

Overground LIME: updates

scan in VGEM1 and Z reconstruction with Linear regression



R. Roque | CYGNO Reconstruction & Analysis Meeting | 19/01/2023

Introduction

Data Information

- Runs 4432 -> 4469
- Dark lab, air cooled, He-40%CF₄
- VGEM2 = VGEM3 = 440 V
- Scan in z and in VGEM1 with the ⁵⁵Fe source

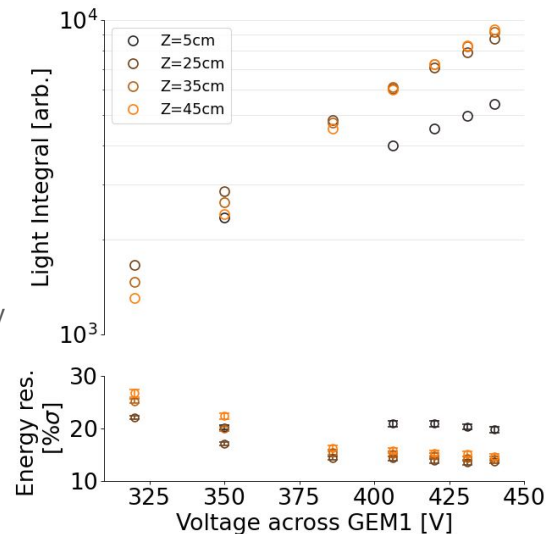
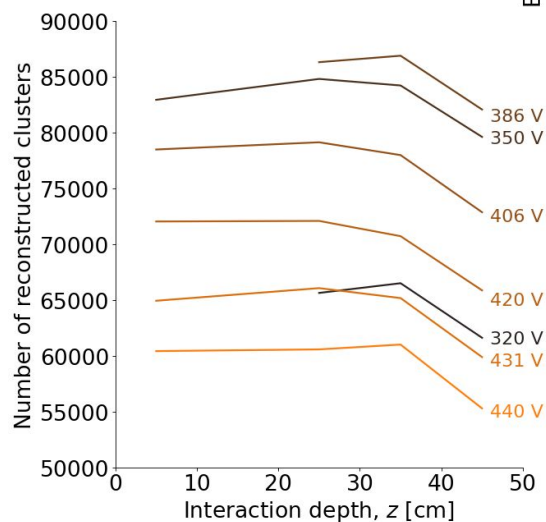
Runs	Bk	45 cm	35 cm	25 cm	5 cm
440 V	4433	4441	4448	4455	4463
431 V	4434	4442	4449	4457	4464
420 V	4436	4443	4450	4458	4465
406 V	4437	4444	4451	4459	4466
386 V	4438	4445	4452	4460	4467
350 V	4439	4446	4453	4461	4468
320 V	4440	4447	4454	4462	4469

Last results

The light integral spectra of each VGEM1 and z was fitted to a Gaussian + background profile.

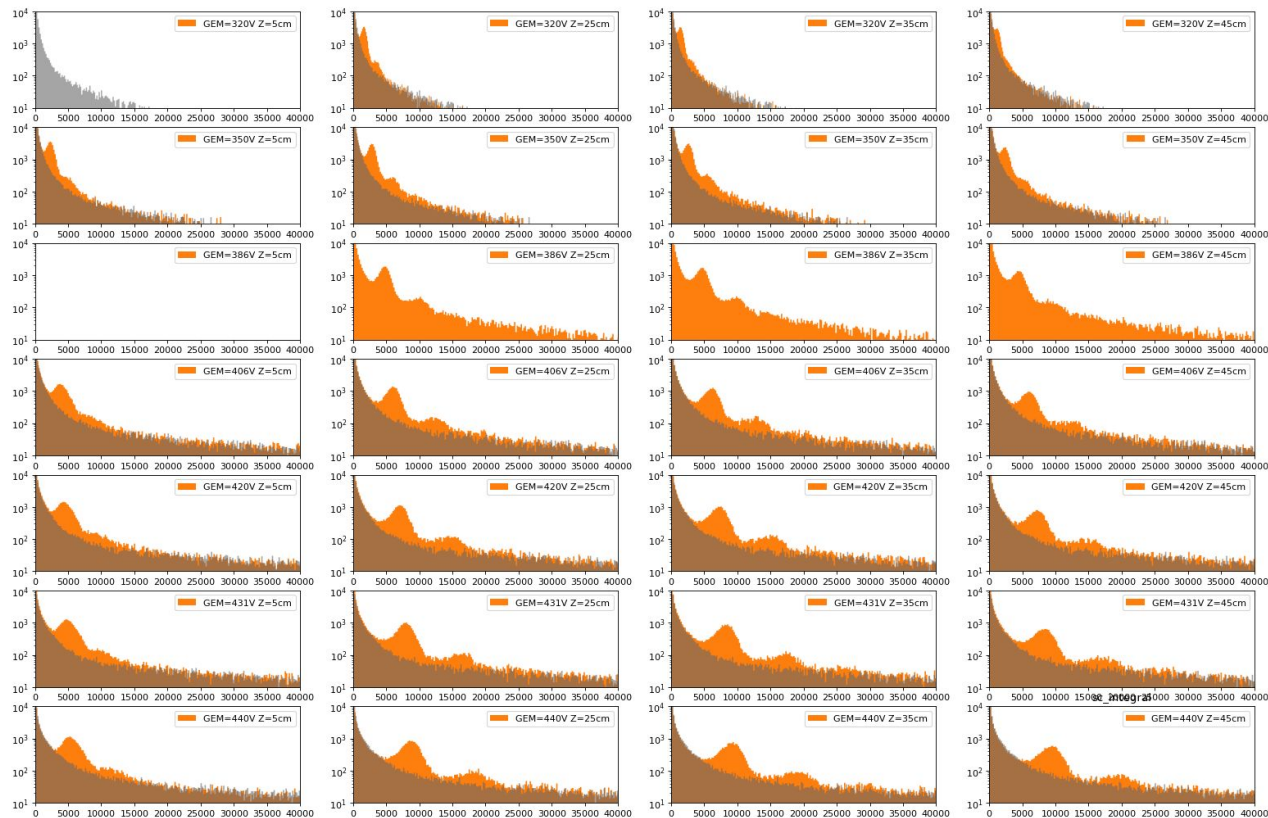
As expected, the light integral increases exponentially with VGEM1, and the energy resolution decreases.

For z=5 cm, the behaviour is different.



The detection efficiency was not increasing with increasing VGEM1, as should be expected.

Taking a closer look to the spectra

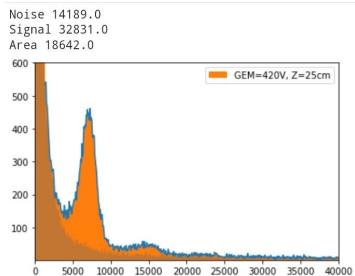


The histograms of the light integral have several peaks: **probably the reconstruction algorithm is identifying overlapping ^{55}Fe clusters as one.**

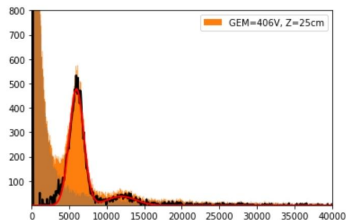
Detection efficiency

We tried:

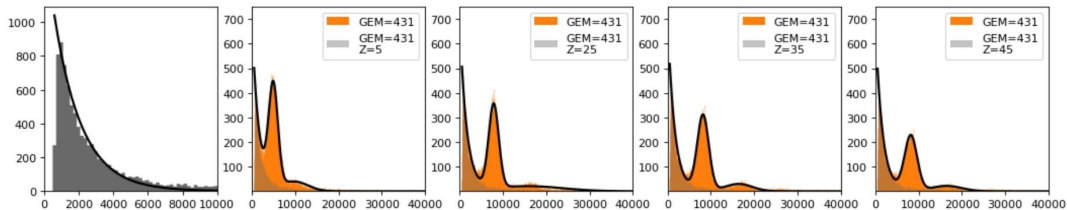
Directly subtracting the noise
from the signal histogram:



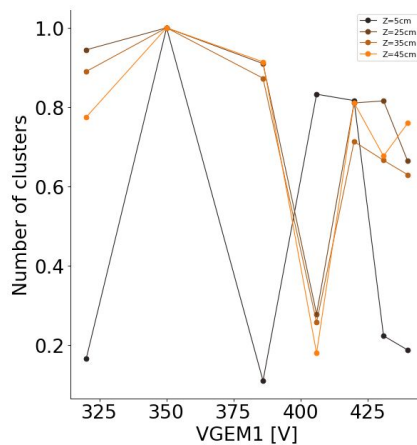
Subtracting the noise from the
signal histogram and fitting the
difference to a double gaussian:



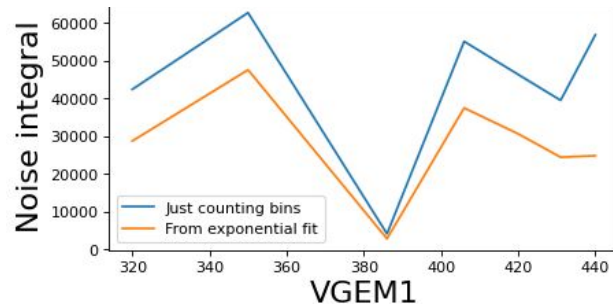
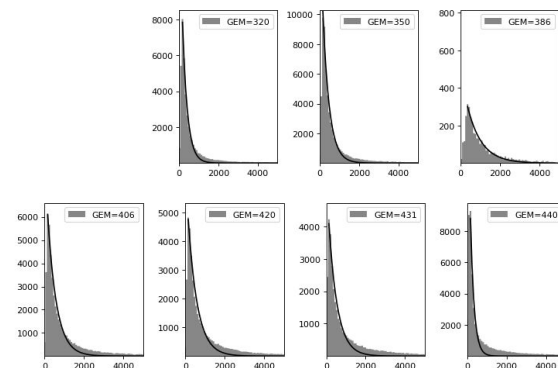
Fitting the spectra to background (exponential) + double gaussian:



There is still no improvement:

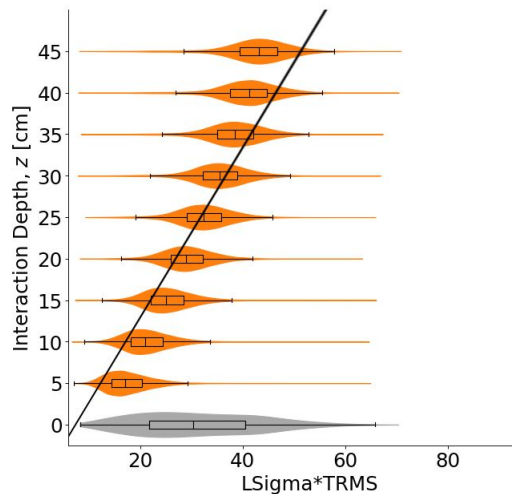


Noise integral
Does not increase with VGEM1



Z reconstruction with linear regression

1st order linear regression

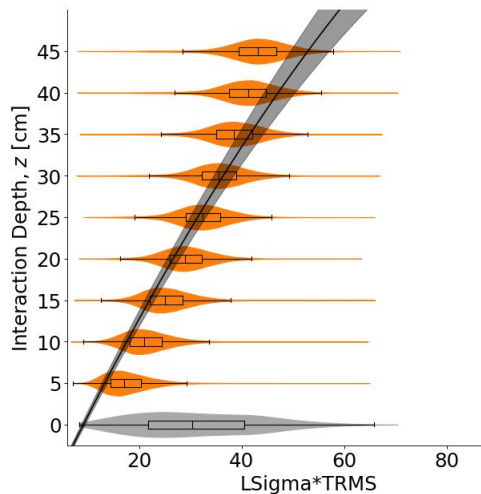


$$r^2=0.647(12)$$

$$RMSE=7.34(13) \text{ cm}$$

$$y=1.0233(15)x-7.52(5)$$

2nd order linear regression



$$r^2=0.648(12)$$

$$RMSE=7.33(13) \text{ cm}$$

$$y=-0.00436(16)x^2 + 1.297(10)x - 11.41(15)$$

Individual distributions of **LSigma** and **tfullrms**

