Study of saturation parameters (update)

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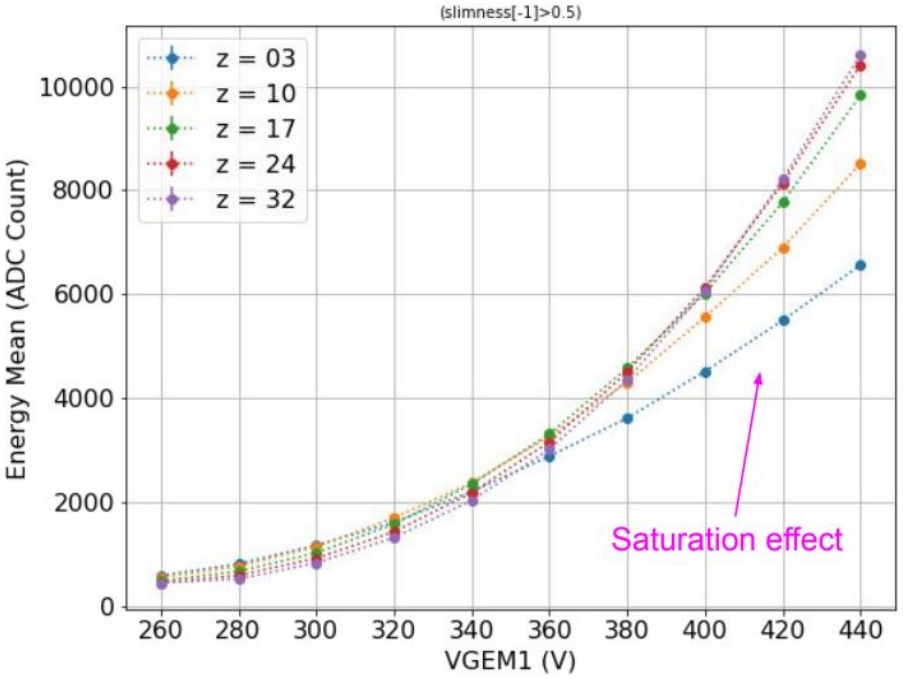
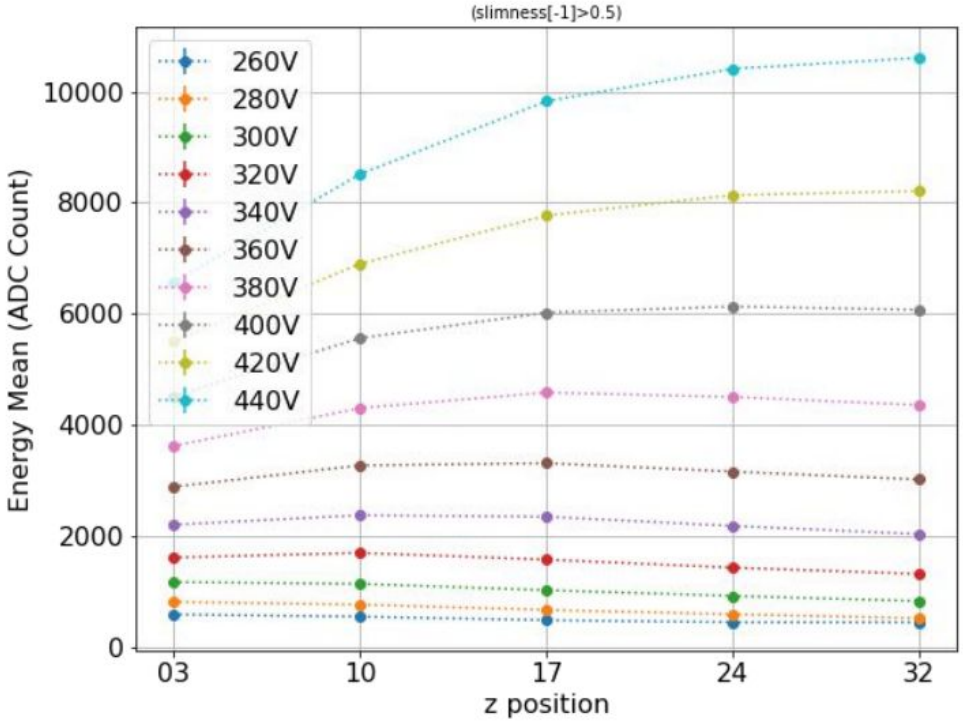
Recap 1:

We want to find a set of digitization parameters that reproduce these trends of sc_integral vs z and vs HV **(prove that we simulate saturation at different energies)**





From Rafael's presentation

Recap 2

By selecting data points (in z and HV) that are *“expected”* not to be saturated, we can fit the integral with a 2D function (in z and HV) and estimate:

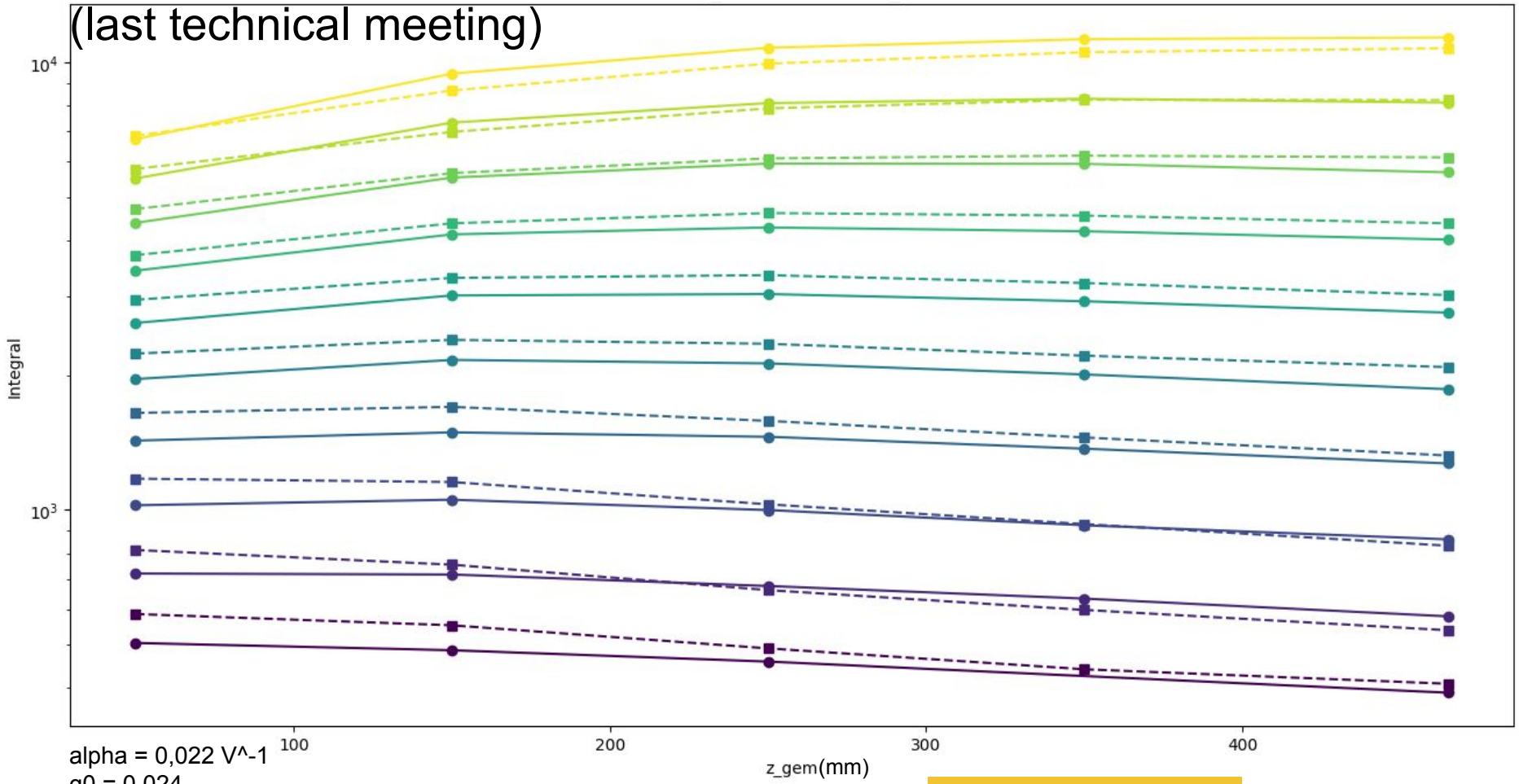
-absorption length (**lambda**)

-first Townsend coefficient (**alpha**)

Then by fixing these parameters, we can calibrate **beta** (saturation param.)

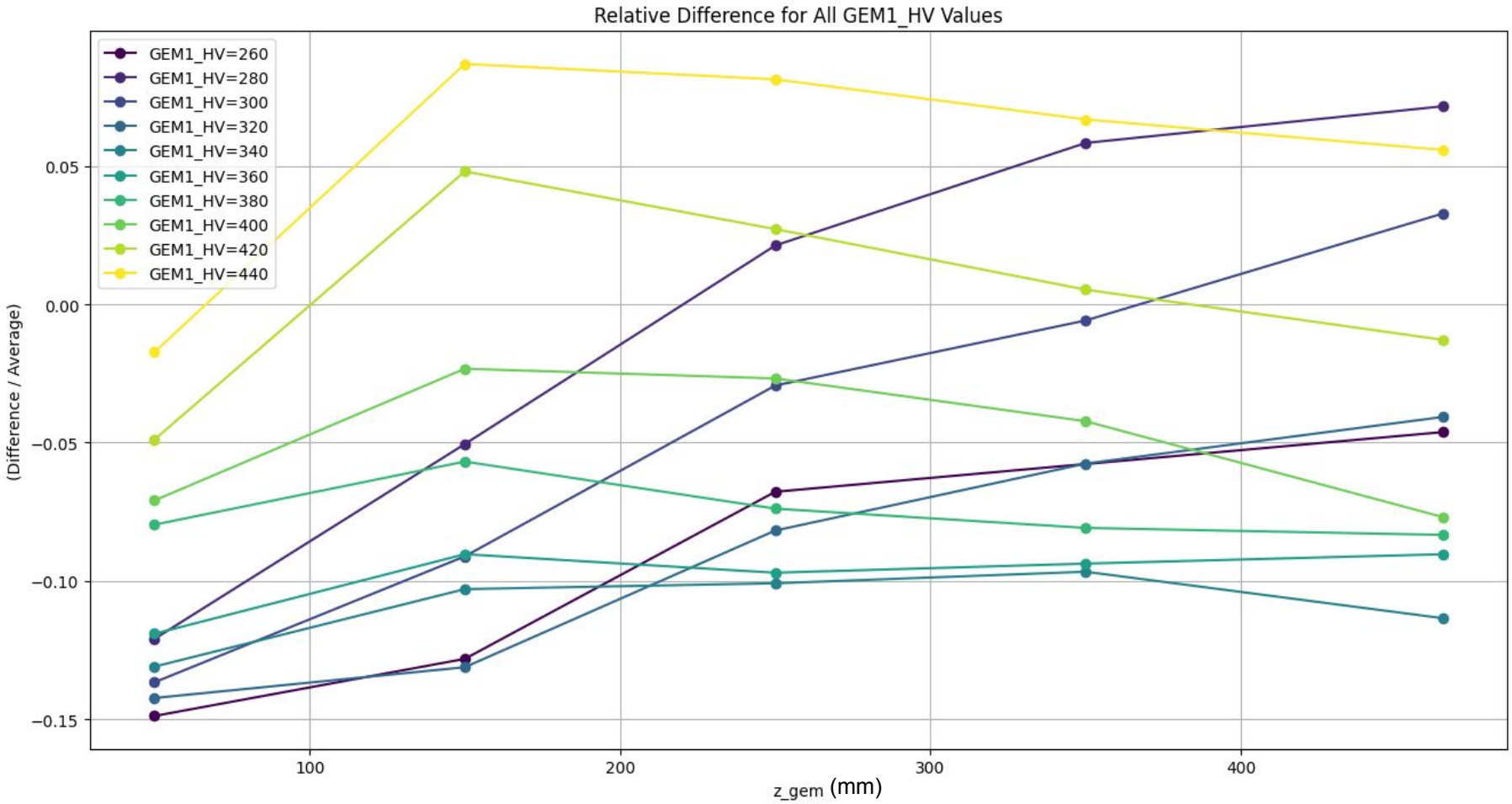
$$I = I_0 \cdot e^{\alpha \cdot V} \cdot e^{-\frac{z}{\lambda}}$$

(last technical meeting)



alpha = 0,022 V^-1
g0 = 0.024
lambda = 125 cm
beta = 4e-06

yellow: GEM1= 440 V
dark purple: GEM1 = 260 V


Relative Difference for All GEM1_HV Values
GEM1_HV=260
GEM1_HV=280
GEM1_HV=300
GEM1_HV=320
GEM1_HV=340
GEM1_HV=360
GEM1_HV=380
GEM1_HV=400
GEM1_HV=420
GEM1_HV=440
(Difference / Average)
0.05
0.00
−0.05
−0.10
−0.15
100
200
300
400
z_gem (mm)

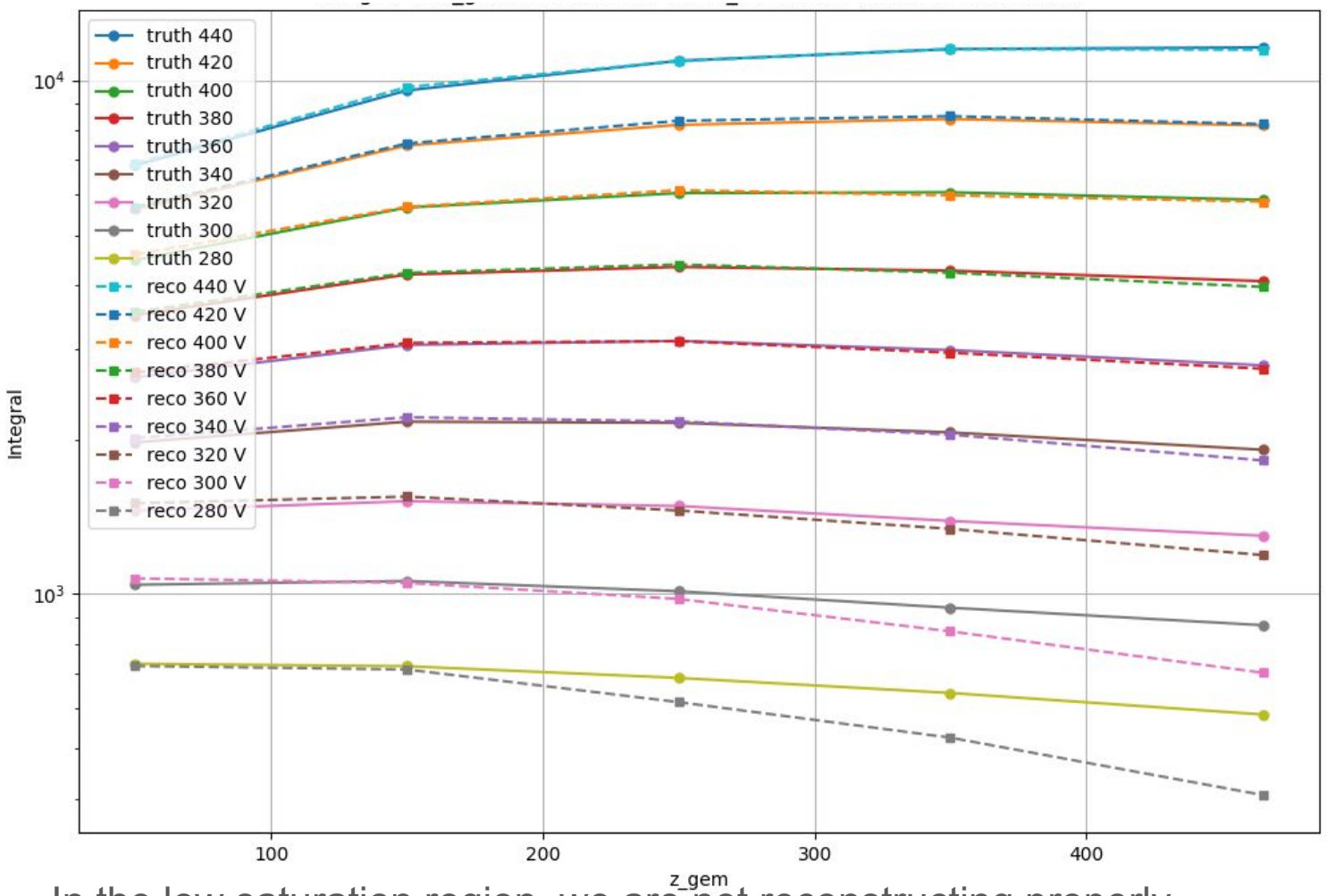
How to improve it?

- comparison with a grid of parameters around the found parameters
- comparison with sigma
- **ISSUE of the efficiency of reconstruction at low HV**

Issue of the efficiency of reconstruction at low HV

For a quick optimization, I was looking at the real integral before the reconstruction…

But apparently at low HV, integral is so small that the track are not properly reconstructed.

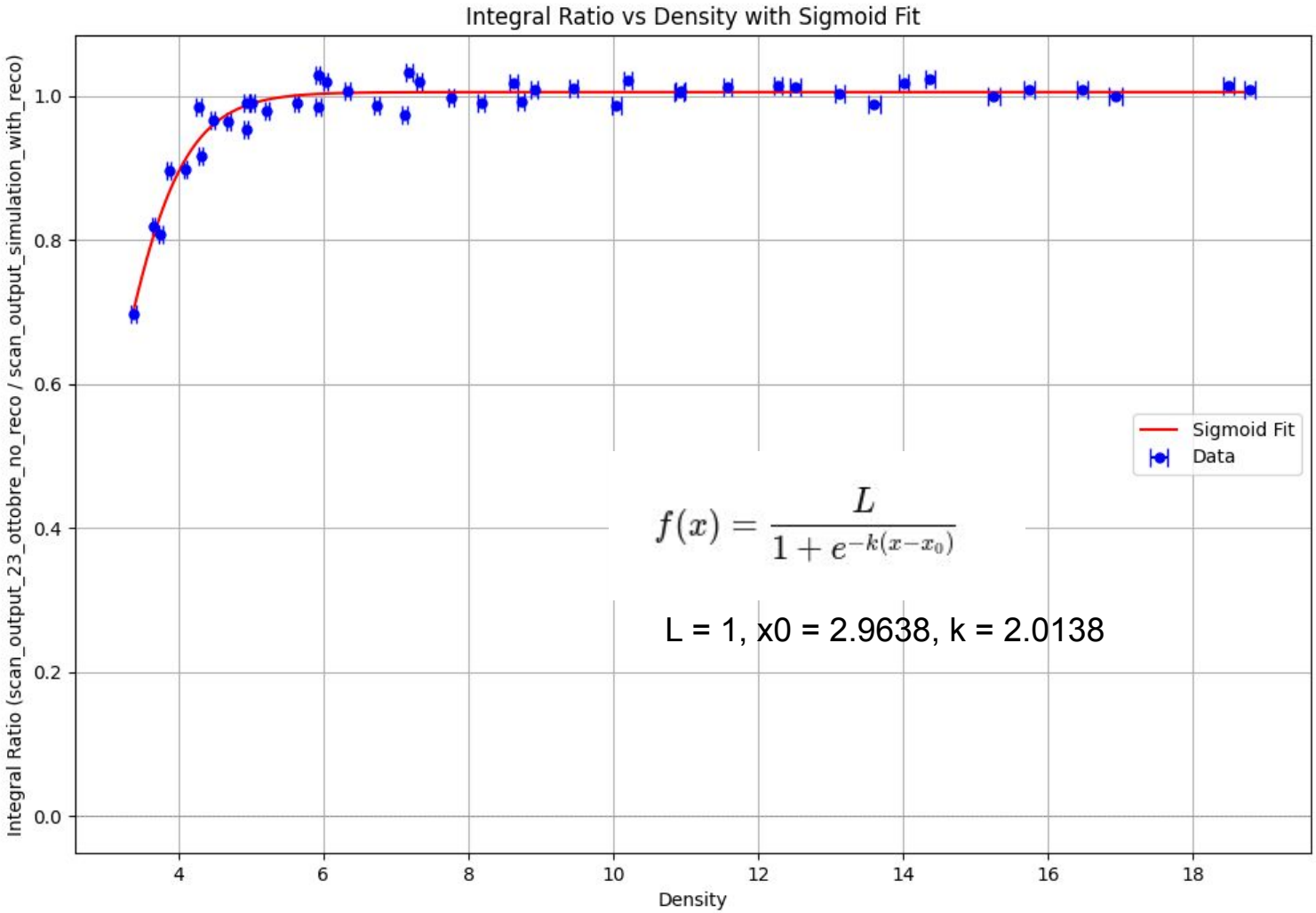


In the low saturation region, we are not reconstructing properly (**note the dependency on the z**)

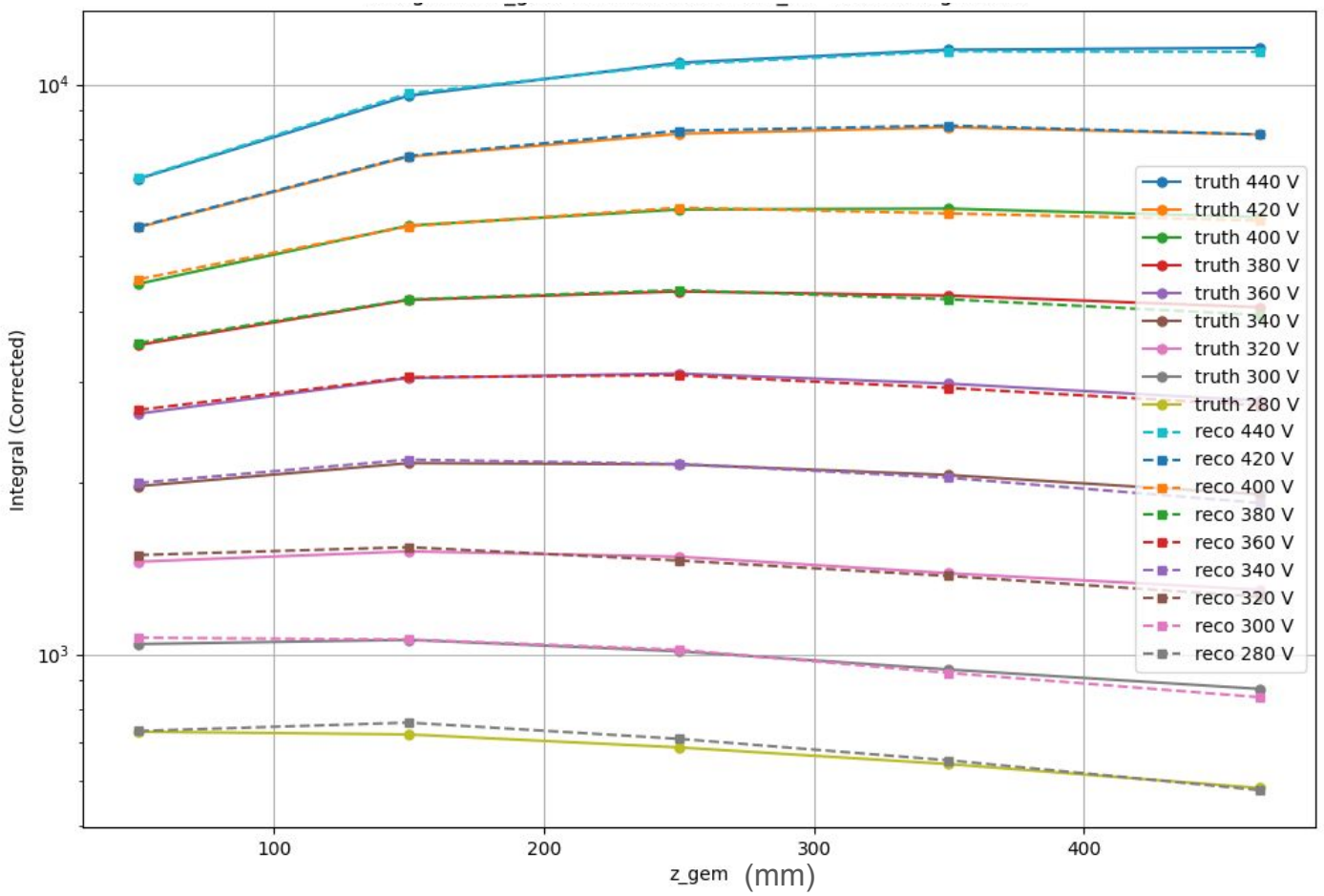
Integral correction for low density spots in MC

By looking at the ratio between reconstructed sc_integral and real (simulated) sc_integral, we can see how the correction varies with the **density** (sc_integral / sc_nhits).

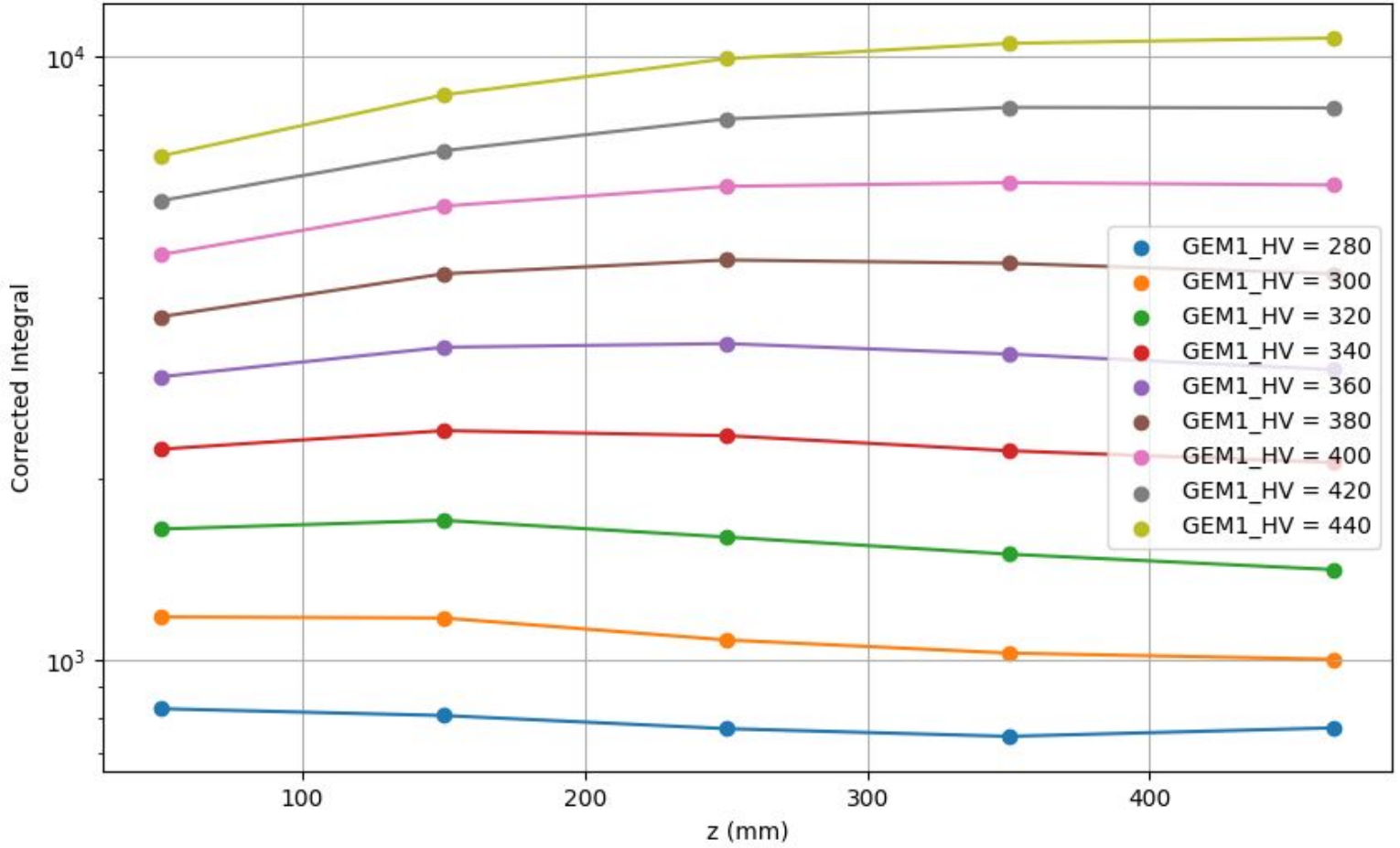
In fact the efficiency seems to be dependent on the z (sigma, or density of the spots)


Integral Ratio vs Density with Sigmoid Fit
Integral Ratio (scan_output_23_ottobre_no_reco / scan_output_simulation_with_reco)
Density
Sigmoid Fit
Data
$f(x) = \frac{L}{1 + e^{-k(x-x_0)}}$
L = 1, x0 = 2.9638, k = 2.0138

Corrected sc_integral (simulation) -> of course makes sense

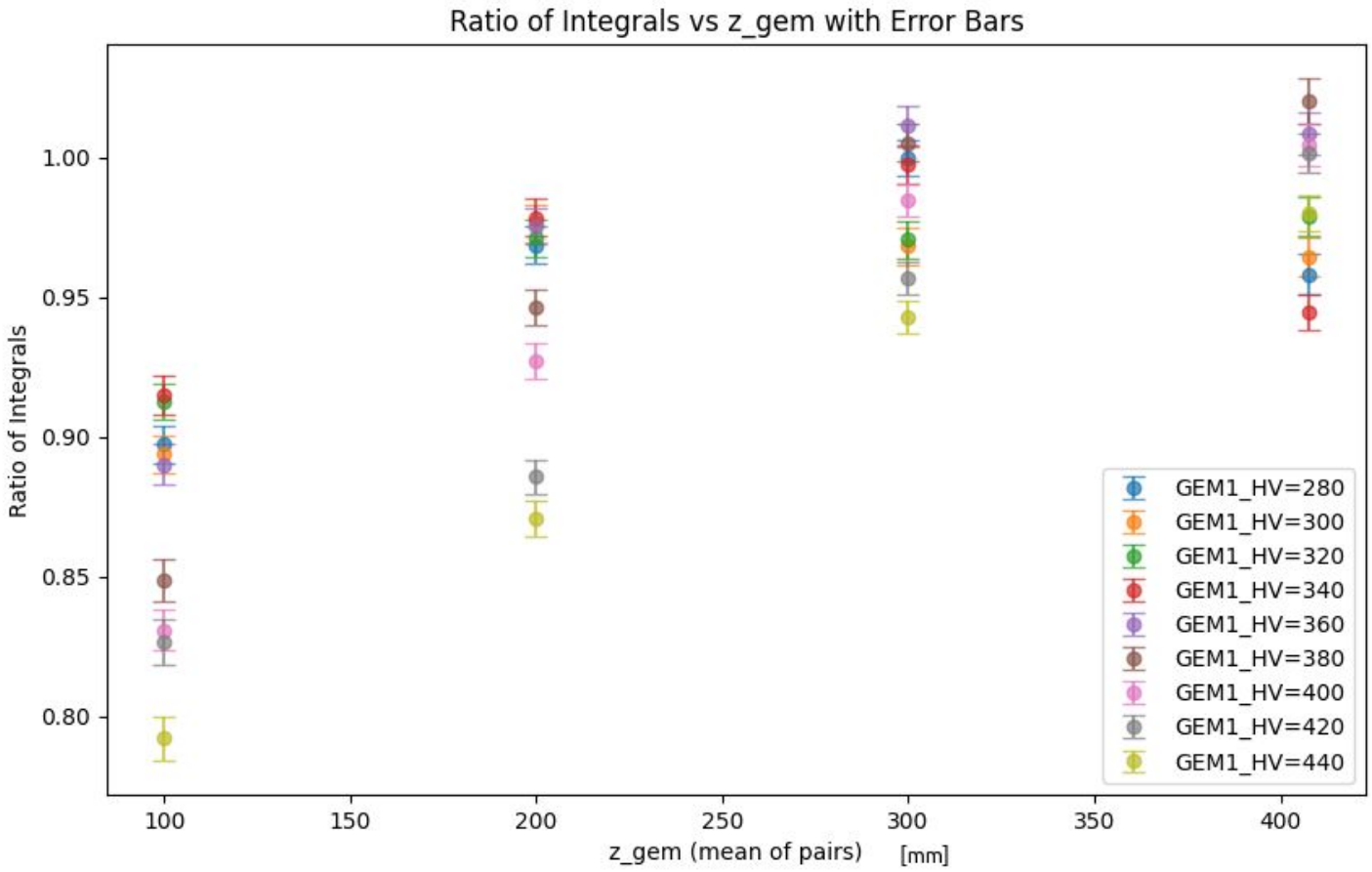


Now we apply the correction to the data



seems overly corrected

Also ratios make no sense -> overly corrected



Maybe using wrong pedestal used to estimate the correciton?
(real pedestal are on the tape... ops)

real pedestal

used pedestal

Conclusions

To solve this I’ll need the following pedestal runs on the tape:

42985

42996

43007

43018

43029

43040