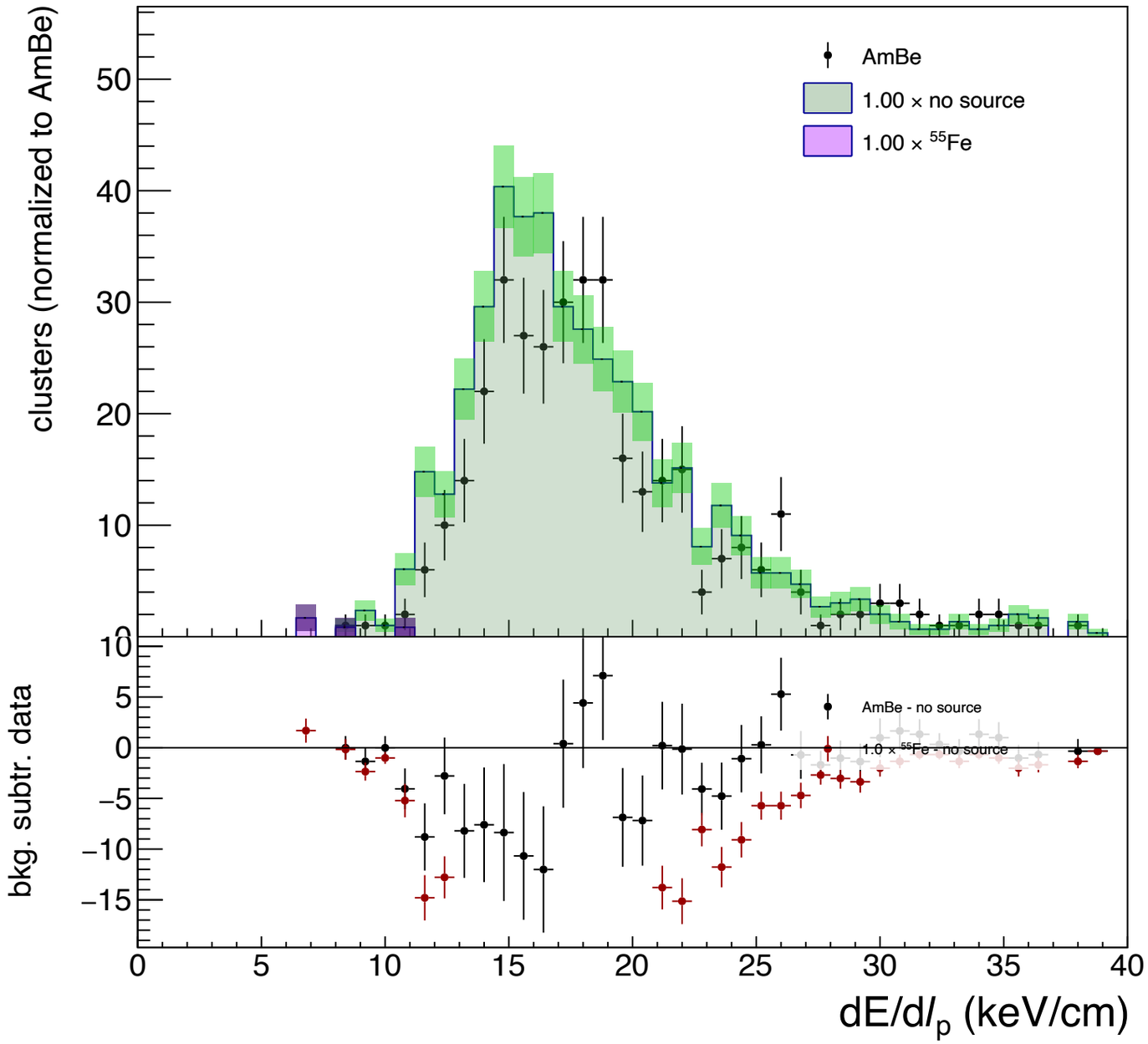


only a bit higher at the top/bottom

it means that 1.5σ cut of the ZS

is in reality 2σ cut

possible effect on energy

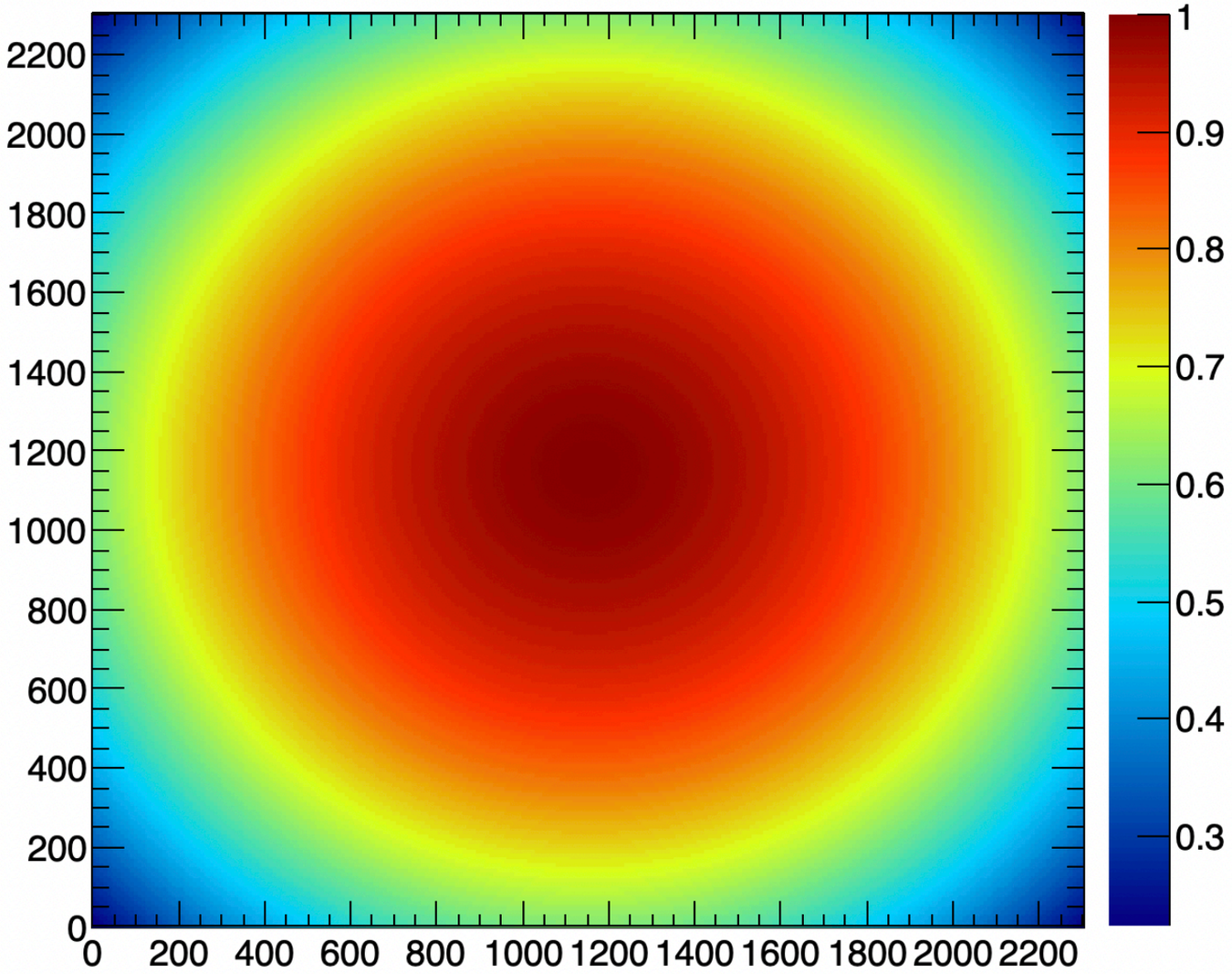


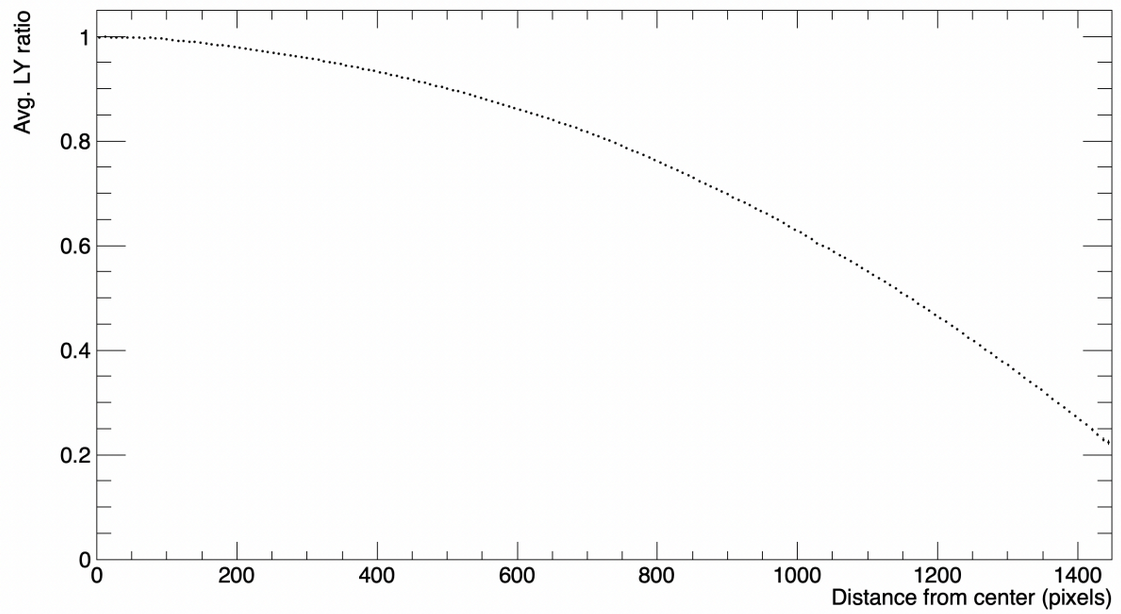
The extra light can be the reason of large dE/dx in cosmic tracks, which always traverse a poisoned region.

N.B. Even subtracting a pedestal with "light in" doesn't remove the issue, since ambient light variations during data-taking can be significant

Pure optical vignetting

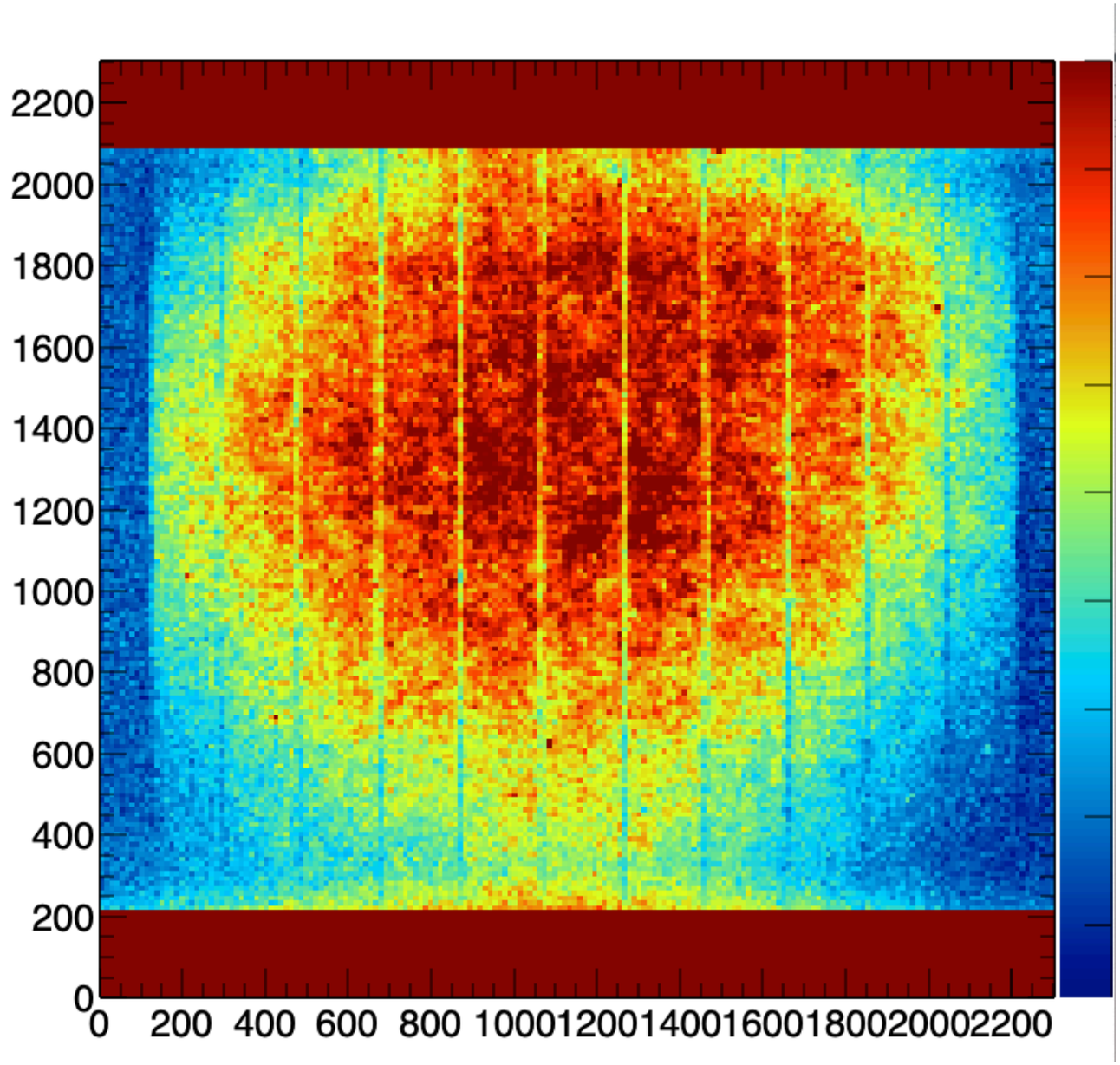
From pictures of white surface, averaged in 3 directions with ORCA flash





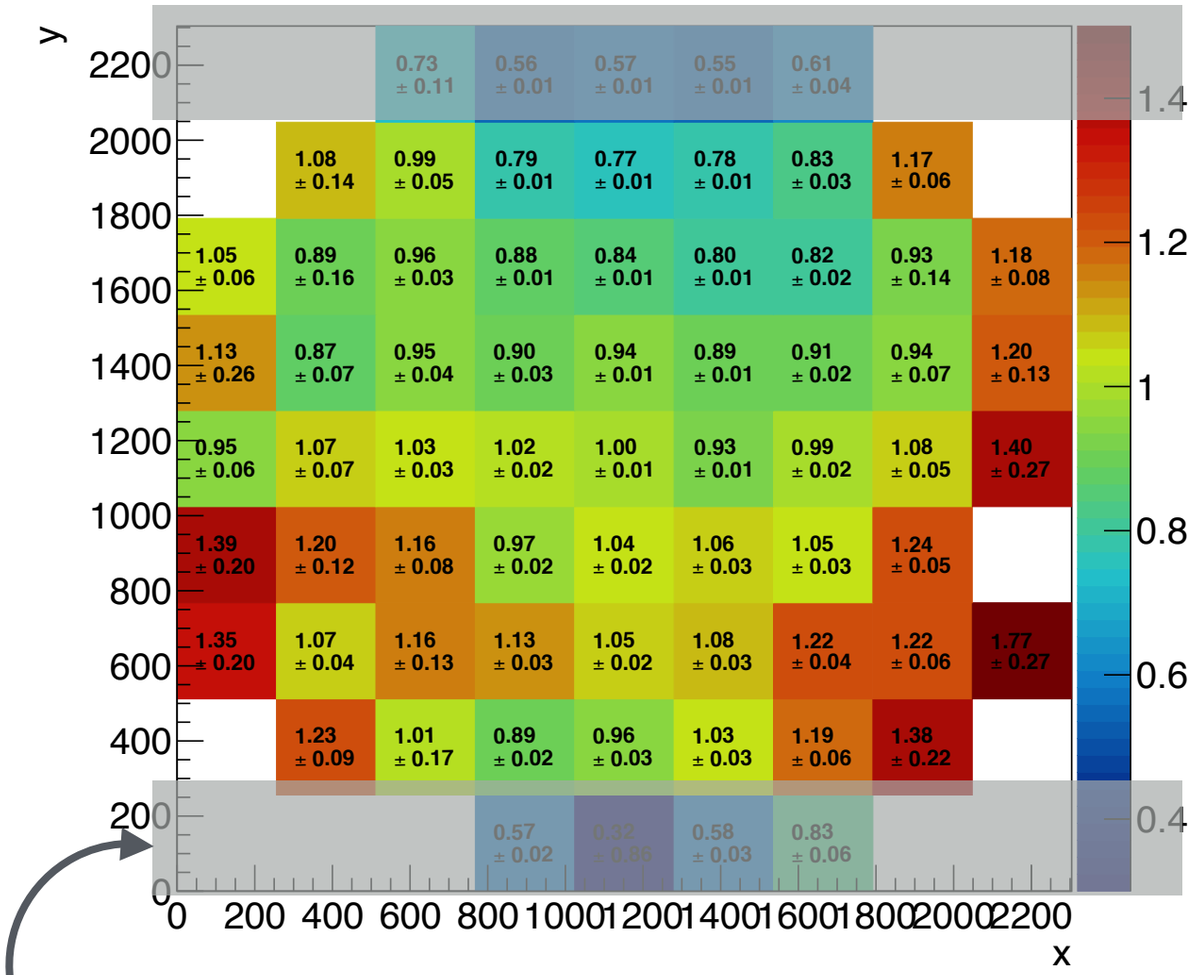
Full "vignetting"

Using average response from cosmics run 3806



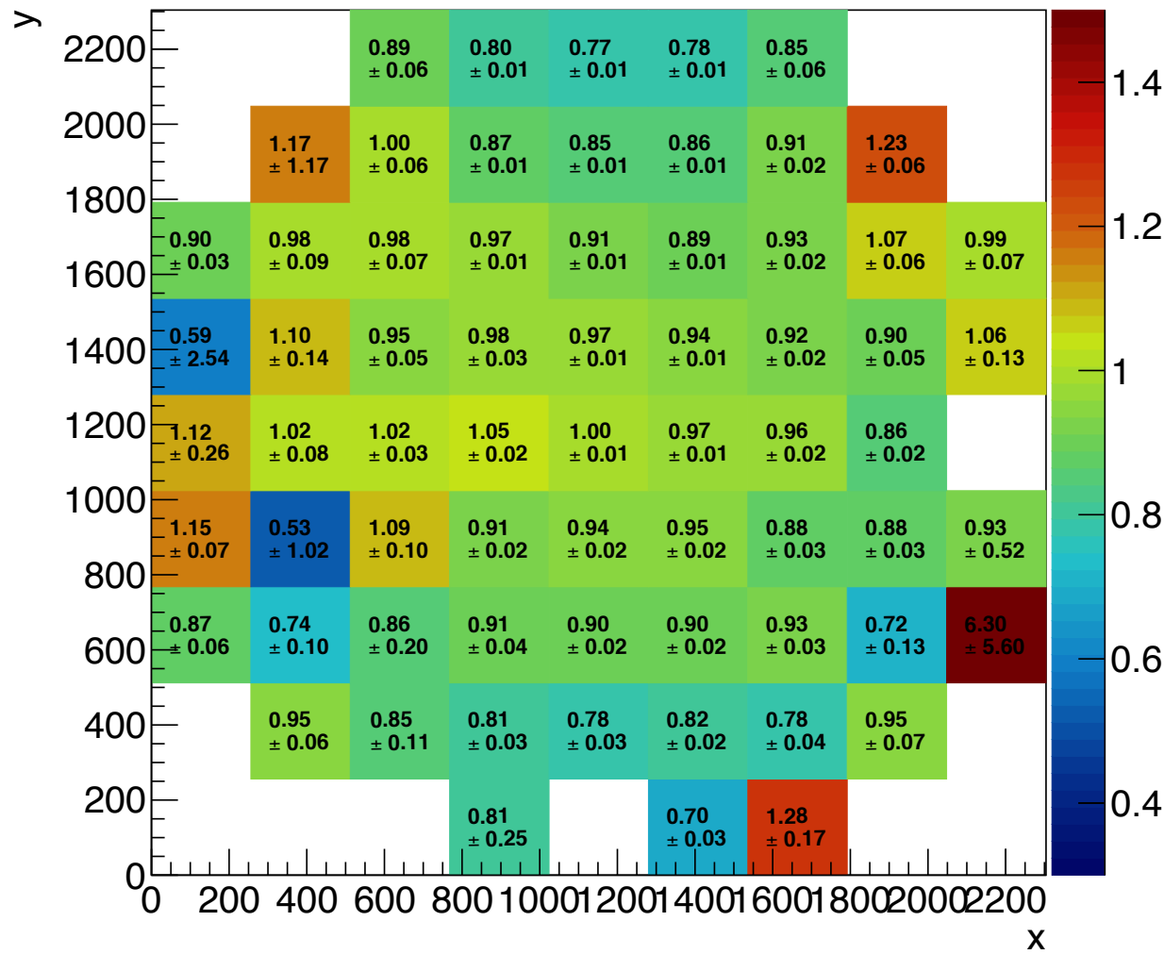
E scale with ^{55}Fe

Applied to 55Fe spots. Energy scale a bit more uniform with optical vignetting correction. Still a 10-20% residual effect?



noisy regions not corrected

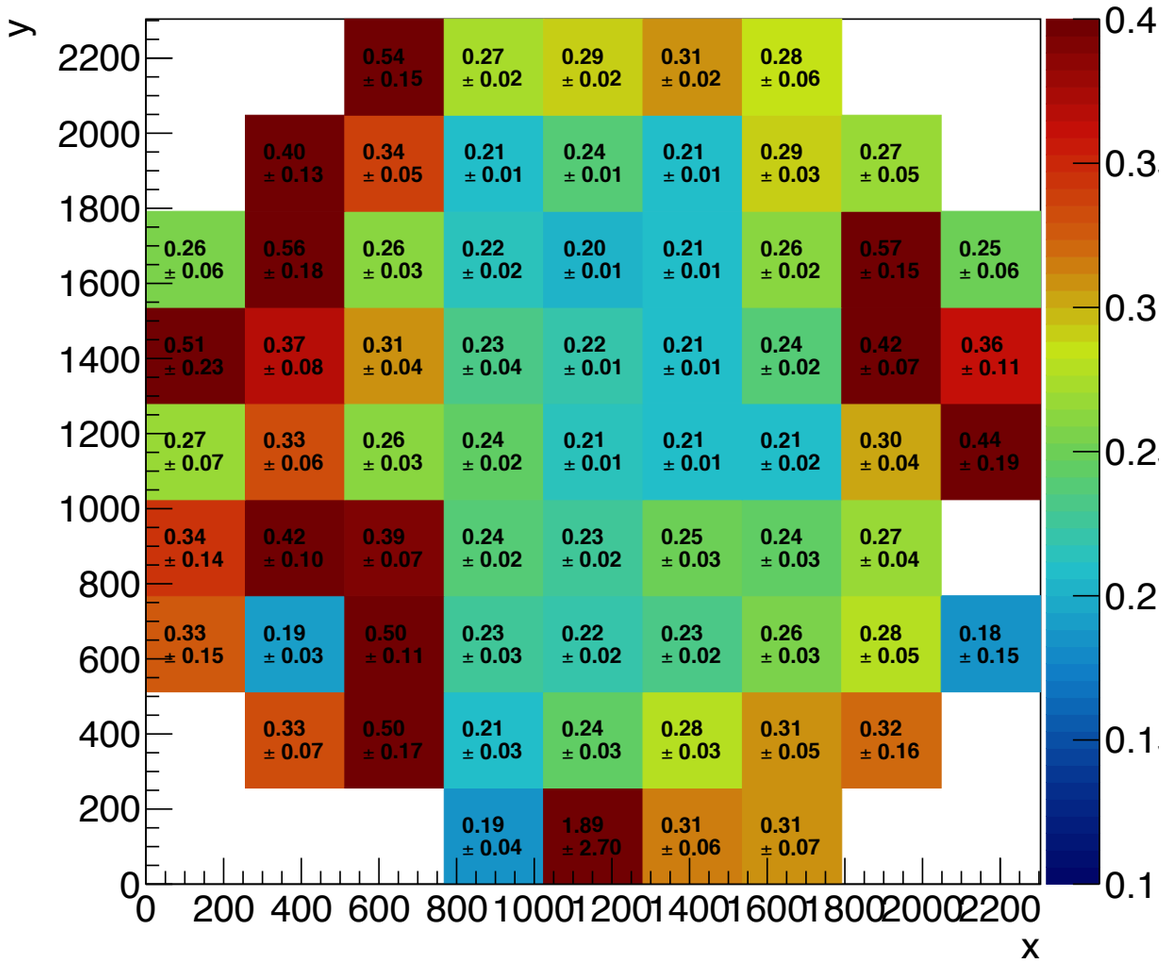
Correction with run 3806



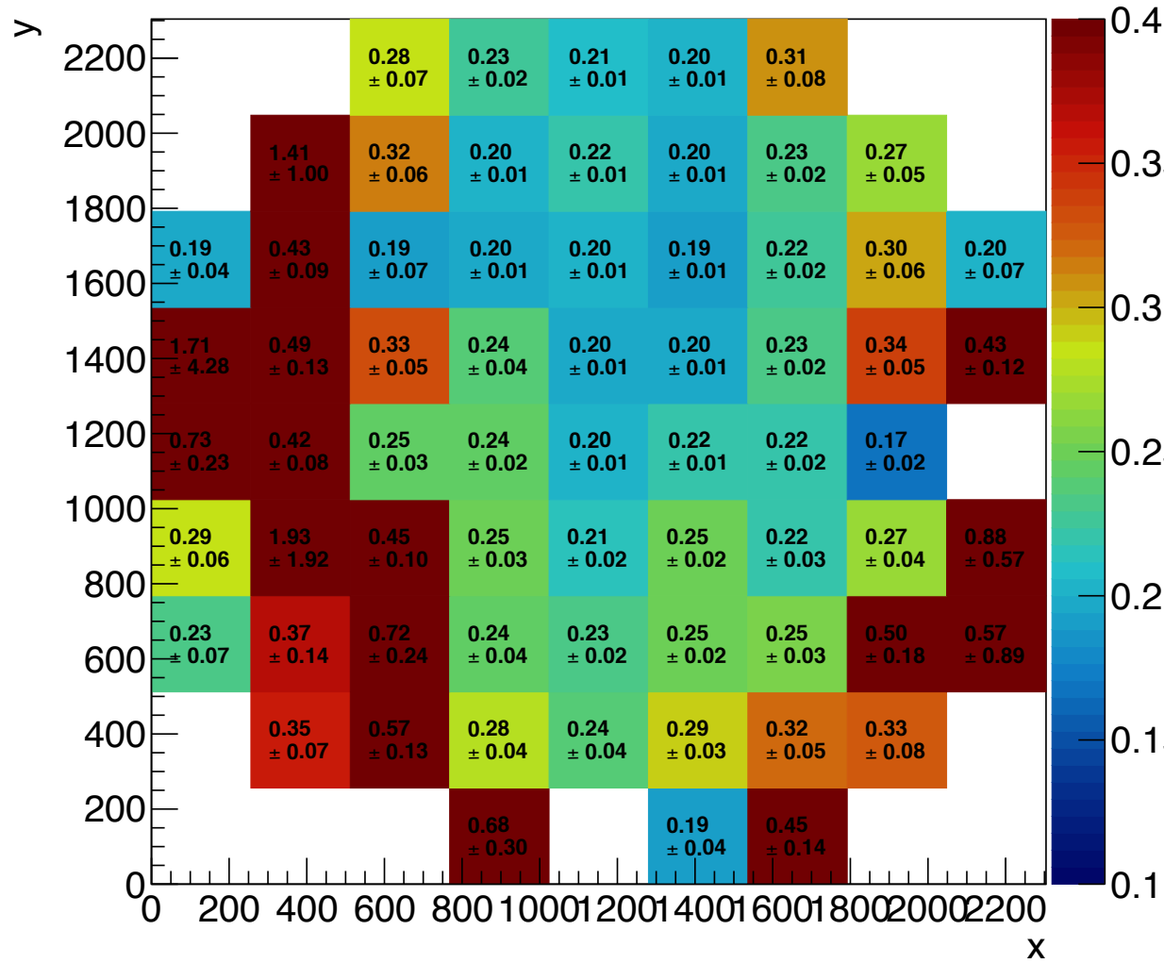
Optical-only correction

E resolution with ^{55}Fe

Similar resolution with both corrections (~20%)



Correction with run 3806



Optical-only correction