Update systematic error due to intrinsic resolution

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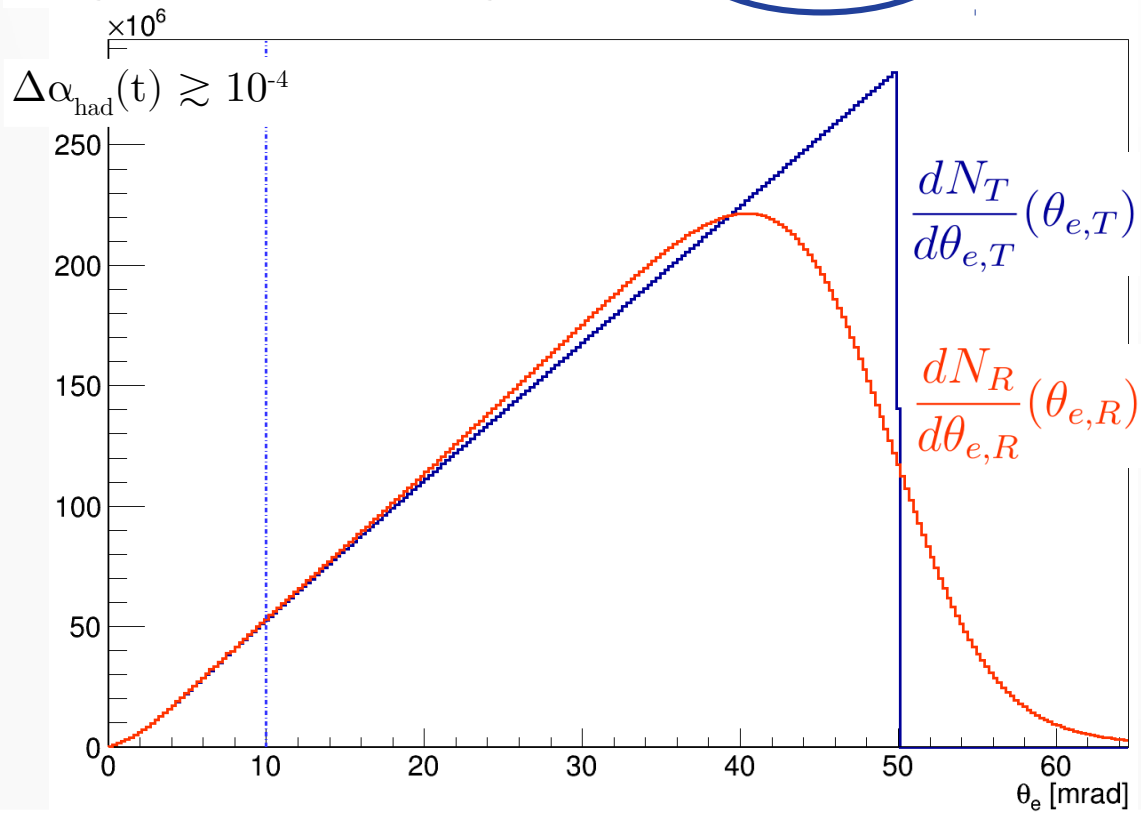
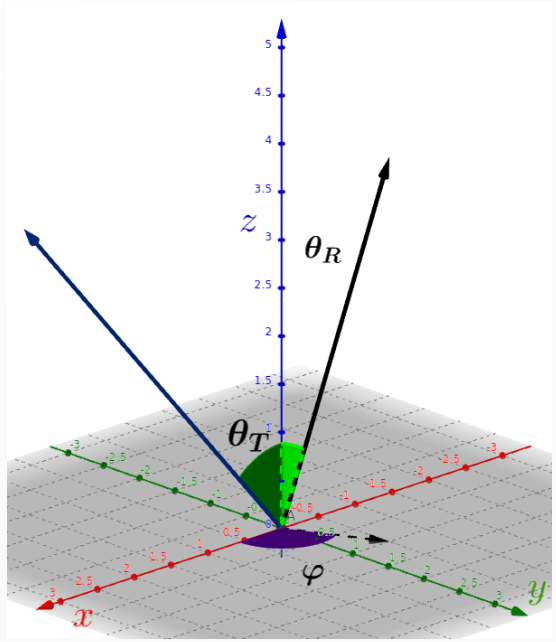
Multiple scattering effects on the differential cross section

Parameterization of detector resolution

$$\frac{dN_R}{d\theta_{e,R}}(\theta_{e,R}) = \int \frac{dN_T}{d\theta_{e,T}}(\theta_{e,T})\, g(\theta_{e,R},\ \theta_{e,T})\, d\theta_{e,T}$$

Models multiple scattering effects and intrinsic resolution of the tracker





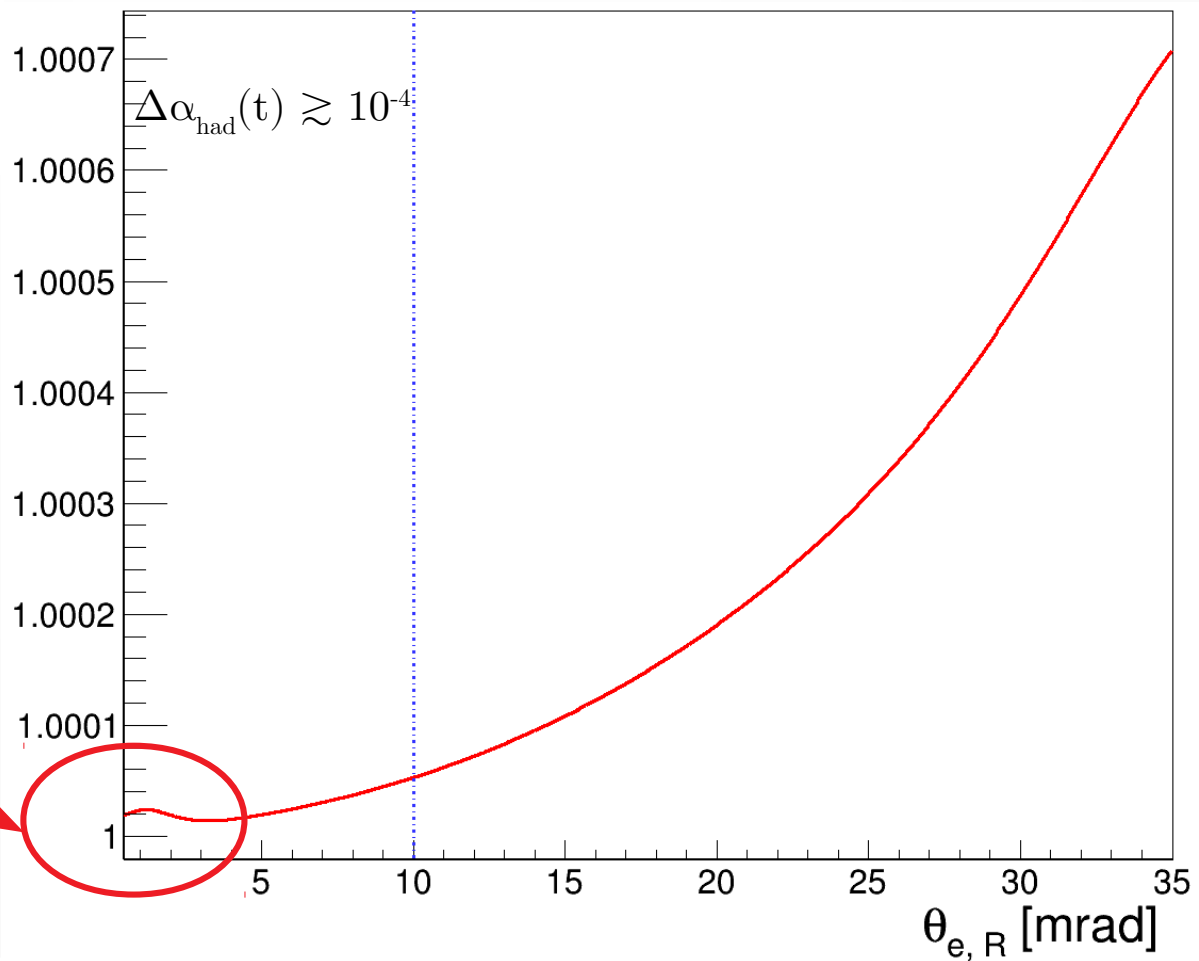
Effect of a miscalibration on the Gaussian core

What is the effect of a miscalibration of the Gaussian core on the differential cross section?

$$\frac{\frac{dN}{d\theta_{e,R}}(\theta_{e,R} \mid \sigma_G + 1\%)}{\frac{dN}{d\theta_{e,R}}(\theta_{e,R})}$$

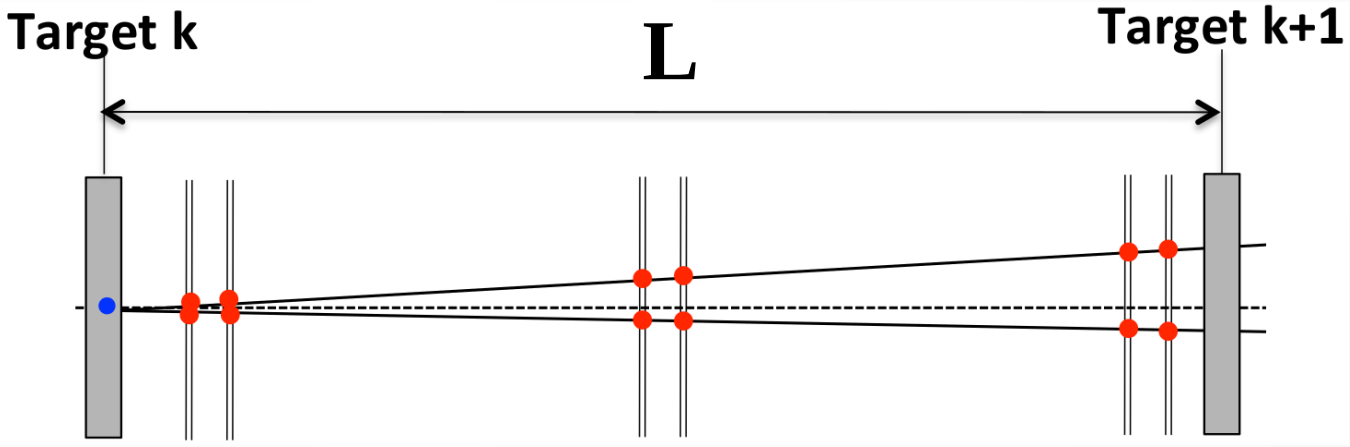
$$\sigma_G(E_e) = \sqrt{q_0^2 + q_1 E_e^{2 \cdot q_2}}$$

Bump due to an error on the intrinsic resolution



Intrinsic resolution for different experimental setups

$$q_0 = \frac{\sigma_{CMS}}{L}\sqrt{2}$$



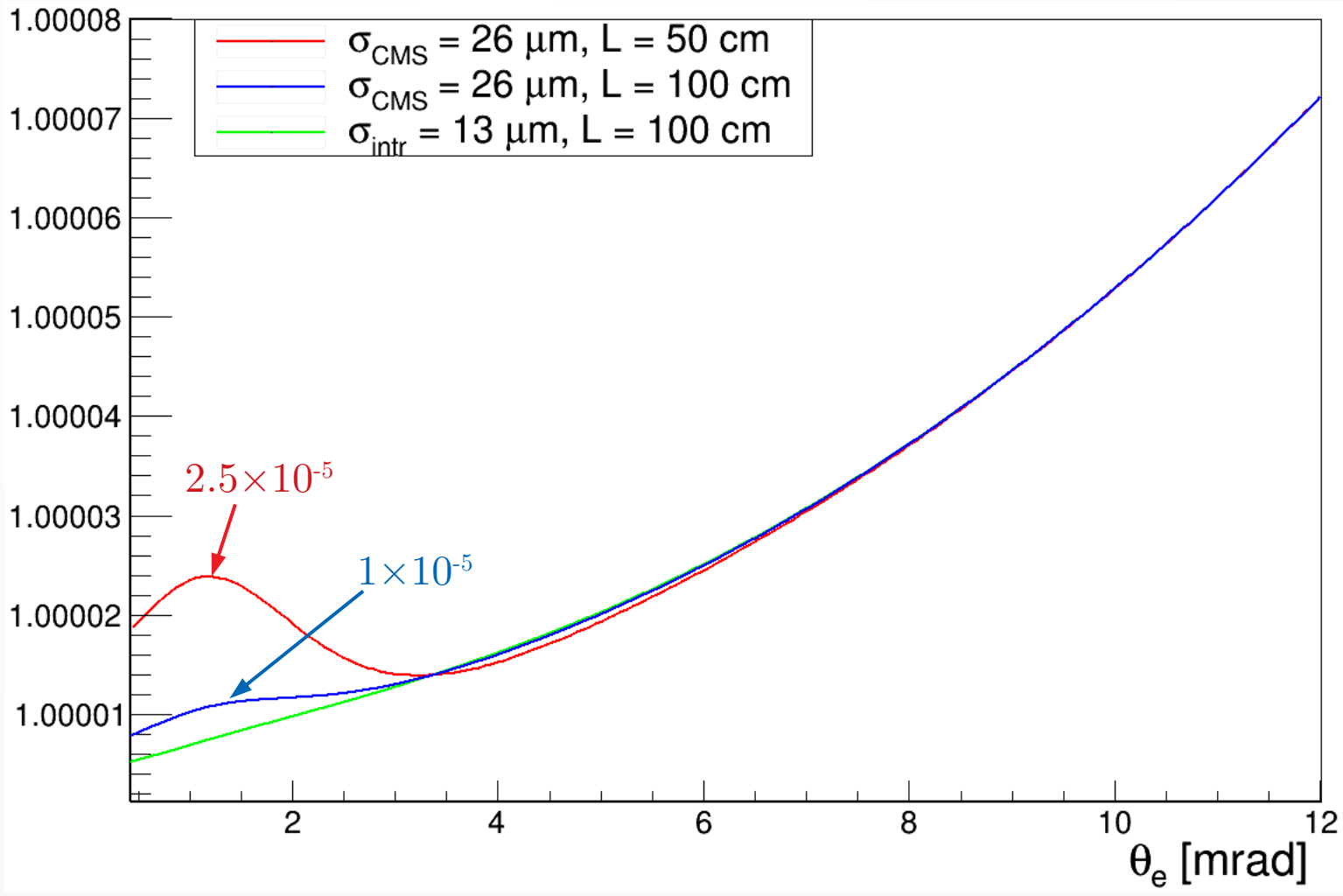
1) my thesis: $\sigma_{CMS} = 26\,\mu m$ L = 50 cm → $q_0 \simeq 74\,\mu rad$

2) Test Run: $\sigma_{CMS} = 26\,\mu m$ L = 100 cm → $q_0 \simeq 37\,\mu rad$

3) ideal setup: $\sigma_{intr} = \frac{\sigma_{CMS}}{2} = 13\,\mu m$ L = 100 cm → $q_0 \simeq 18\,\mu rad$

Intrinsic resolution for different experimental setups

$$\frac{\frac{dN}{d\theta_{e,R}}(\theta_{e,R} \mid \sigma_G + 1\%)}{\frac{dN}{d\theta_{e,R}}(\theta_{e,R})}$$



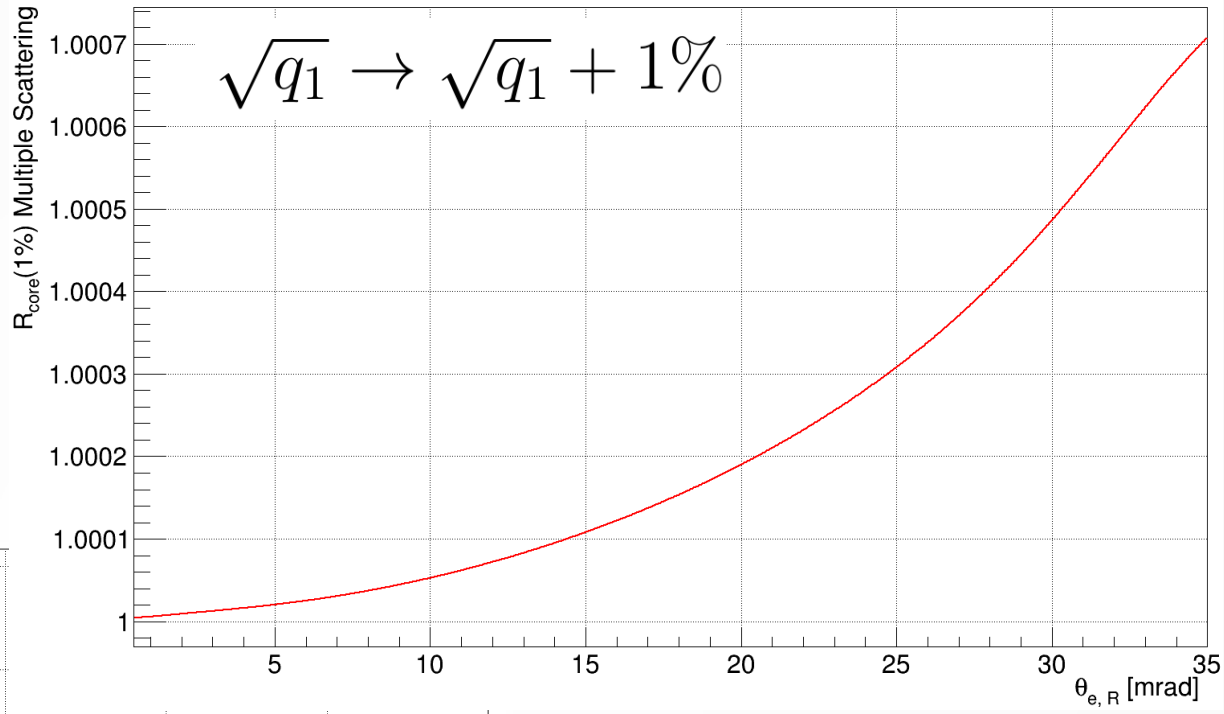
Conclusions

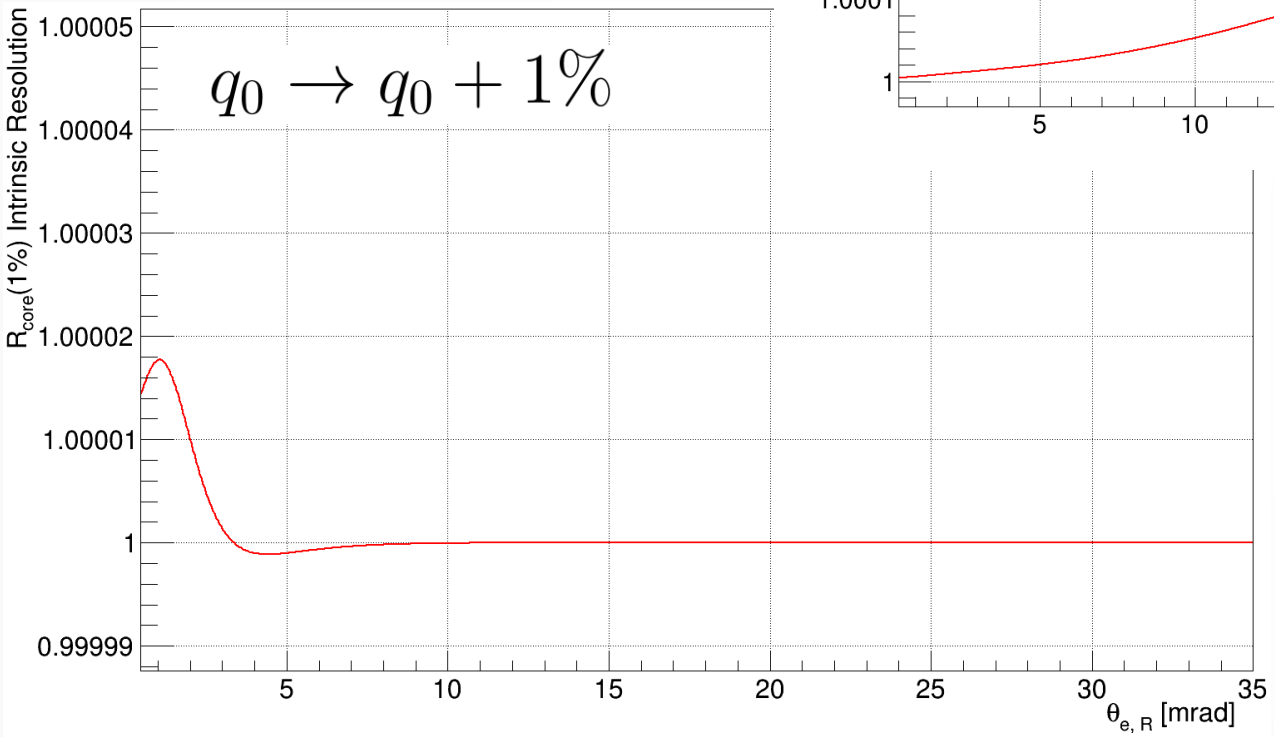
- Test Run setup: a 1% miscalibration on the intrinsic resolution of the tracker translates into a systematic effect $\sim 1 \times 10^{-5}$ on the knowledge of the differential cross section. It can be seen as a small bump at low θ_e.

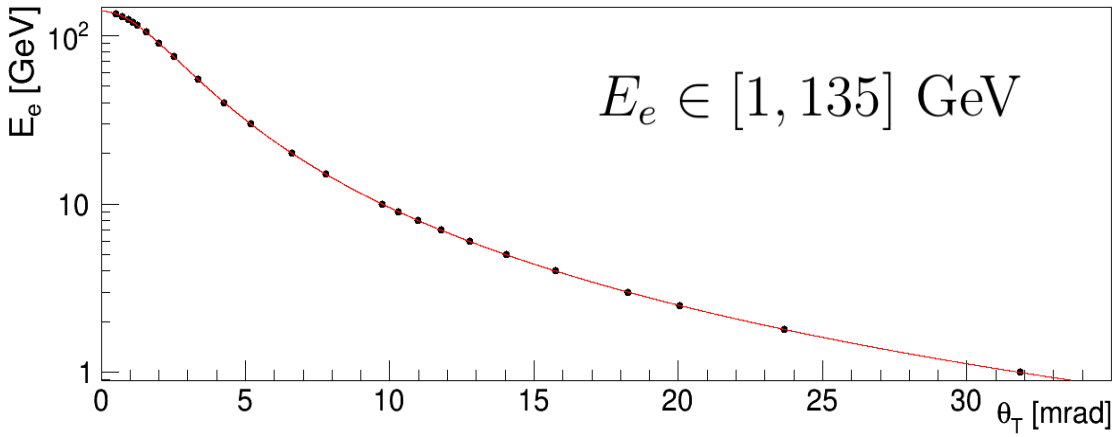
- A single hit resolution of 13 μm makes a 1% systematic effect on the intrinsic resolution negligible.

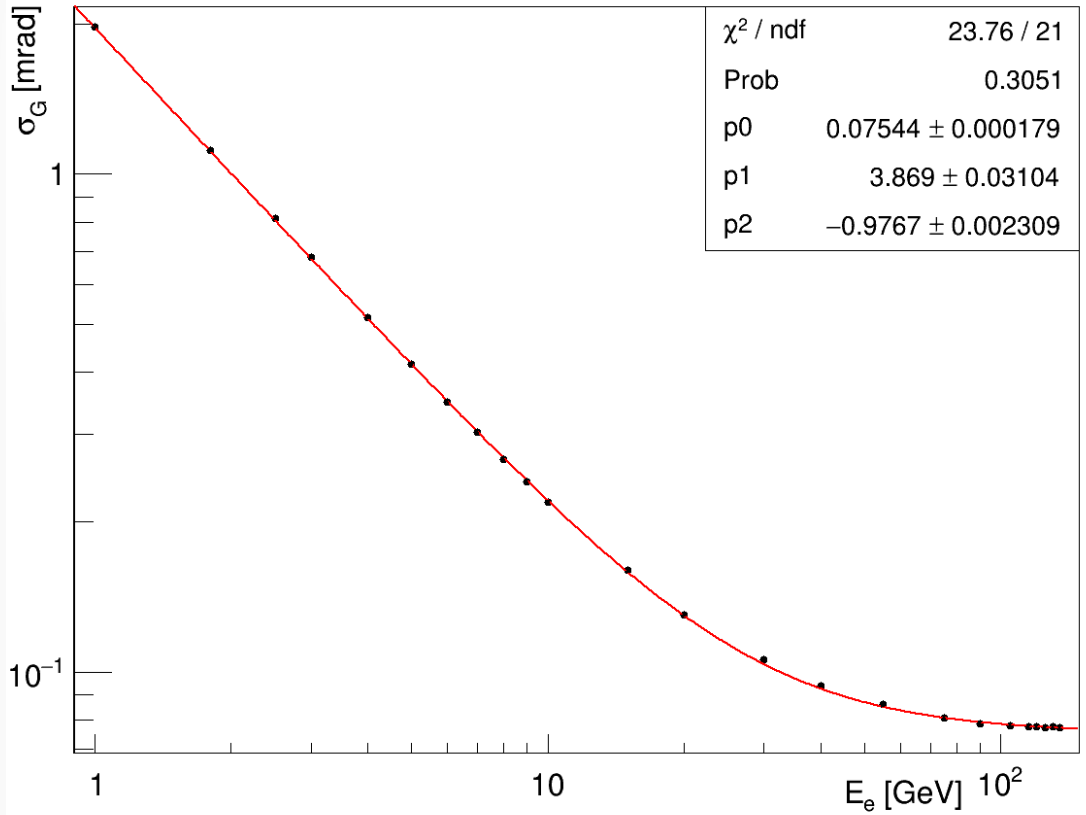
BACKUP

$$\sigma_G(E_e) = \sqrt{q_0^2 + q_1 E_e^{2 \cdot q_2}}$$









24 electron samples.
Each sample corresponds to a different energy.

Parameterization of the resolution function as a function of E_e

$$\sigma_G(E_e) = \sqrt{q_0^2 + q_1 E_e^{2 \cdot q_2}}$$