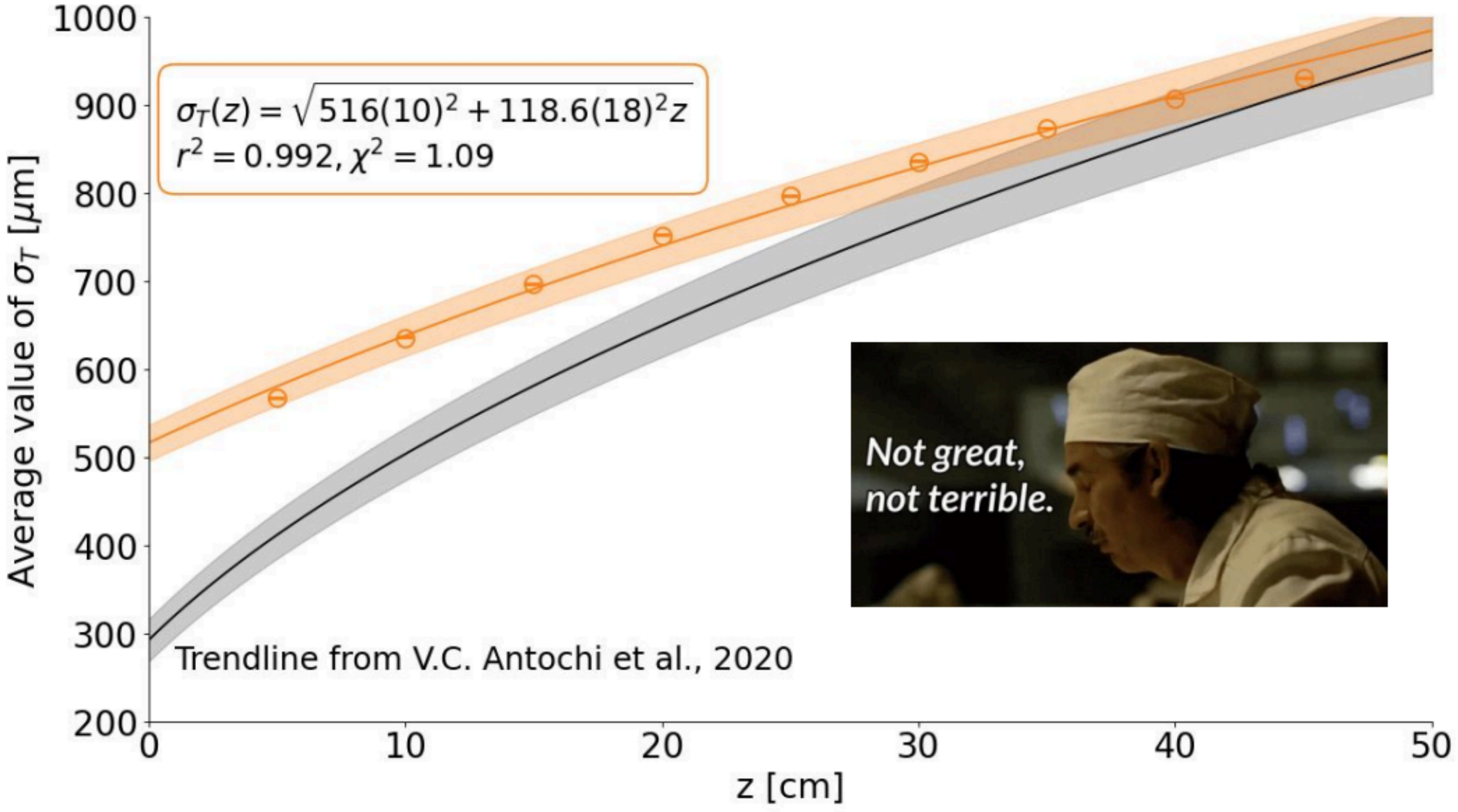
Simulation of the diffusion

Simulation/Experimental comparison



	LEMOn	LIME
B	129.7(31)	118.6(18)
σ_0	292(12)	516(10)

The transverse diffusion coefficient is similar.

The contribution of the electron avalanche propagation in the GEM stack seems much more significant in LIME.

9

Rita obtained with LIME a diffusion behavior different from LEMON published results;

In particular σ_0^T (or B) is different;

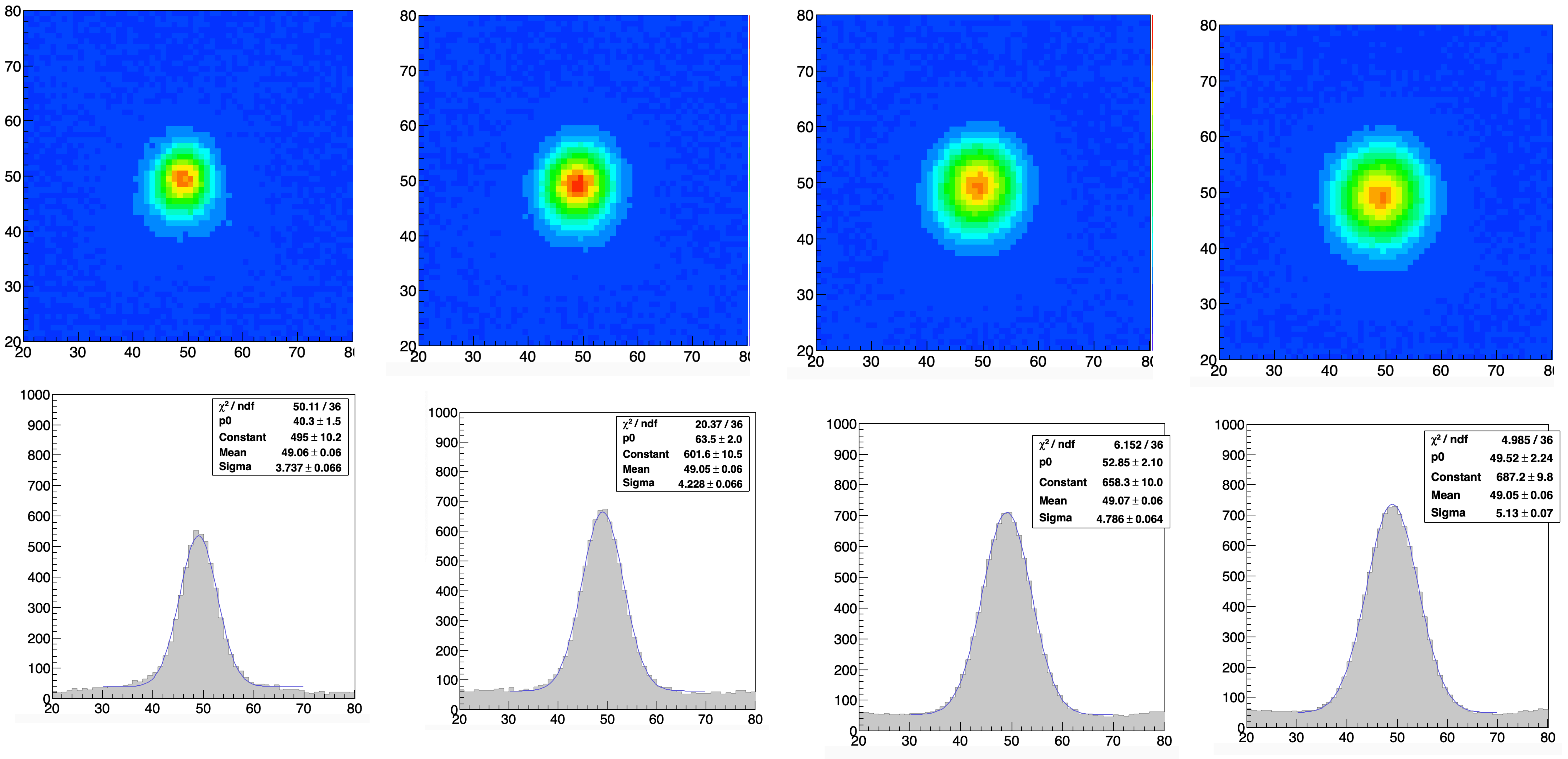
Tracks redigitized have been compared with the latest results obtained from data with sPlot.

```
#'diff_const_sigma0T'    : 0.0784,     # diffusion constant [mm]^2 - Original
#'diff_coeff_T'          : 0.01232,    # diffusion parameter [mm/sqrt(cm)]^2 for 1 kV - Original

'diff_const_sigma0T'    : 0.266,     # diffusion constant [mm]^2
'diff_coeff_T'          : 0.01392,    # diffusion parameter [mm/sqrt(cm)]^2 for 1 kV
```

Samuele produced some data with larger σ_0^T

Experimental shapes of spots due to ^{55}Fe interactions



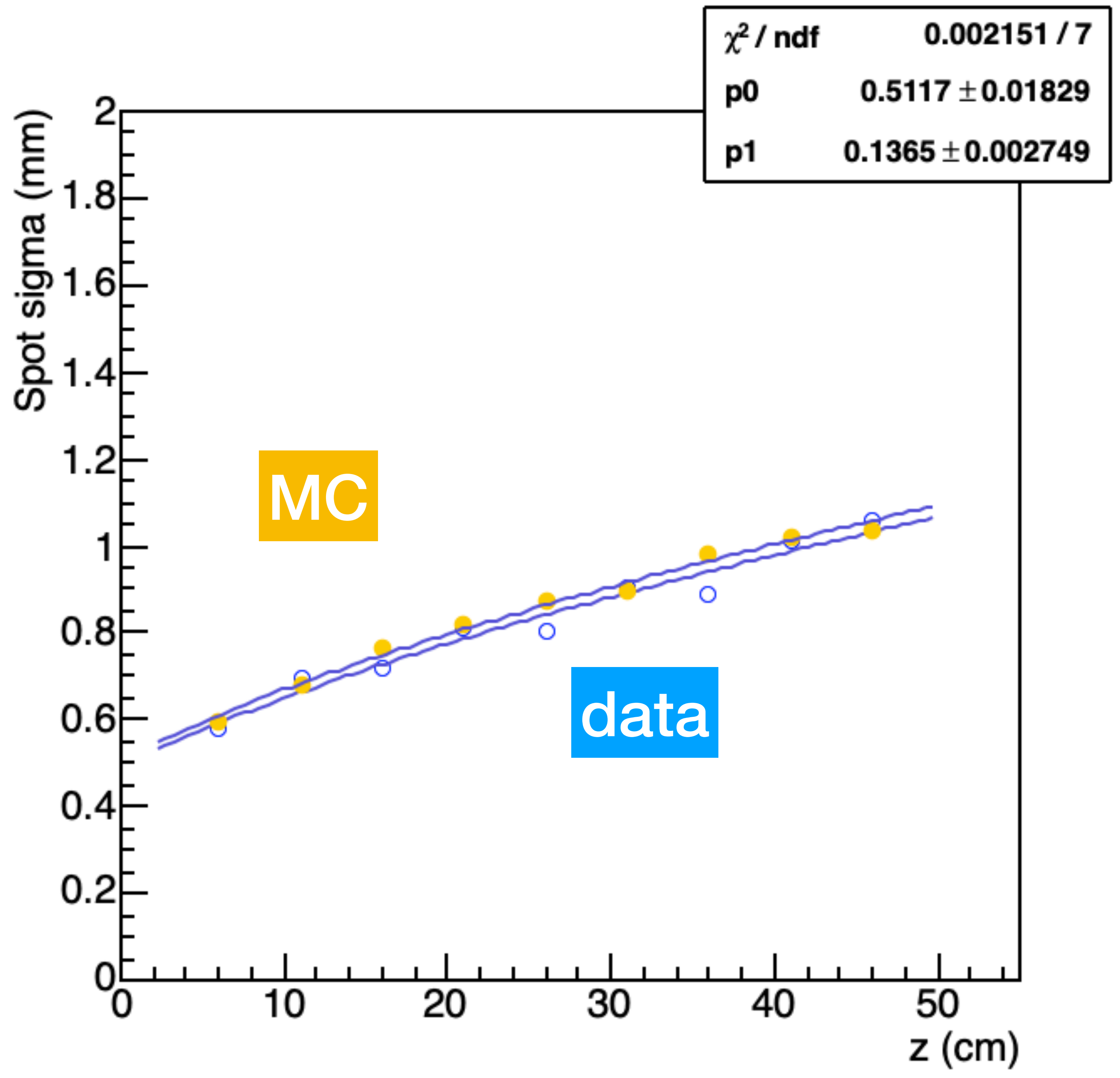
6 cm - light = 4635 **11 cm - light = 6373** **16 cm - light = 7895** **21 cm - light = 8834**

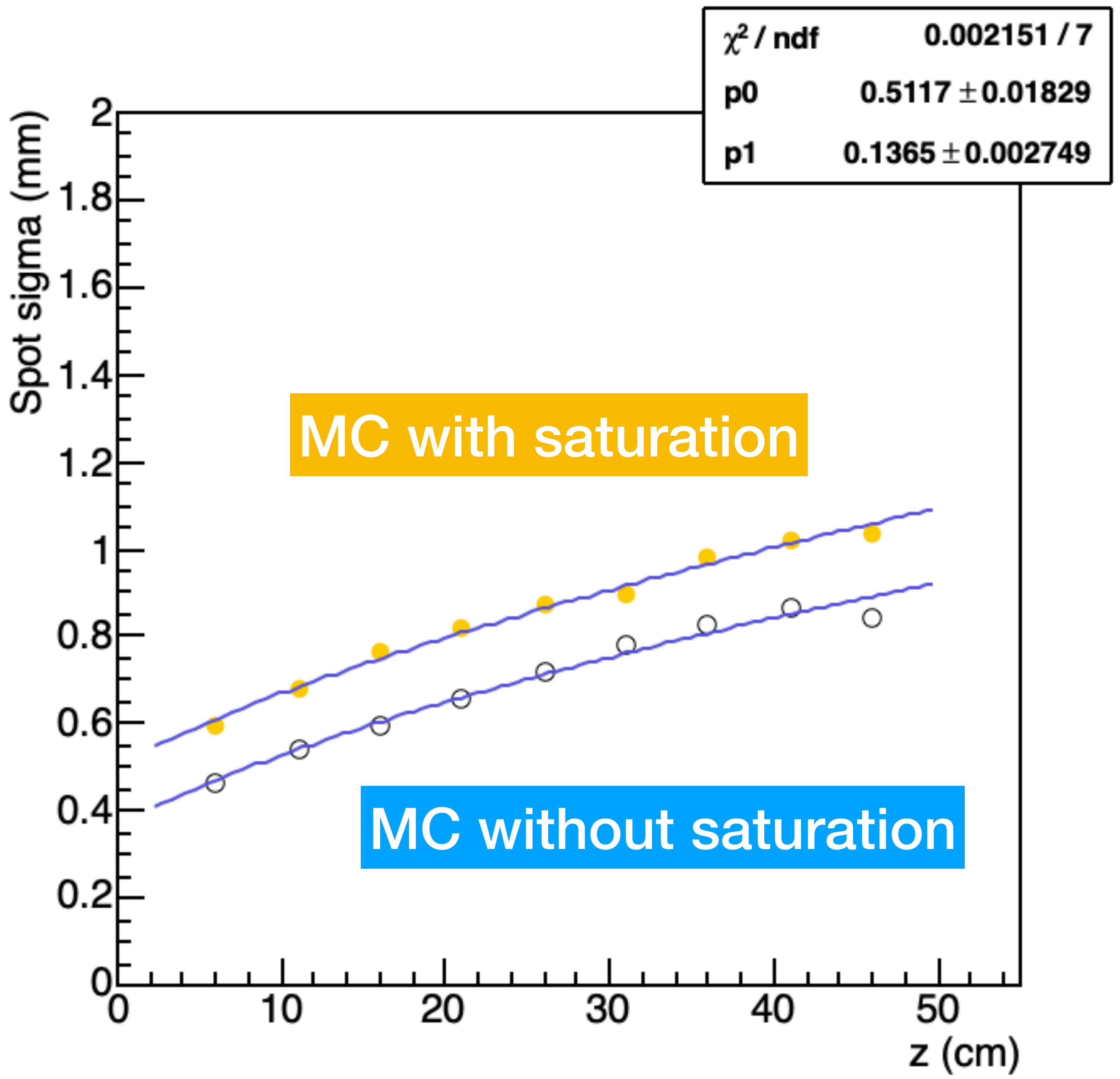
Experimental spot shapes

26 cm - 9659 **31 cm - 10001** **36 cm - 10379** **41 cm - 10436** **46 cm - 10480**

Saturation

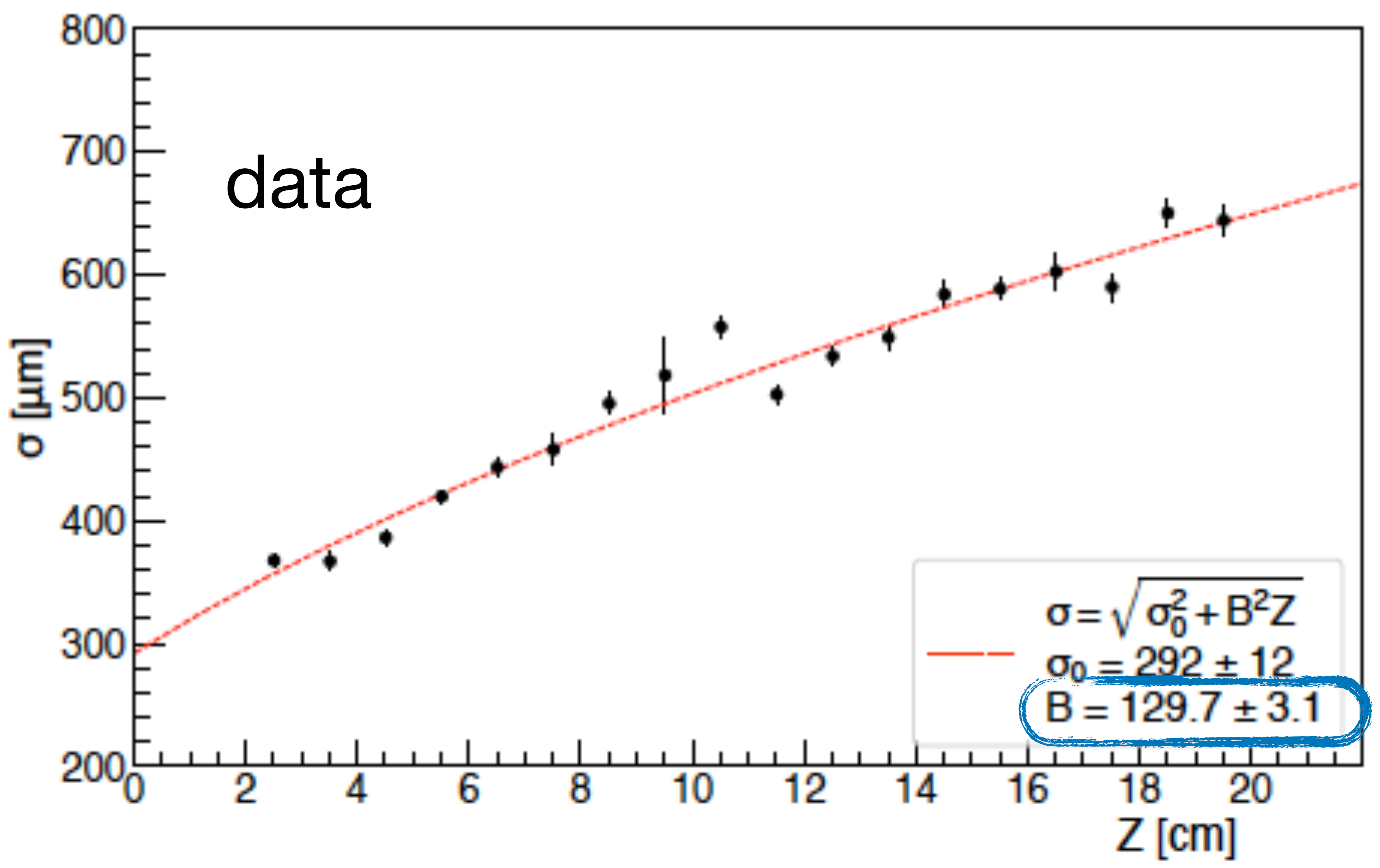
Because of the gain saturation in the central part of the spots, their shape is modified and this results in a “larger” effective diffusion;

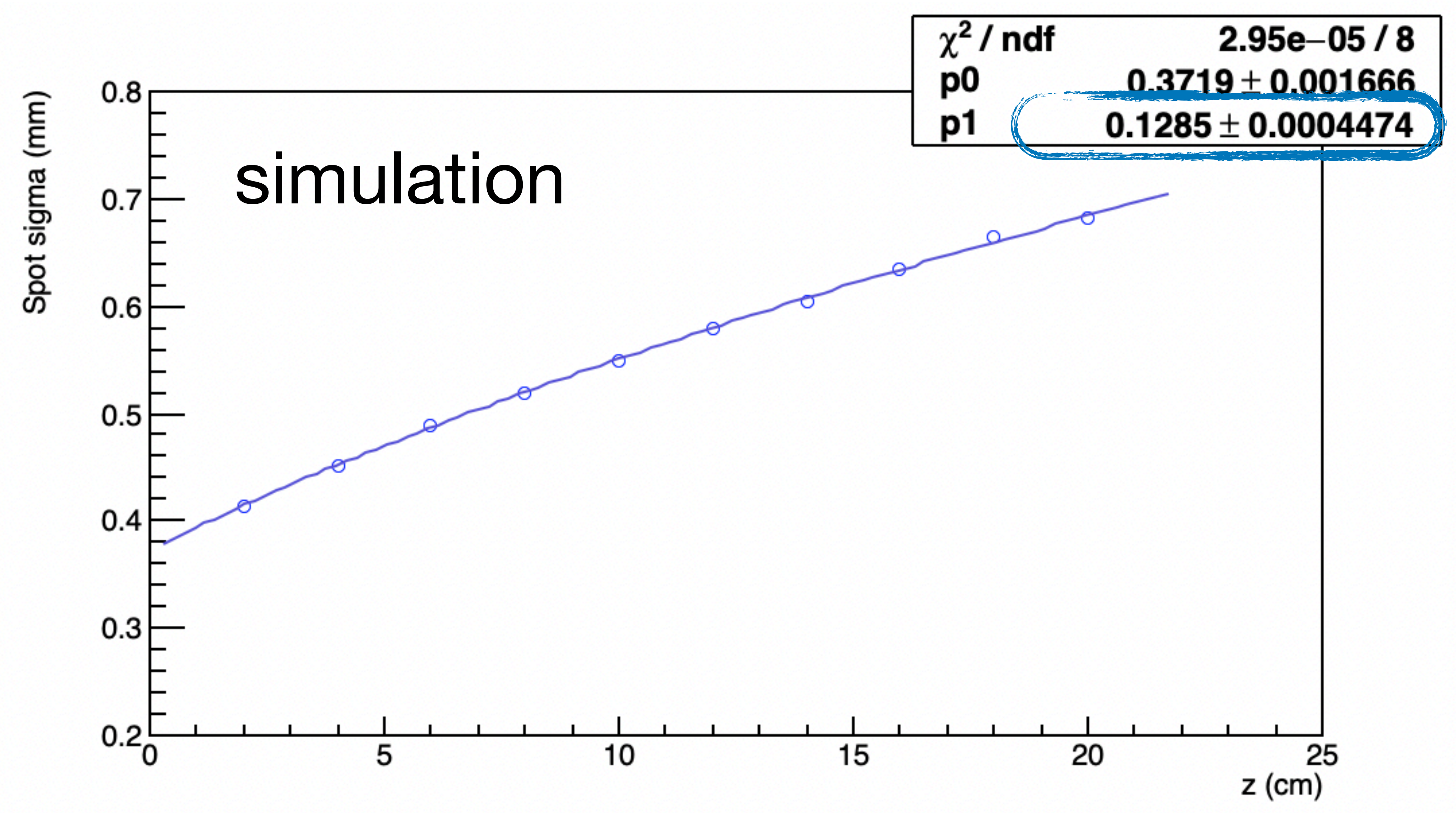




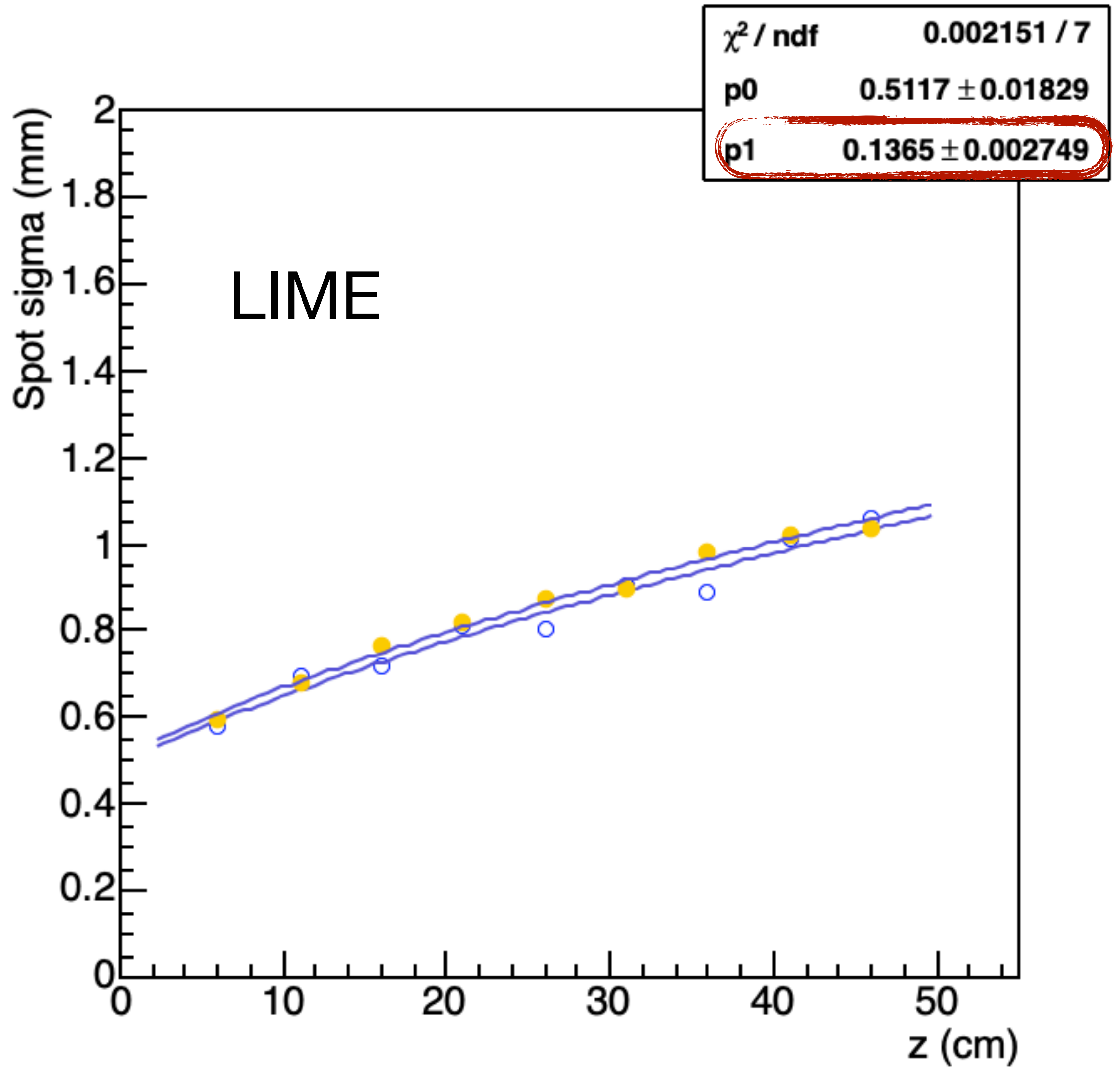
$$\sigma_0^T = 350\ \mu m \qquad \sigma^T = \frac{130\ \mu m}{\sqrt{z(cm)}}$$

Mip Comparison





- Starting from same parameters simulation is providing σ_0^T, σ^T values closer to experimental ones and different from LIME



Conclusion

The saturation results in a non linear response of a detector and in a dependence of the response on the ionization distance from the GEM and modifies the spot shapes resulting in a larger effective diffusion;

We propose to simulate:

- 5 z positions: 5,10,20,30,40 cm
- 3 valori di $\sigma_0^T = 350,\ 450,\ 550\ \mu m$
- 3 valori di $\sigma^T = \dfrac{(110,\ 120,\ 130)\ \mu m}{\sqrt{z(cm)}}$

Please, keep in mind that area acquired is 34.6 x 34.6 cm^2 while sensor has 2304 pixels with 6.5 um side. Therefore, sensor side is 1.4976 cm.