

A crosscheck with the Lemon AmBe runs

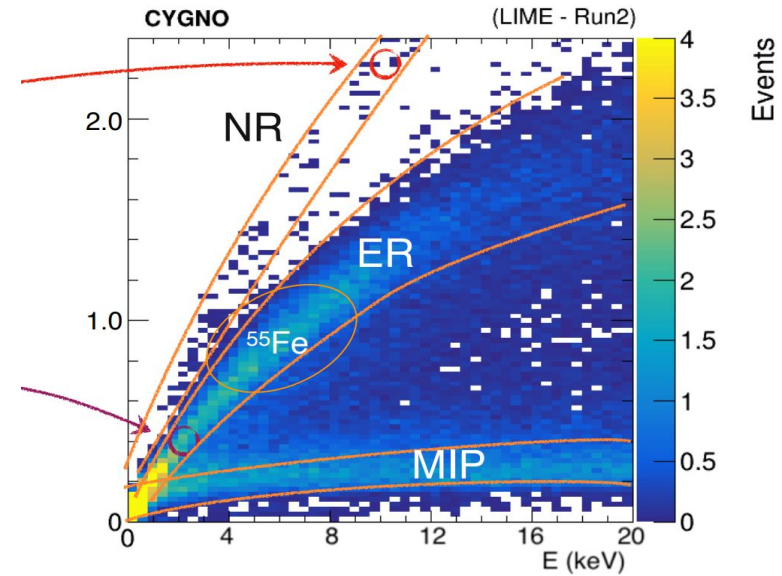
Matteo Folcarelli & Stefano Piacentini

E. BAracchini, F. Borra, E. Kemp, D. Marquez, A. Messina, A. Prajapati

Key Idea

Goal: Understand where the events consistent with NR from AmBe would be in the LIME RUN2 E vs dE/dx plot.

Type	Runs **	Link reco files
Ambe	2097-2098	https://cernbox.cern.ch/index.php/s/uQJt4VrkJNqbstu/download
Bkg	2156-2159	https://cernbox.cern.ch/index.php/s/EoYzBbEnShCYkmj/download
Fe	2065-2089*	https://cernbox.cern.ch/index.php/s/0KUaJhSoi5xqJa7



** link to row data (not for Fe)

* non all runs in the sequence

Run	# Events	# Reco clusters
AmBe	1467	7433
Bkg	3175	8358
Fe	1255	8245

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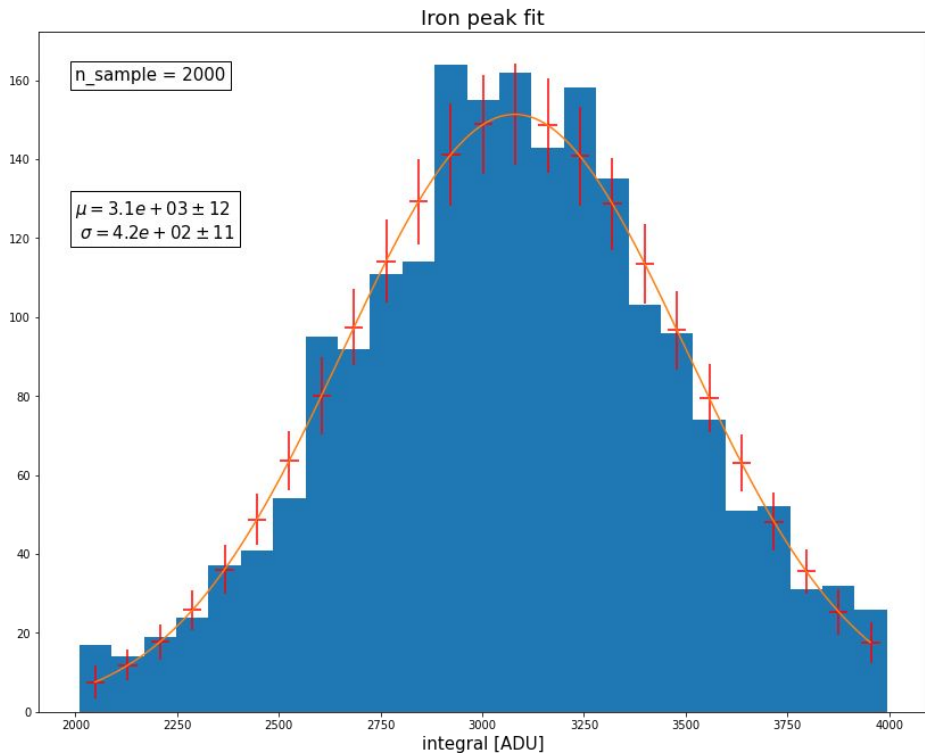
- Look at the distributions of reco variables for the three types of LEMON runs
- Identification of cuts, based on the previous look, to select AmBe specific events
- Application of those cuts and direct look on selected clusters
- Application of the same cuts on LIME datas (with the corresponding transposition)
- Direct look to the selected clusters and to their position on the *E vs dE/dx plot*
- Conclusions:

This analysis confirms that, due to saturation, there is a superposition of the ER and the NR band on the *E vs dE/dx plot*.

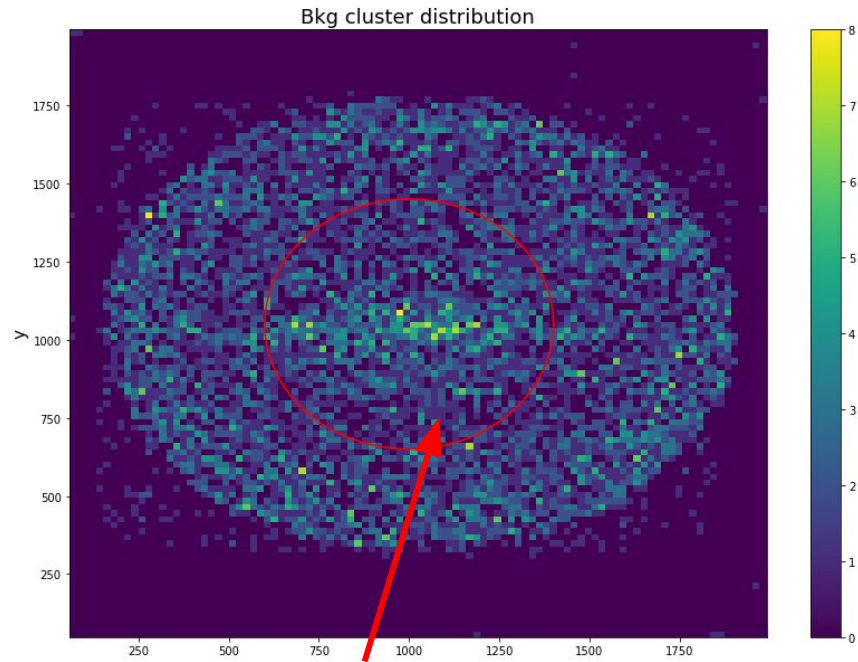
Reconstructed variables distributions - first operations

All distribution normalized to the background exposure time with the factor

$$f_i = \frac{events_i}{events_{Bkg}}$$



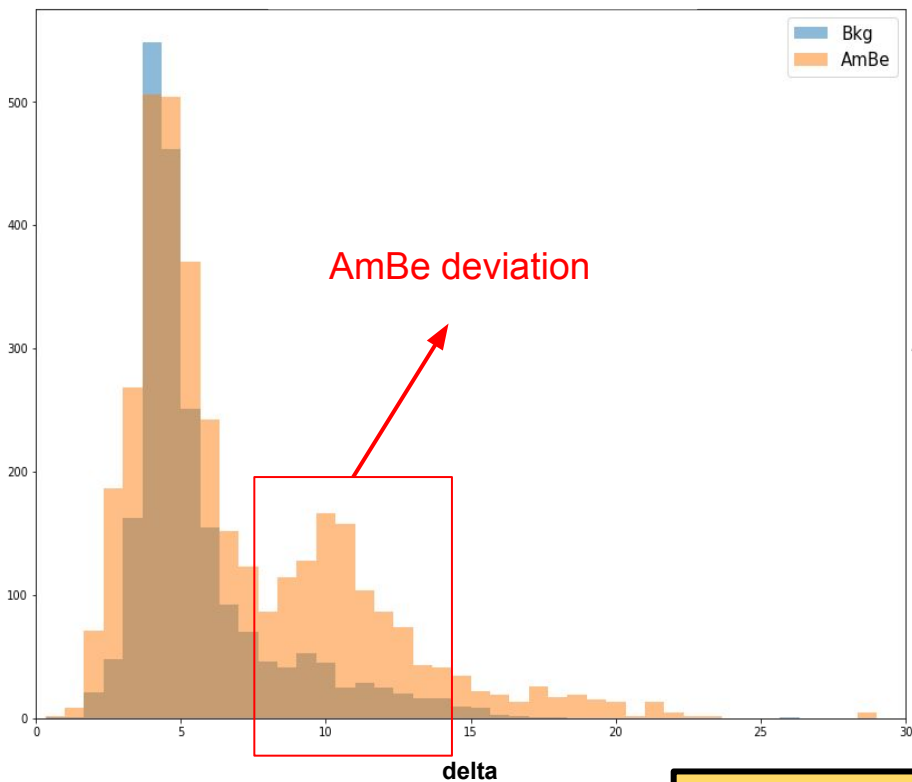
Iron calibration of that runs



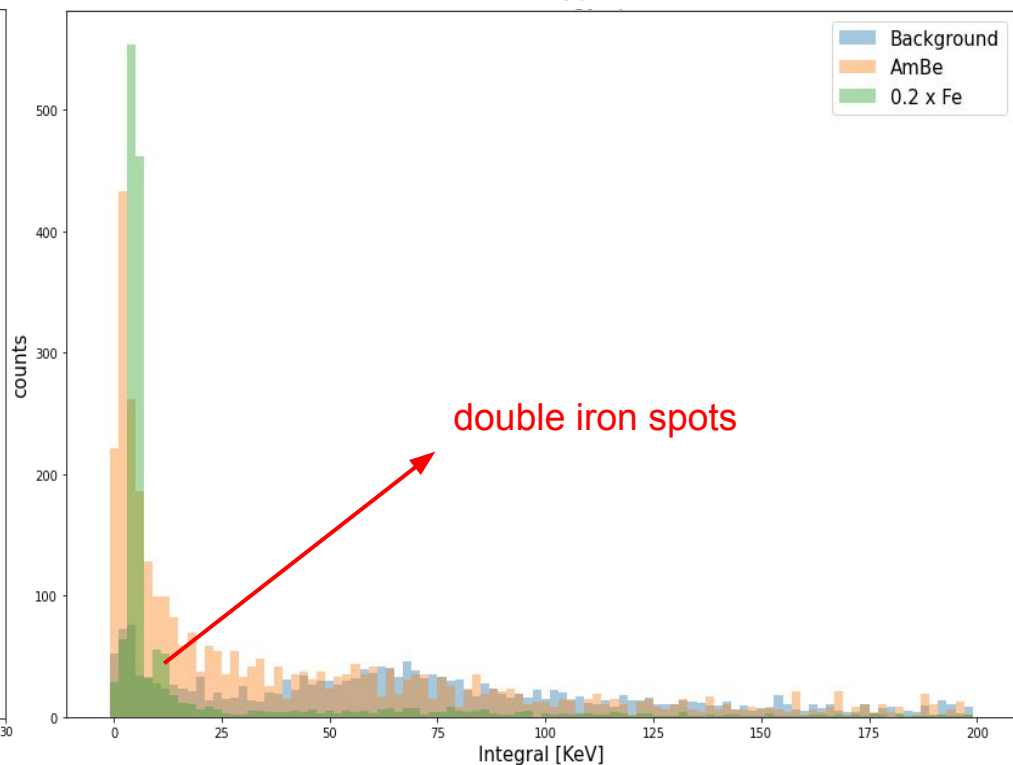
Considered clusters only in the central region

Reconstructed variables distributions

normalized delta distribution



normalized energy distribution

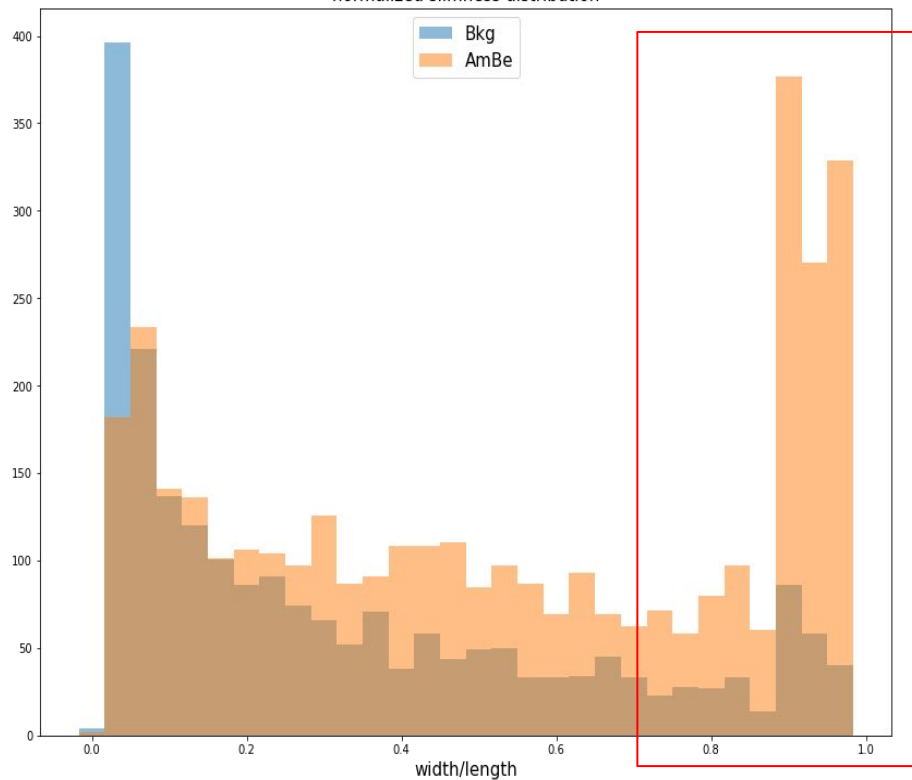


$$\text{delta} = \text{sc_integral} / \text{sc_nhits}$$

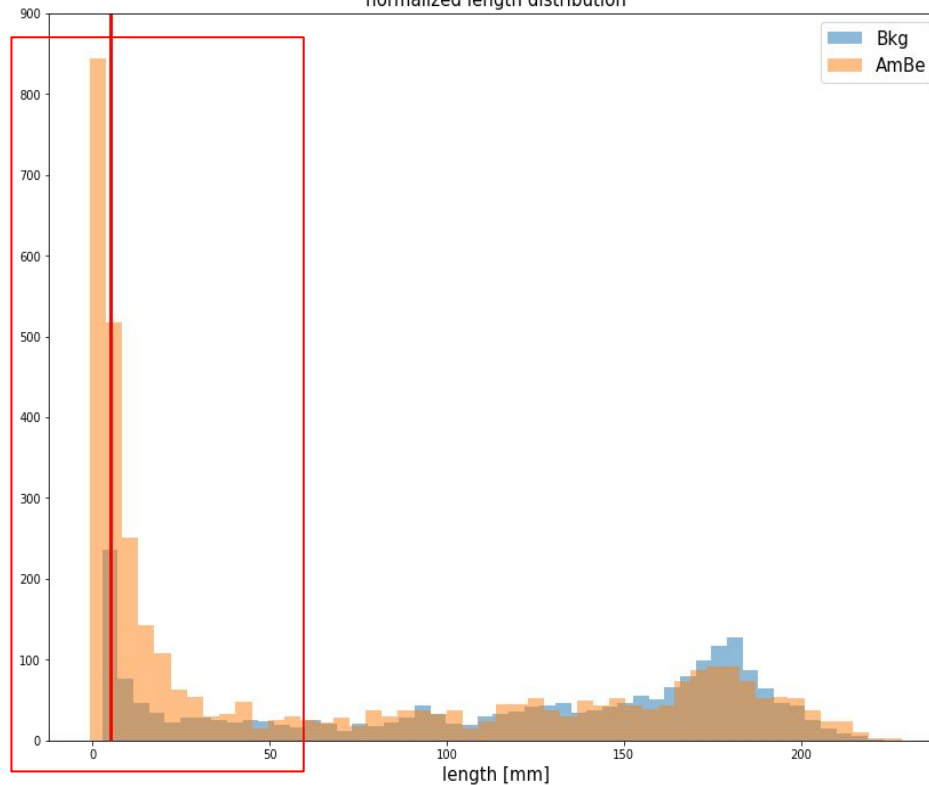
Reconstructed variables distributions

AmBe deviation

normalized slimness distribution



normalized length distribution



Cuts to isolate the AmBe deviation

CUTS:

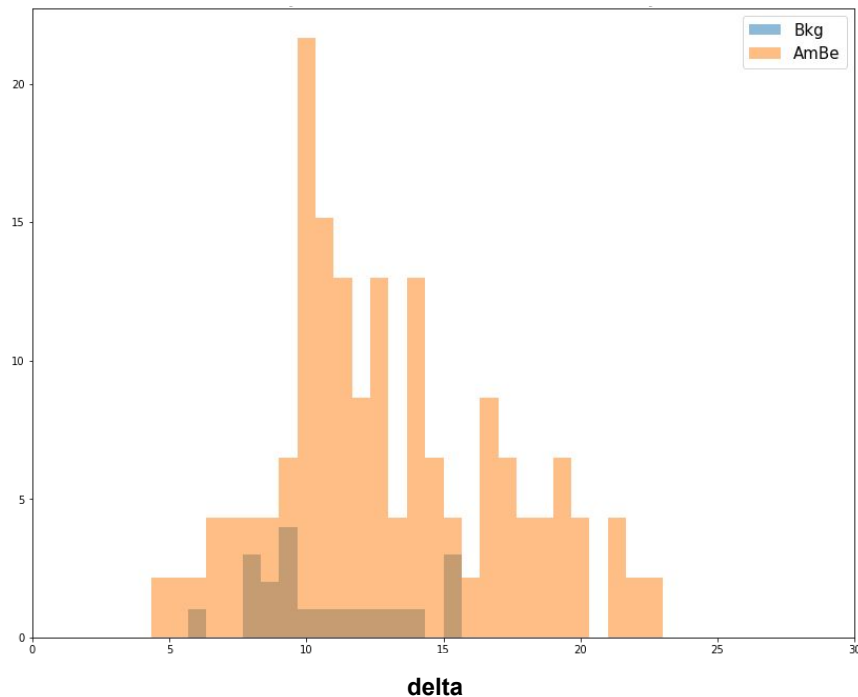
Radius (x,y,xc=1000,yc=1050) < 400 px

width/length > 0.8

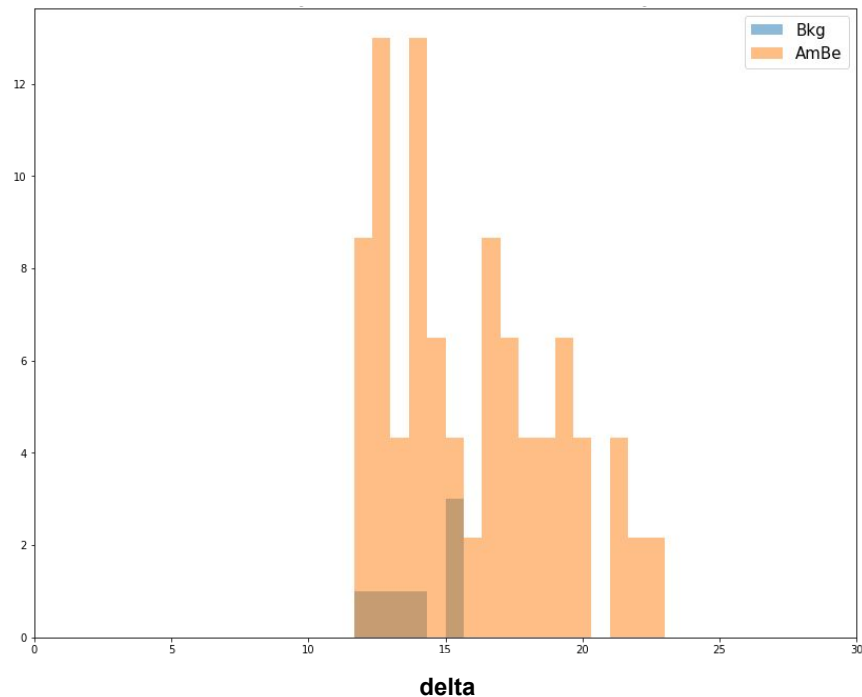
length < 0.5 cm

density = integral/nhits > 12 [ADU]

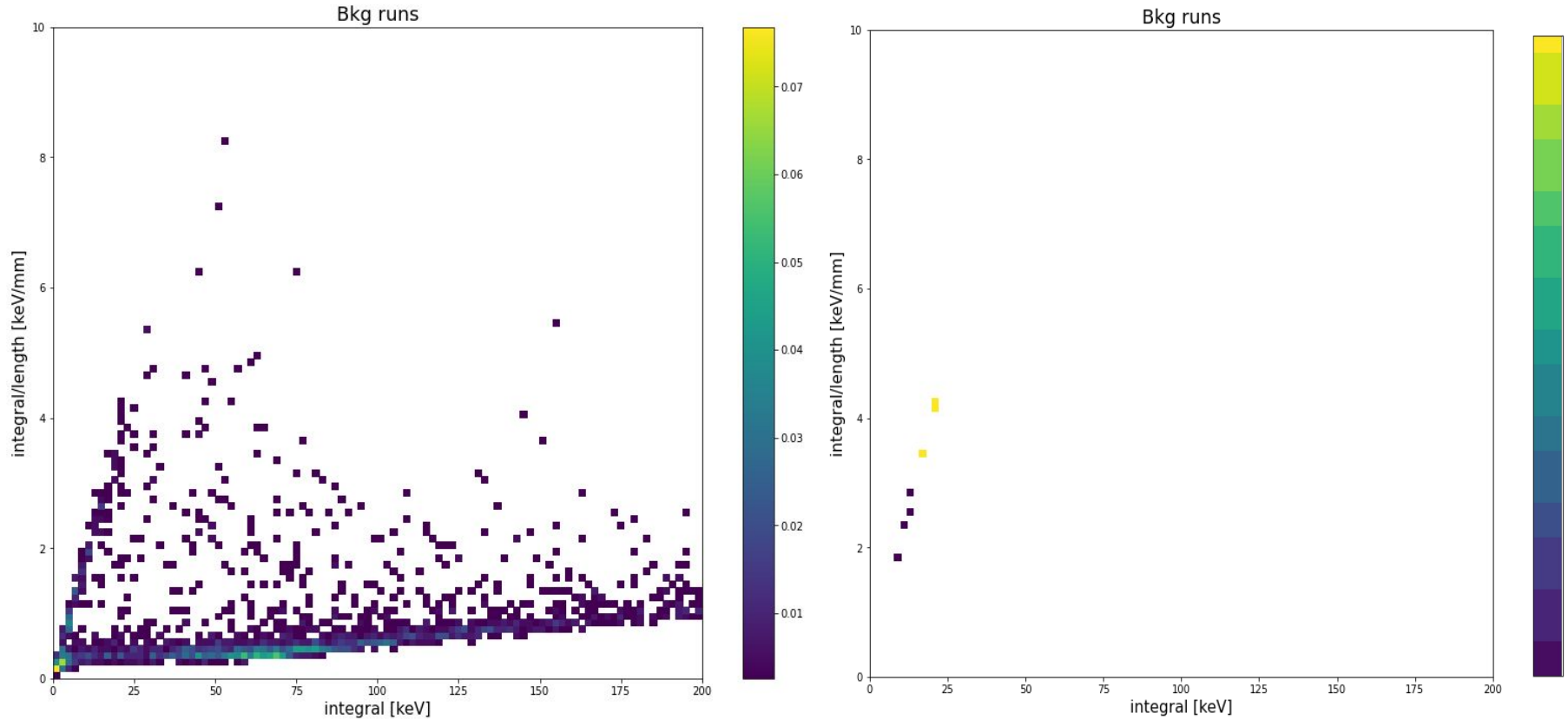
normalized delta distribution



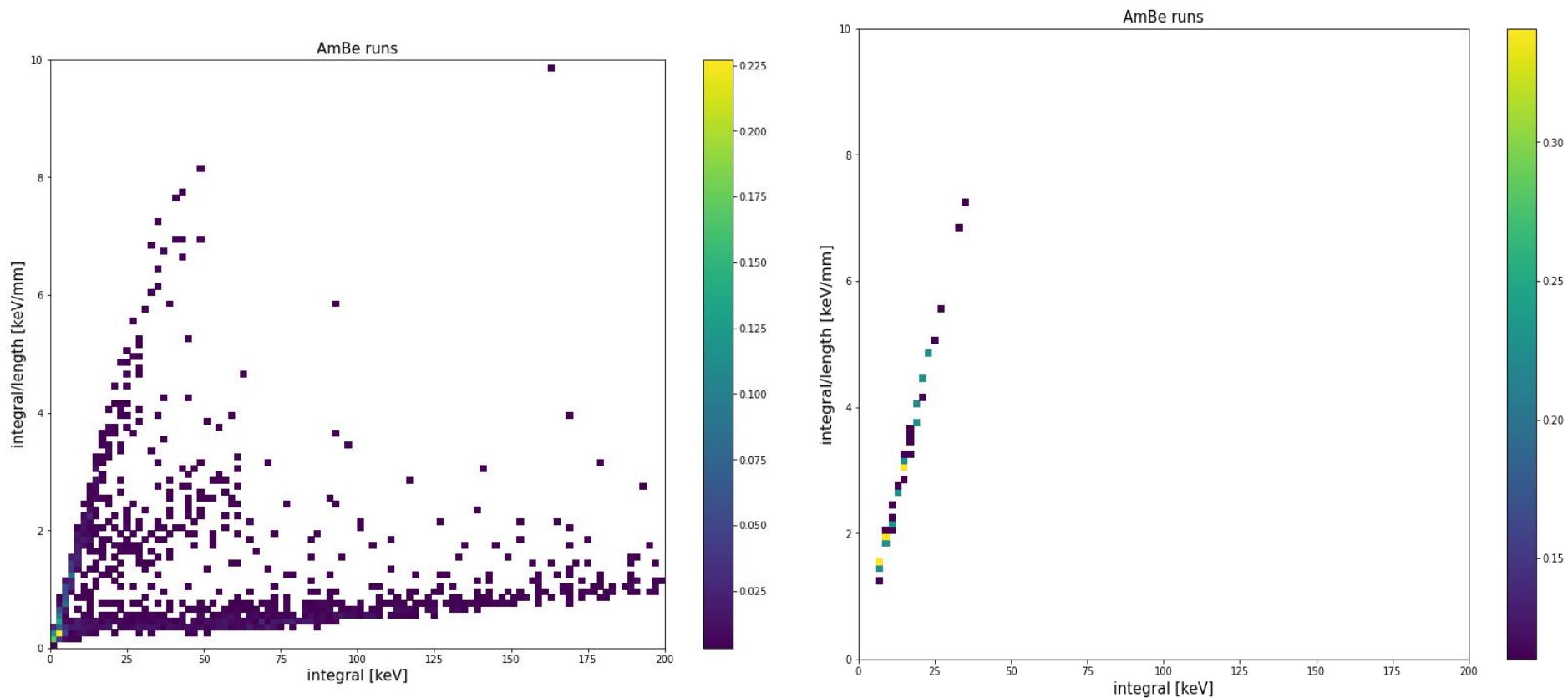
normalized delta distribution



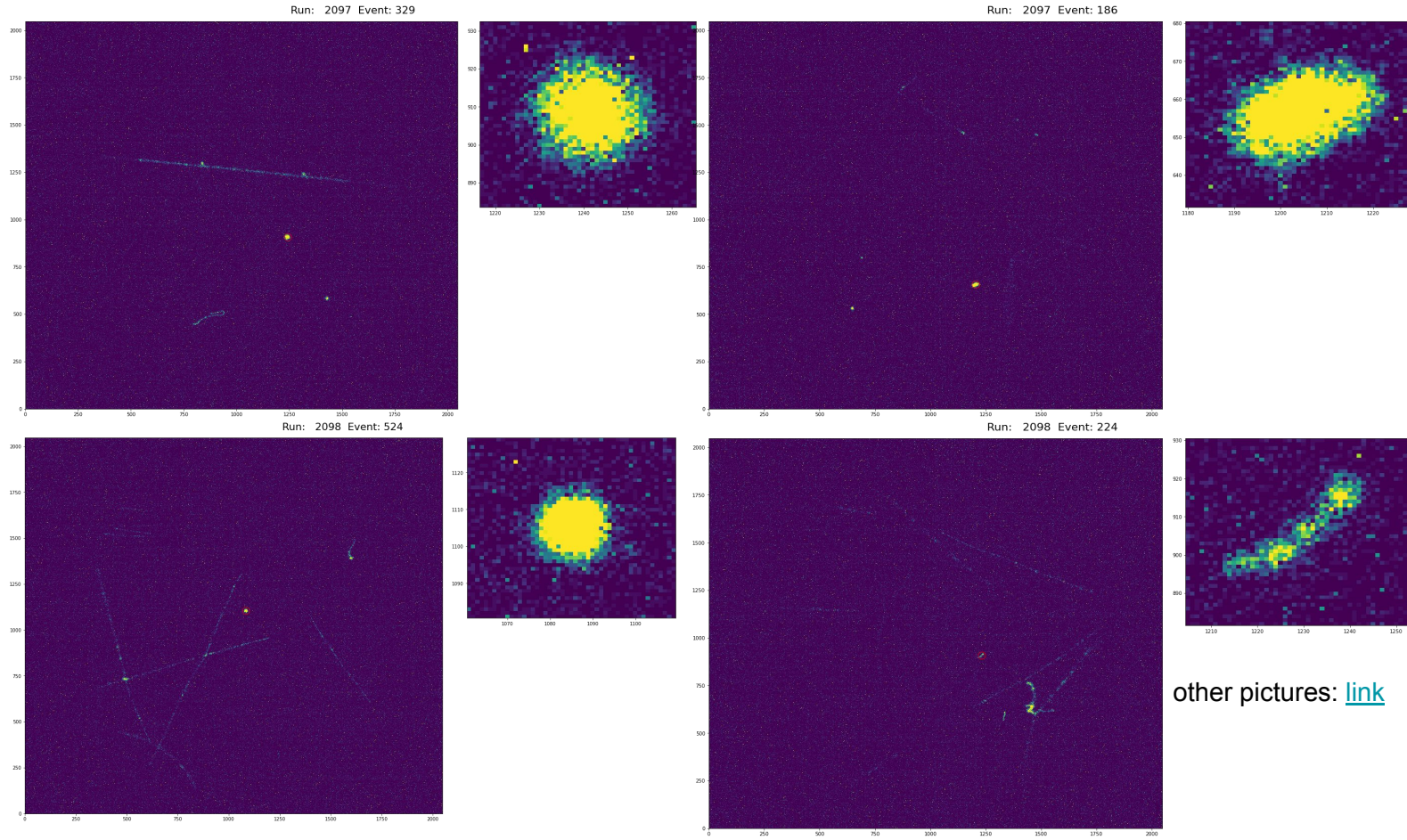
E vs dE/dx diagram



E vs dE/dx diagram



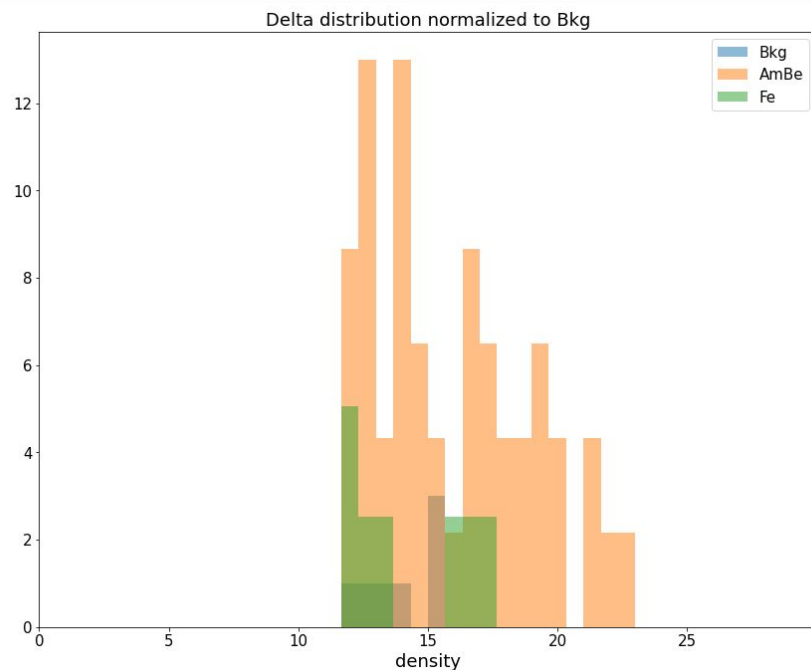
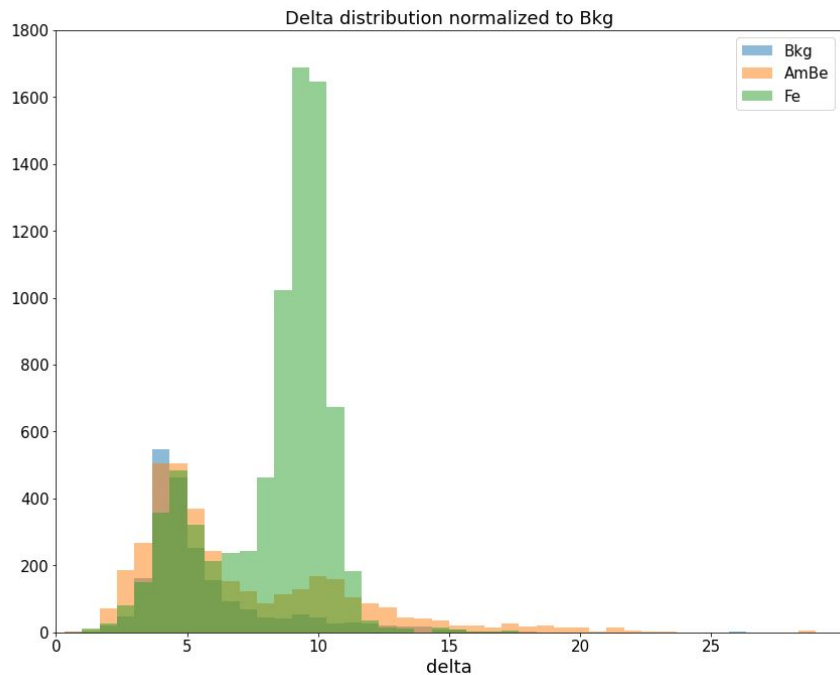
And now a direct look to the pictures



other pictures: [link](#)

How these cuts work on iron runs?

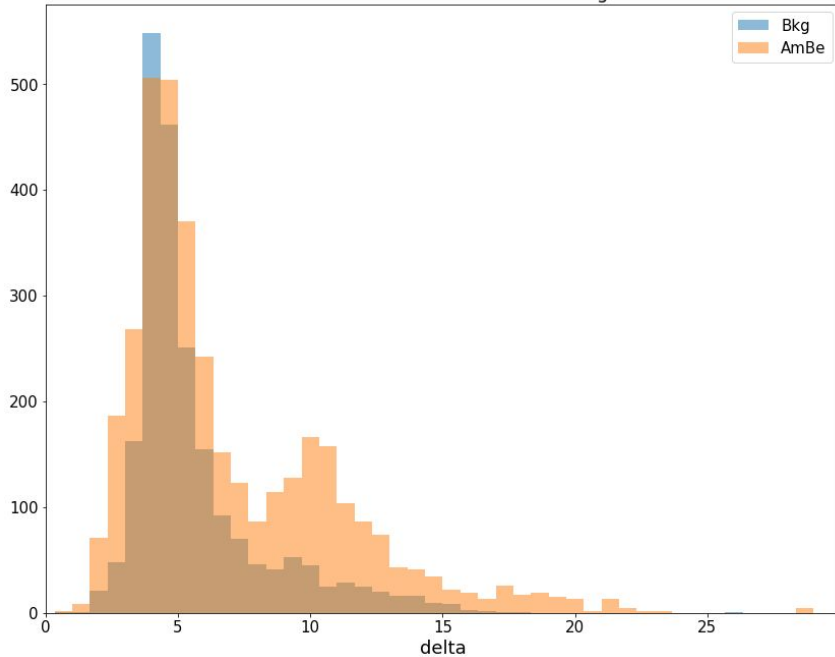
#sel Bkg / # sel AmBe = 0.1590
#sel Fe / # sel AmBe = 0.1591



From Lemon to Lime:



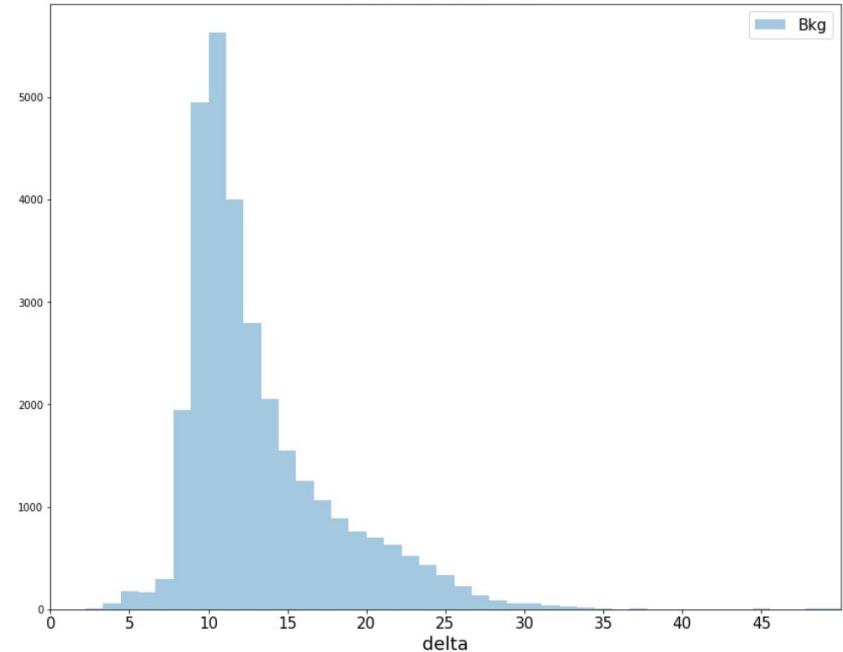
Delta distribution normalized to Bkg



In order to apply the same cuts but taking into account the difference between the two experiments, we look to the effects of the different LY and drift diffusion to the delta distribution



Delta distribution LIME



Cuts transposition:



CUTS:

Radius (x,y,xc=1000,yc=1050) < 400 px
width/length > 0.8
length < 0.5 cm
density = integral/nhits > 12 [ADU]

***used to cut events on the sensor. See previous presentation by [S. Piacentini](#)

List of golden runs from LIME

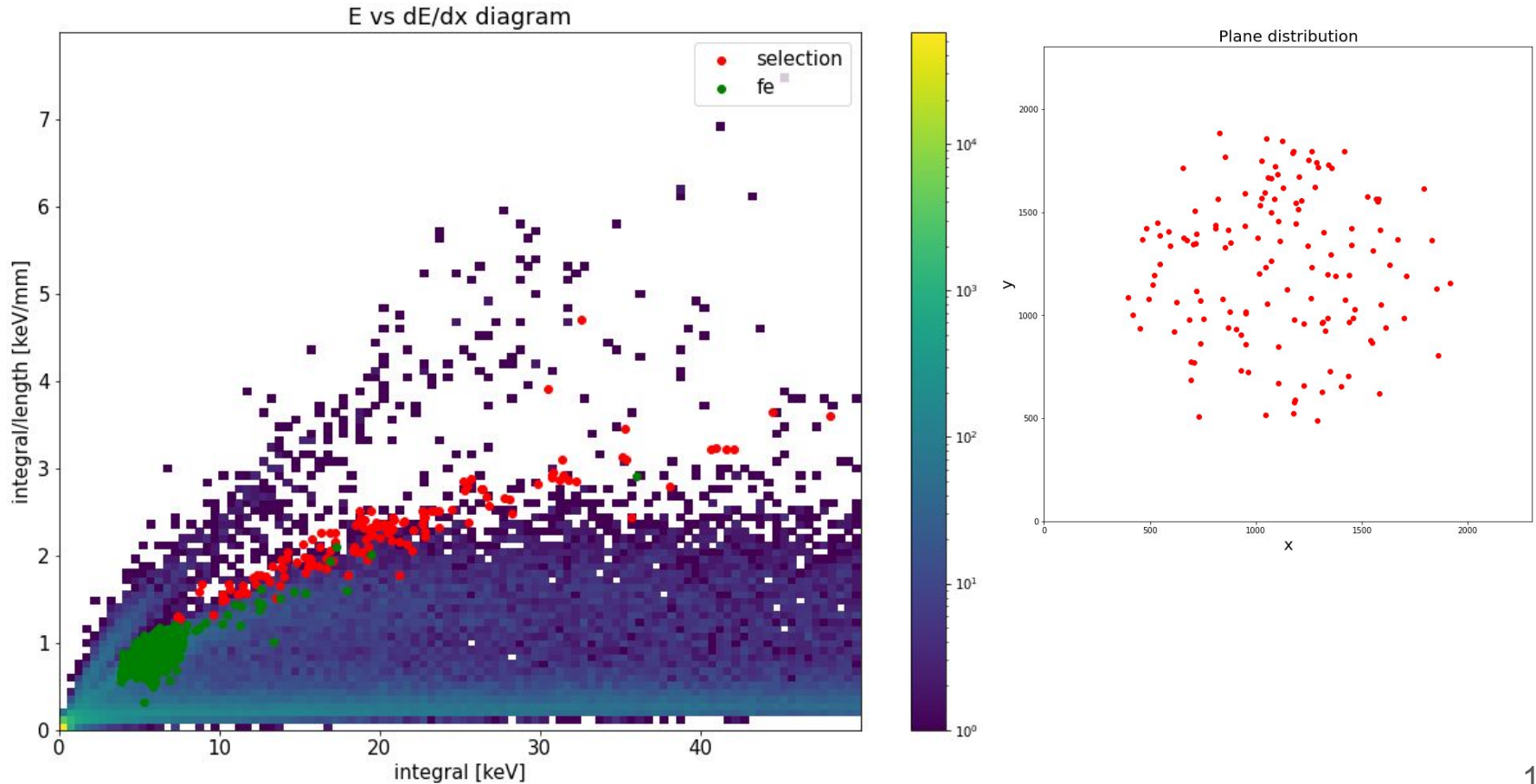
https://docs.google.com/document/d/122110u5WZxldB13dPcrTVA_P_ukqzQ0Kj0tTjARuDy5A/edit?usp=drive_link



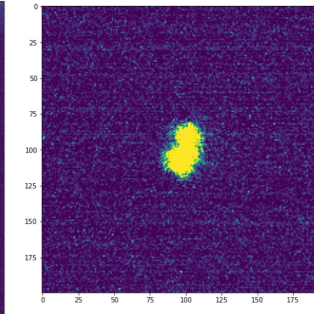
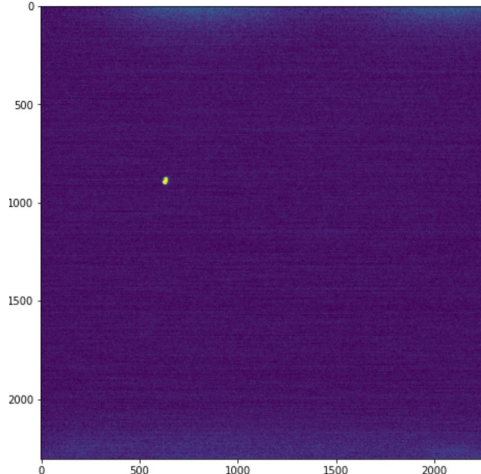
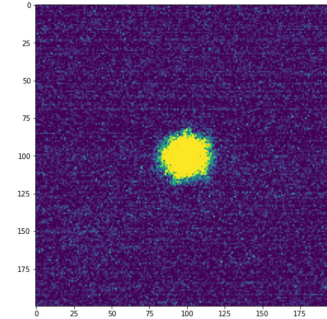
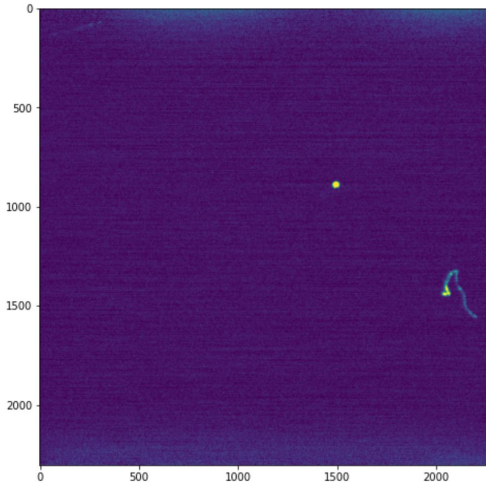
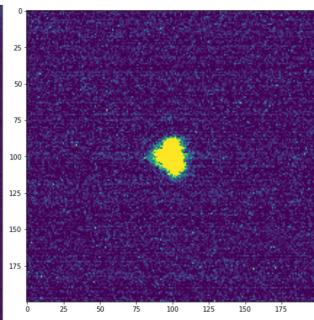
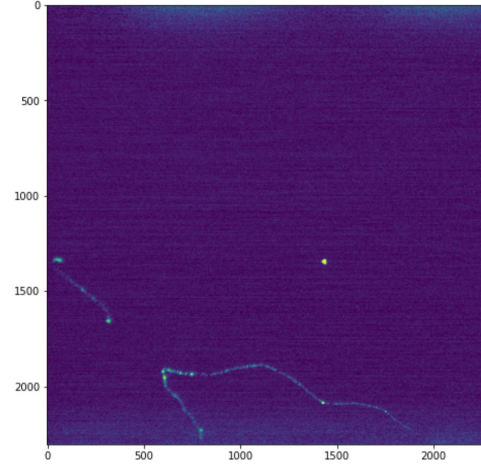
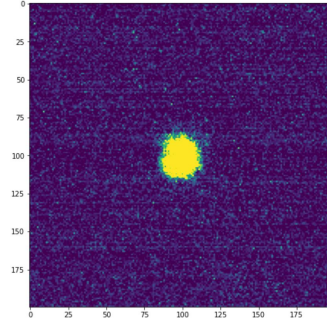
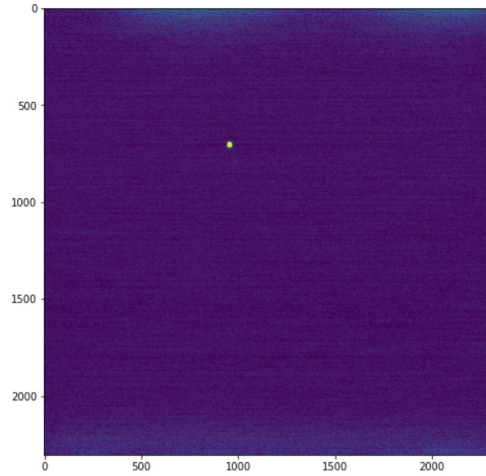
CUTS:

sc_rms > 6
sc_tgausssigma > 0.5 / 0.152***
Radius (x,y,xc=1152,yc=1152) < 800 px
width/length > 0.8
length < 1.5 cm
density = integral/nhits > 30 [ADU]

Effects on the E vs dE/dx plot



And now a direct look to the pictures



[Other pictures](#)

Conclusions

- Applying the selection suggested by the LEMON analysis we are able to identify some cluster consistent with NR events and look to their position in the E vs dE/dx plot
- The selected clusters appear uniformly distributed on the GEM plane, consistent with the shape of a NR cluster and take place in the ER band of the usual diagram
- Conclusions:

This analysis confirms that, due to saturation, there is a superposition of the ER and the NR band on the E vs dE/dx plot.