RUN3,4 data analysis

Energy histograms

Cuts

- sc_rms > 6
- sc_tgausssigma*0.152 > 0.5
- sc_xmin > 255 & sc_xmax < 2000
- sc_ymin > 300 & sc_ymax < 2000

DAQ inefficiency (Based on Flaminia's Thesis, Page 231)

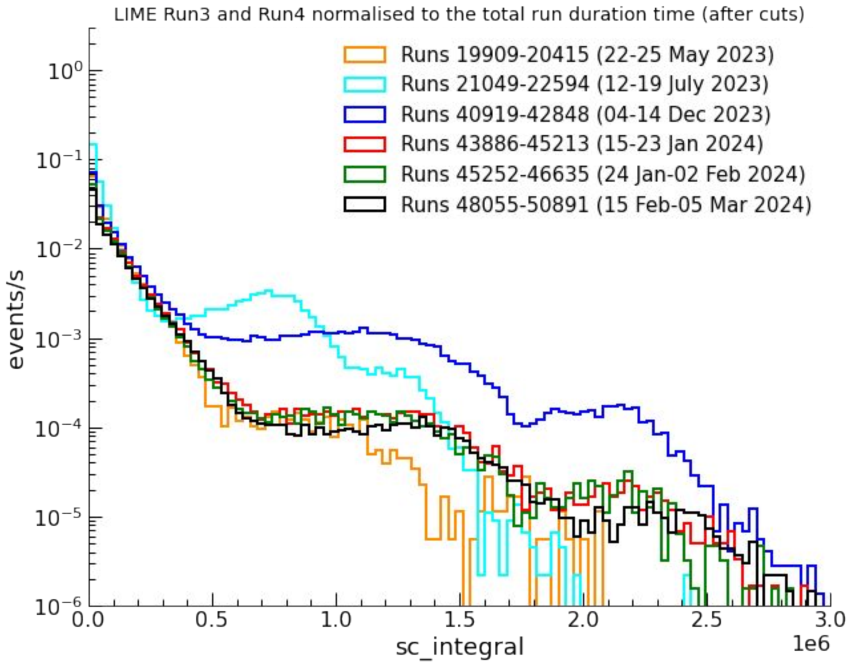
$$D = 1 + \frac{m}{k} = 1 + \frac{T_{Cam} + R_{PMT} \times T_{Window} \times t_{wf}}{T_{Window}}$$

Normalisation using Run Duration Time

- Duration of a specific bkg run calculated.
- Sum of the duration of each run in the range of interest to get the total duration of that data acquisition campaign.
- Normalisation factor applied to the histogram: **(1/total_duration)*daq_inefficiency_factor**, obtaining a histogram of the rate of events.

❑ **Future Work:**

- Using the estimation of lost images study performed by Stefano, the normalisation will be done using the **total number of images (saved + lost) multiplied by the exposure time of the camera (300ms).**



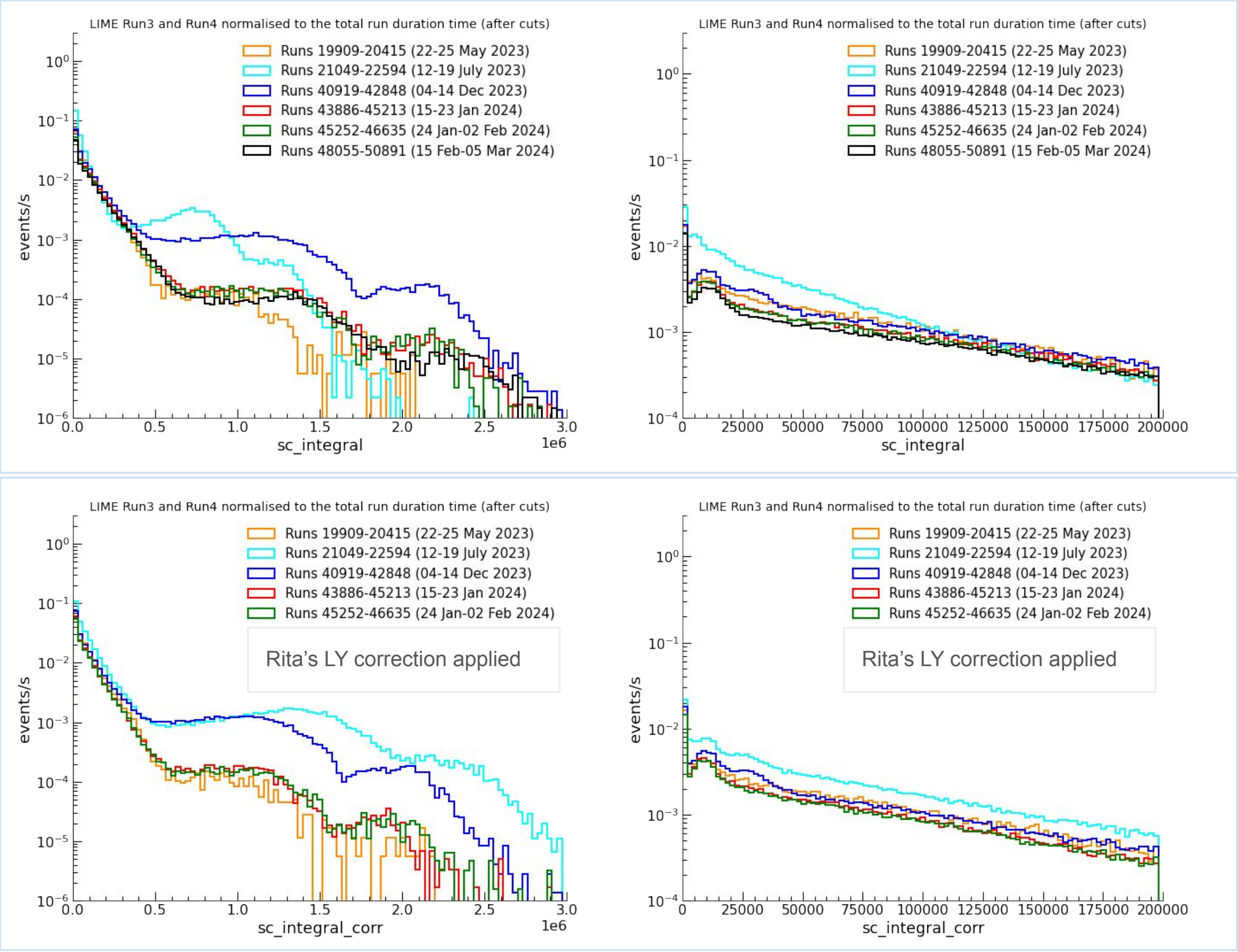
Energy histograms with Rita's LY correction

- Rita's LY equalisation tables were used to correct "sc_integral".

1	Run	Fe_peak	Corr	Evaluated
2	40785	9027.222185939974	9027.222185939974	0
3	40787	9072.271318007684	9072.271318007684	0
4	40789	9124.460686306997	9124.460686306997	0
5	40791	9196.899066685815	9196.899066685815	0
6	40793	9195.176852549599	9195.176852549599	0

- For each run **sc_integral_corr = sc_integral * 1e4/Corr** is evaluated.

- This sc_integral_corr **should not be used to evaluate the energy densities** (e.g. sc_integral/sc_nhits). For those, it is better to still use the raw sc_integral.



Selection of Tracks

Flaminia's Thesis, starting on Page 201.

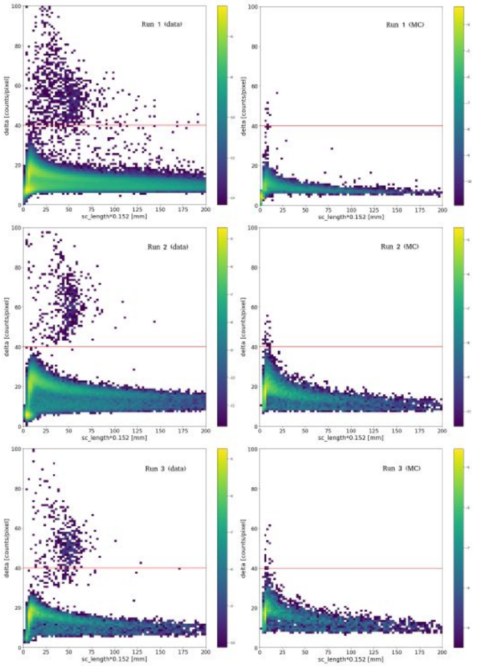


Figure 6.7: Track density δ as a function of the track length sc_length multiplied by the pixel linear size, to express is in units of mm. From top to bottom the distributions for Run 1, Run 2 and Run 3 data (left) and MC simulation (right). The red lines represent the cut applied to make the data and the MC sample consistent and exclude the alpha particles, at and $\delta = 40$.

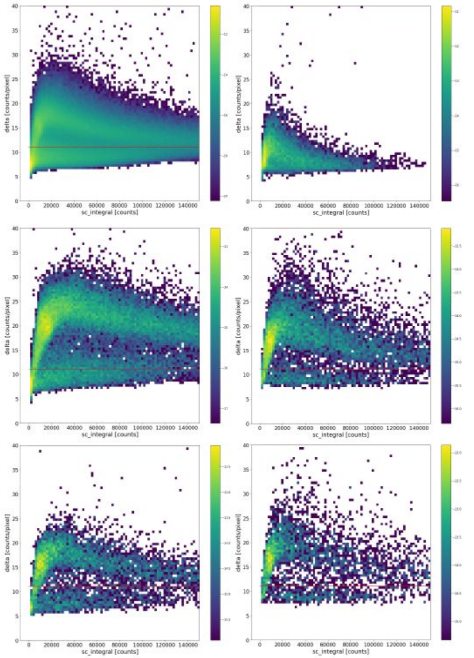
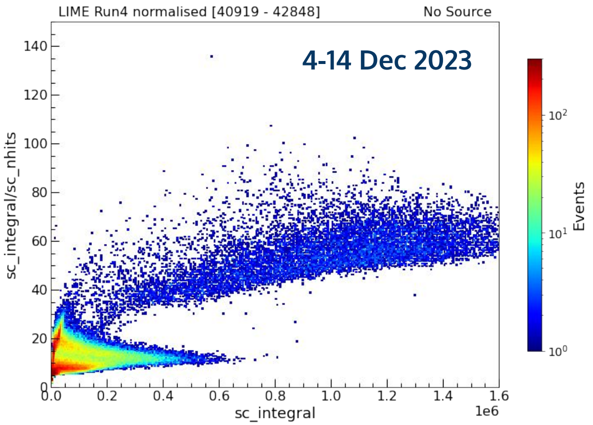


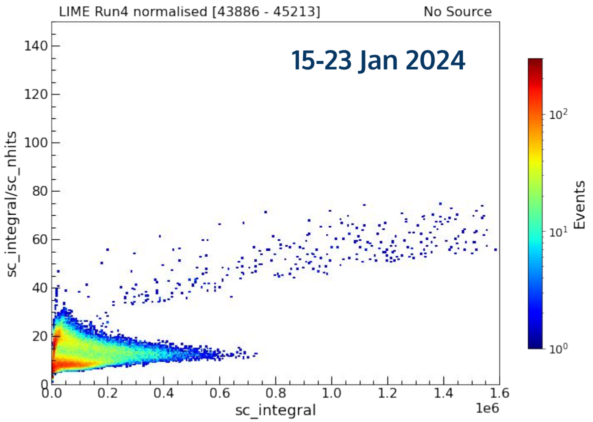
Figure 6.9: Track density δ as a function of the track light integral sc_integral. From top to bottom the distributions for Run 1, Run 2 and Run 3 data (left) and MC simulation (right). The red lines represent the cut applied to make the data and the MC sample consistent and exclude the fragments of higher energy ERs, at $\delta = 11$. The cut is not applied to the simulated Run 1 dataset (see text for the details).

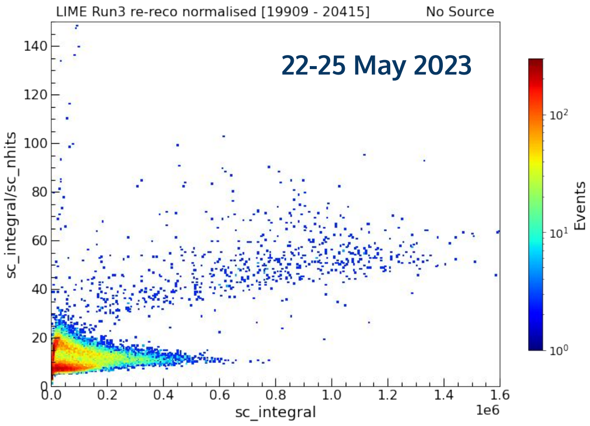
- A comparison between the experimental results and simulation will be done.
- Flaminia discarded events with $\delta < 11$ and $\delta > 40$.

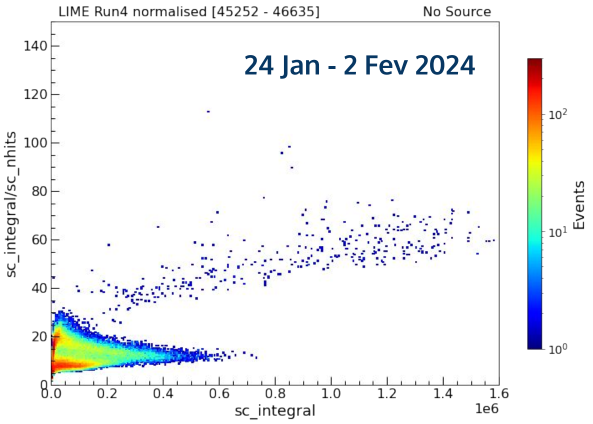
Discrimination of Alphas and Muons

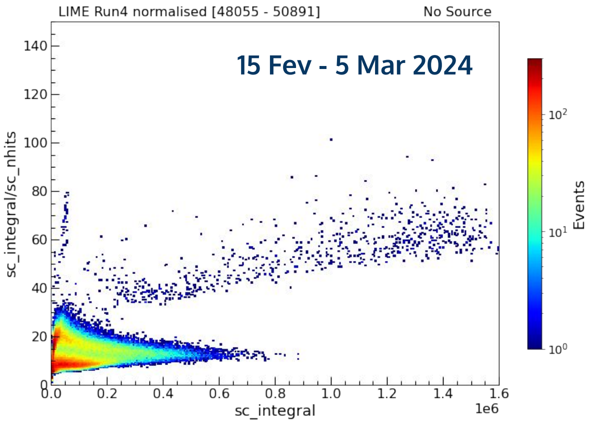
- Light density as a function of the energy ("sc_integral").
- In these plots, "sc_integral" is still not corrected by Rita's LY equalization.







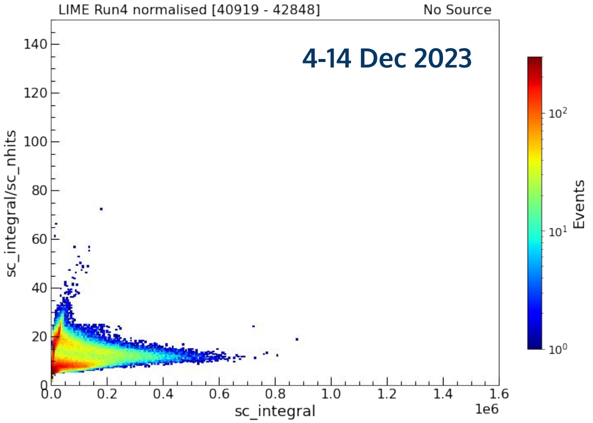


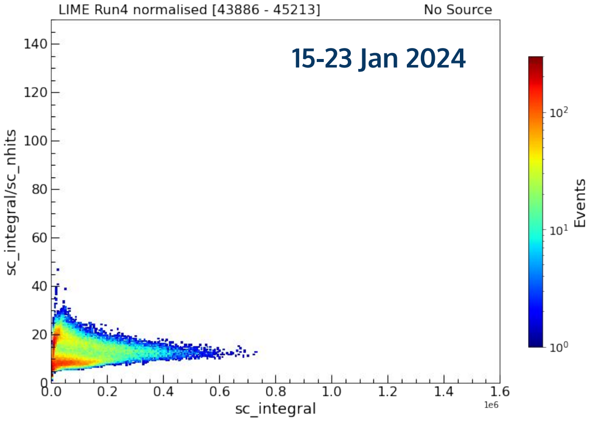


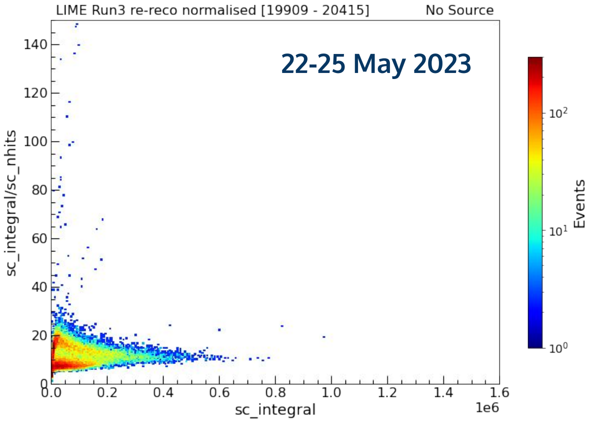
Discrimination of Alphas and Muons

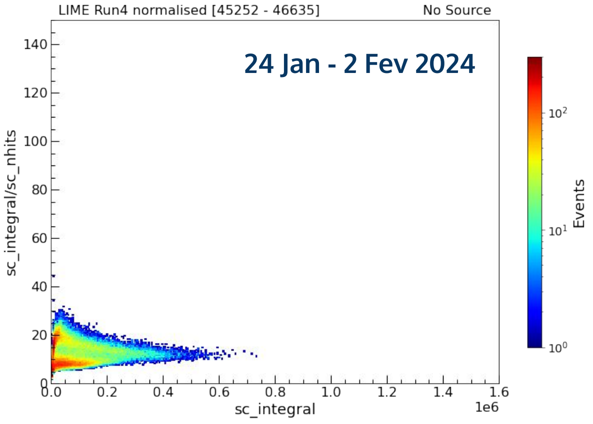
Giorgio's alpha and muon cuts were applied.

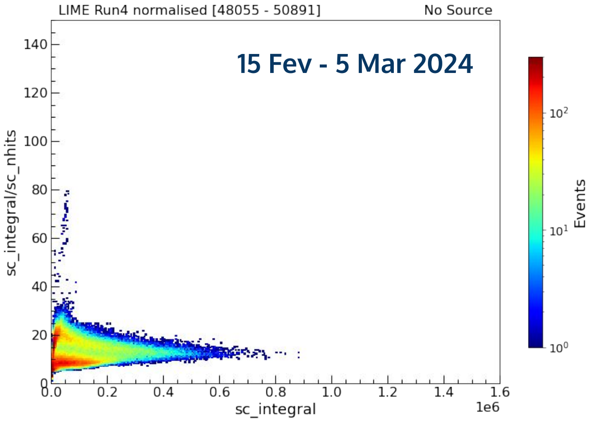
	Sc_integral/sc_nhits	Sc_length	Sc_width	Sc_nhits/sc_size	Sc_tgausssigma
High gain					
Alpha	>25	>100	>50	>0.1	/
Muons	<9	>1000	/	>0.1	<7





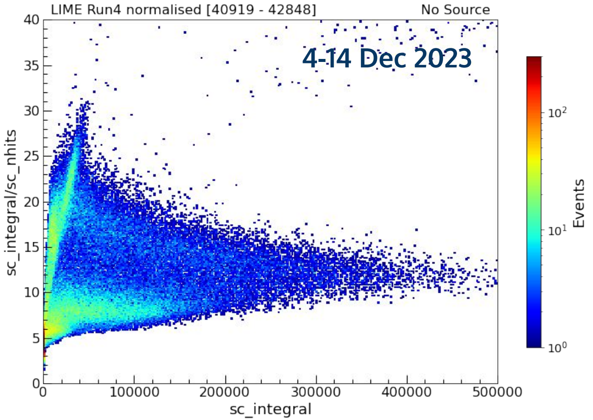


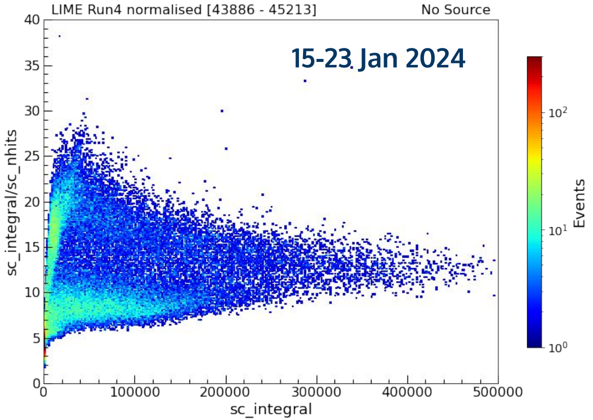


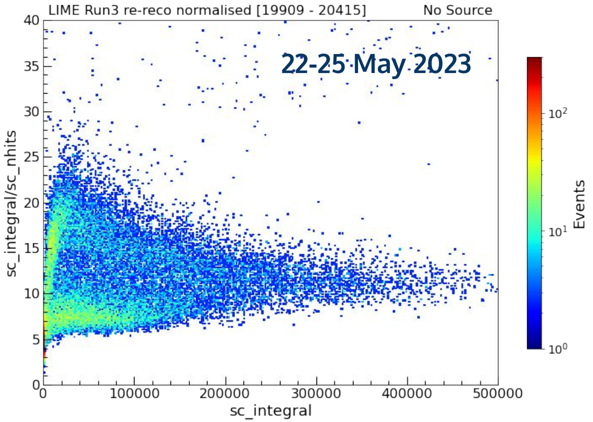


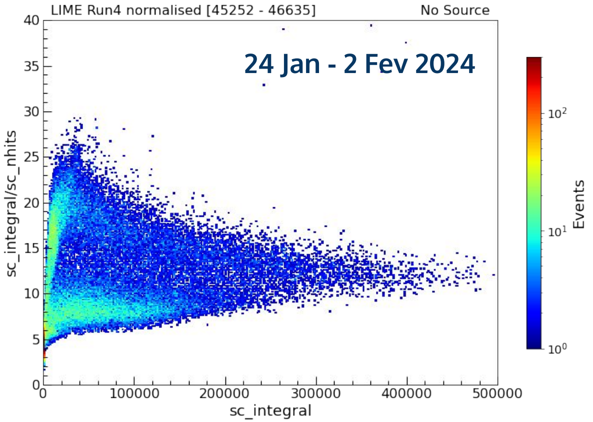
Discrimination of Alphas and Muons

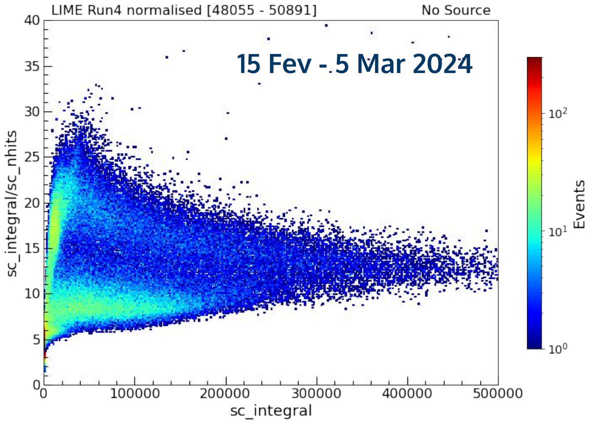
Zoomed plots without discrimination.







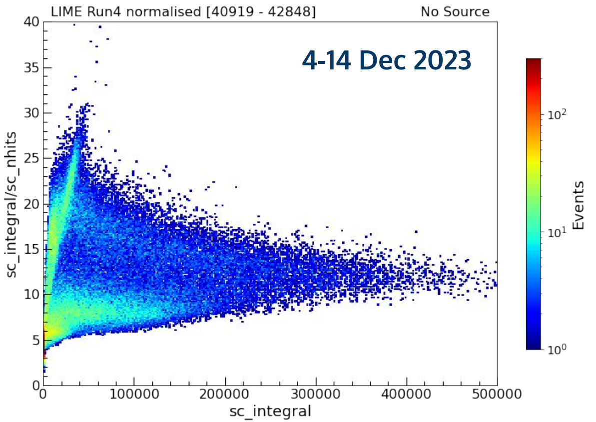


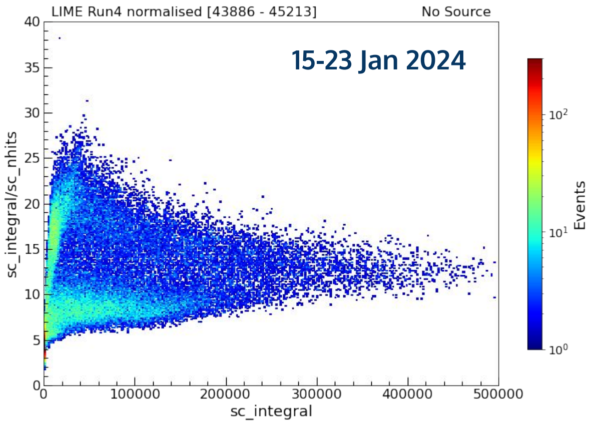


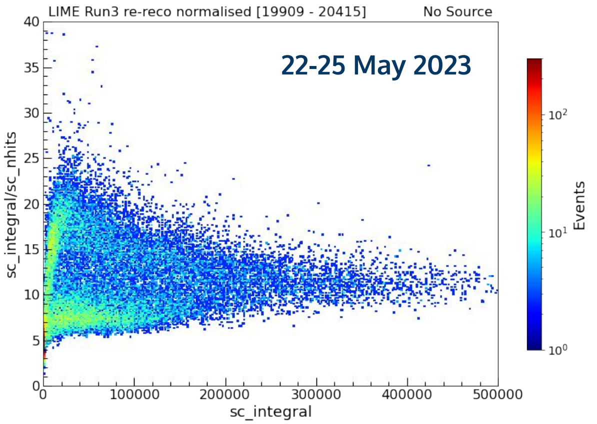
Discrimination of Alphas and Muons

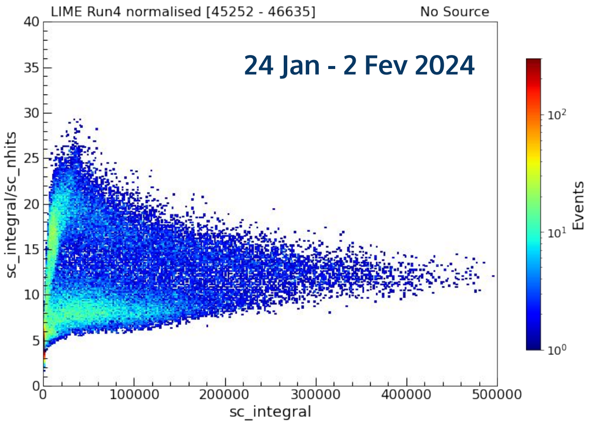
Zoomed plots with Giorgio's alpha and muon cuts applied.

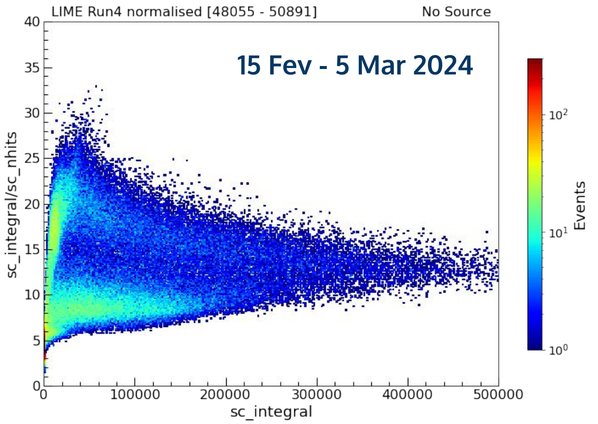
	Sc_integral/sc_nhits	Sc_length	Sc_width	Sc_nhits/sc_size	Sc_tgausssigma
High gain					
Alpha	>25	>100	>50	>0.1	/
Muons	<9	>1000	/	>0.1	<7





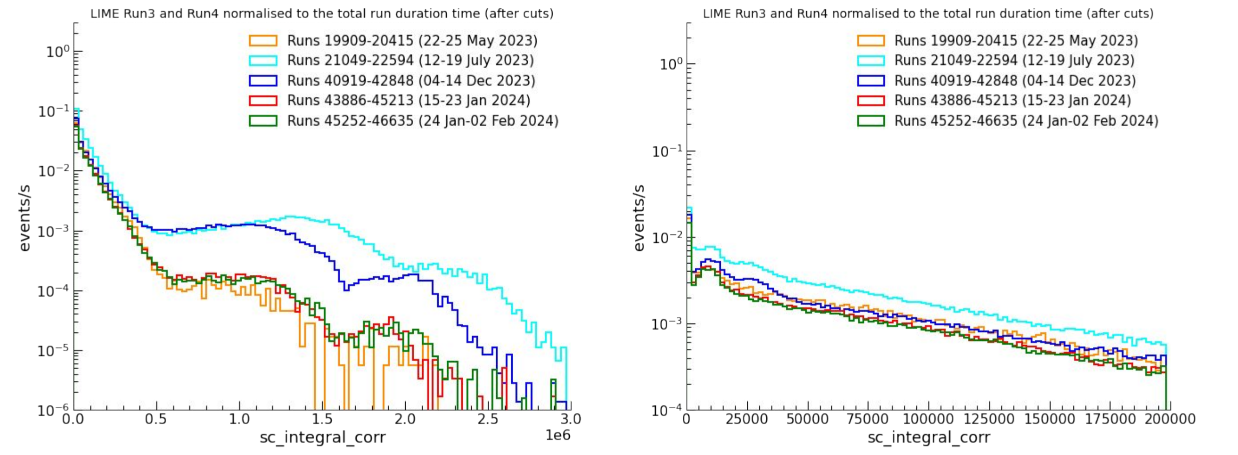




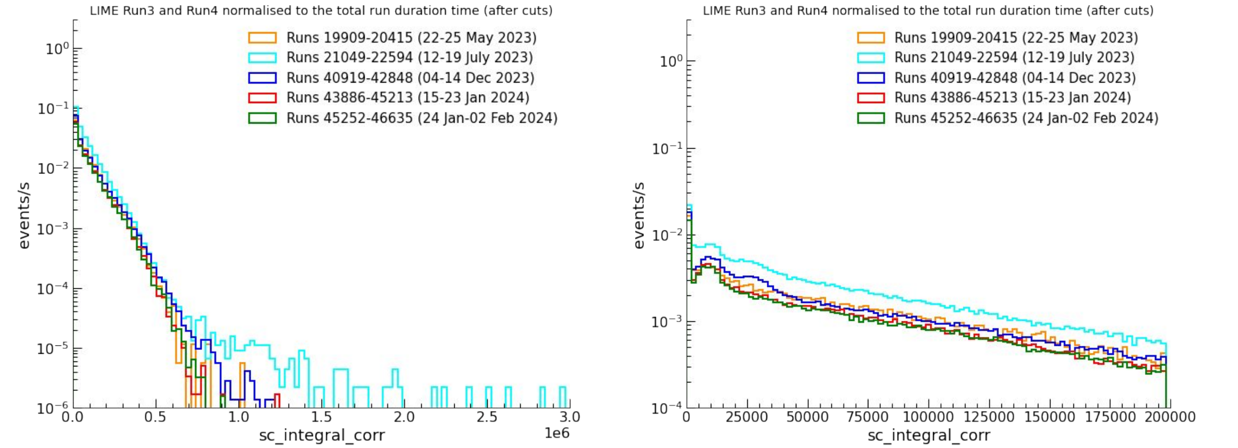


Discrimination of Alphas and Muons

Before discrimination



After discrimination



Future Work

- ❑ Using the estimation of lost images the study performed by Stefano, the normalisation will be done using the **total number of images (saved + lost) multiplied by the exposure time of the camera (300ms).**

- ❑ The equalization of the light yield worked by Rita A. will be implemented also on the light density vs sc_integral plots.

- ❑ ...

Thank you for your attention!