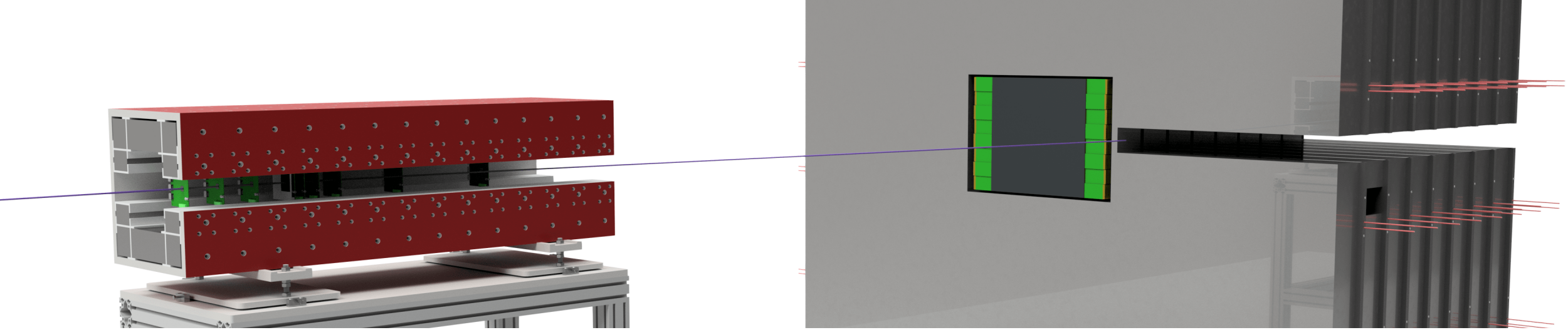
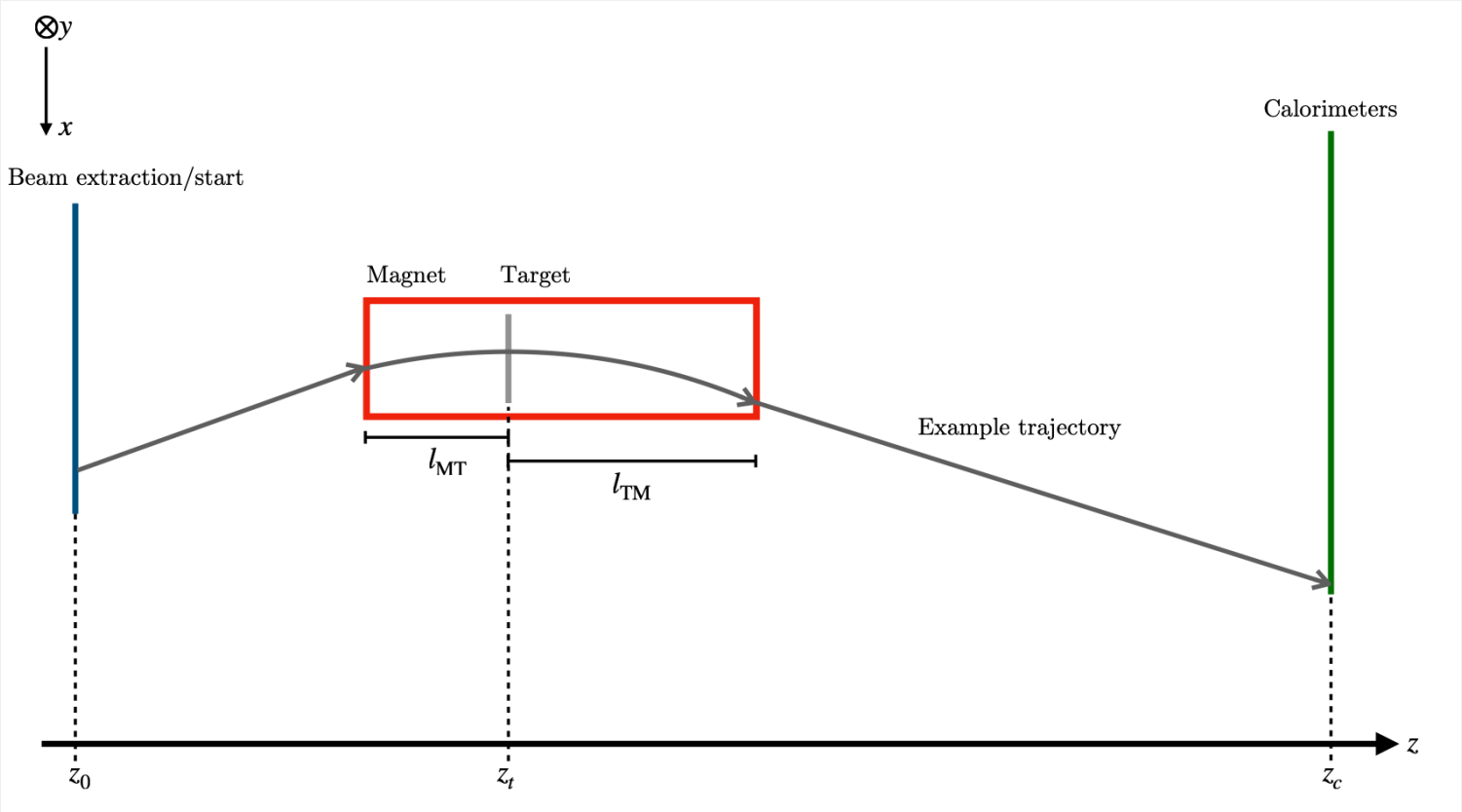


LOHENGRIN MEETING

Cedric Breuning

BEAMLINE

[Repo with more details]



Distances/Dimensions known (input)

Input:

σ_t at target

σ_c at calorimeter

BASELINE SCENARIO

- Target impact perpendicular to target ($\hat{p} = (0,0,1)$)
- Impact in center of target

$$y_c^b = y_t^b = 0 \qquad y_0^b = 0$$

$$x_c^b = R - \sqrt{R^2 - l_{\mathrm{TM}}^2} + \tan\theta \cdot l_{\mathrm{MC}} = R - \sqrt{R^2 - l_{\mathrm{TM}}^2} + \frac{l_{\mathrm{TM}} \cdot l_{\mathrm{MC}}}{\sqrt{R^2 - l_{\mathrm{TM}}^2}}$$

$$x_0^b = R - \sqrt{R^2 - l_{\mathrm{MT}}^2} + \frac{l_{\mathrm{MT}} \cdot l_{0\mathrm{M}}}{\sqrt{R^2 - l_{\mathrm{MT}}^2}}$$

$$p_0^b = R_y(-\theta)\begin{pmatrix}0\\0\\1\end{pmatrix} = \begin{pmatrix}\cos(-\theta) & 0 & \sin(-\theta)\\ 0 & 1 & 0\\ -\sin(-\theta) & 0 & \cos(-\theta)\end{pmatrix}\begin{pmatrix}0\\0\\1\end{pmatrix} = \begin{pmatrix}-\sin(\theta)\\0\\\cos(\theta)\end{pmatrix}$$

$$\sin\theta = \frac{l_{\mathrm{MT}}}{R}$$

All parameters known/ part of the experiment

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OTHER POINTS: y DIRECTION

$$y_0 = y_t - z_t \cdot \tan\vartheta_y$$

$$\tan\vartheta_y = \frac{\frac{\sigma_{y,c}}{\sigma_{y,t}} y_t - y_t}{z_c - z_t}$$

All parameters known/
part of the experiment

OTHER POINTS: x DIRECTION

$$x_c^b + \left(\frac{\sigma_{x,c}}{\sigma_{x,t}} - 1\right) \cdot x_t = R \cdot \left(\sin\left(\frac{\pi}{2} - \theta_t\right) - \sin\left(\frac{\pi}{2} - \theta_t + \Delta\theta\right)\right) + \tan(\Delta\theta - \theta_t) \cdot l_{\mathrm{MC}}$$

$\Rightarrow$ Want $\theta_t(x_t)$

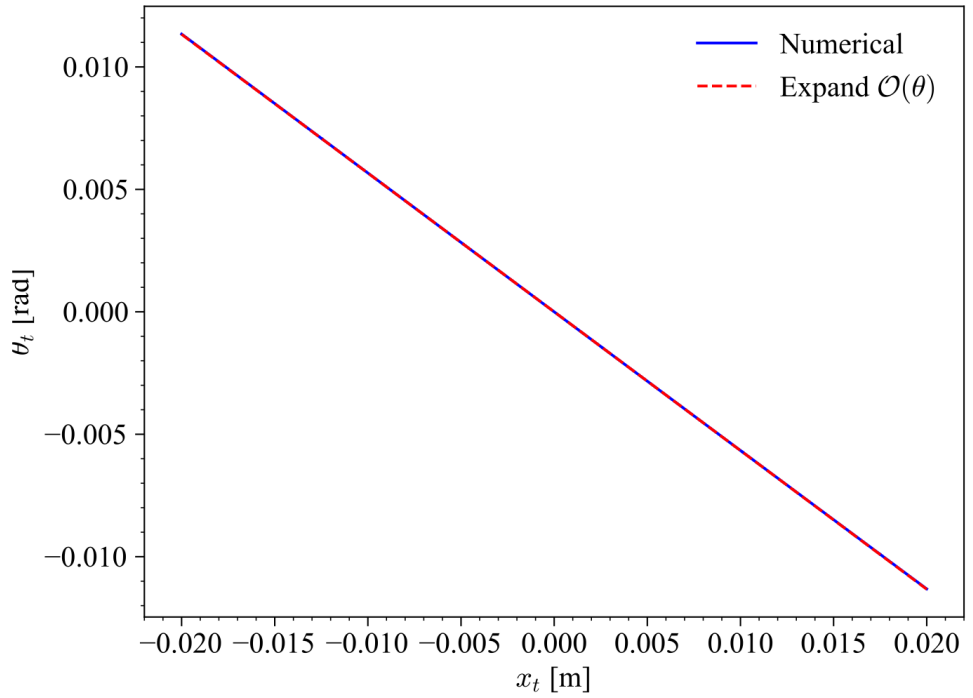
$$\Delta\theta = \frac{\pi}{2} + \theta_t - \arccos\left(\frac{l_{\mathrm{TM}}}{R} - \sin(\theta_t)\right)$$

Approximation to $\mathcal{O}(\theta_t)$:

$$\theta = -\frac{\left(\frac{\sigma_{x,c}}{\sigma_{x,t}} - 1\right)}{\frac{l_{\mathrm{TM}}+l_{\mathrm{MC}}}{\lambda} + \frac{l_{\mathrm{TM}}^2 \cdot l_{\mathrm{MC}}}{R^2\lambda^3}} \cdot x_t$$

$$\lambda = \sqrt{1 - (l_{\mathrm{TM}}/R)^2}$$

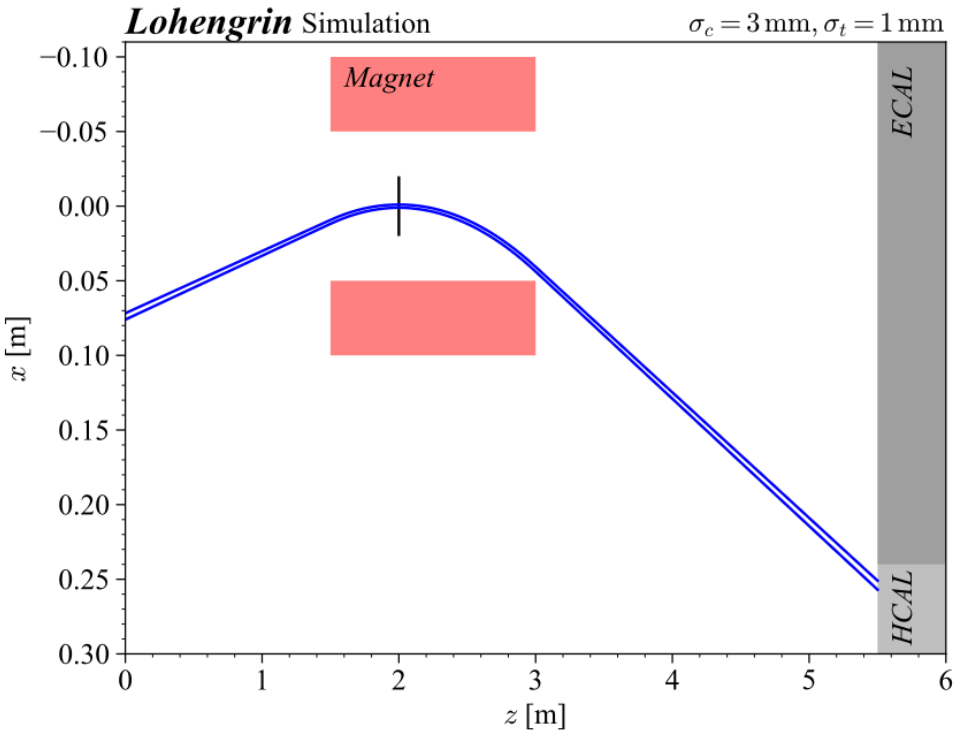
All parameters available

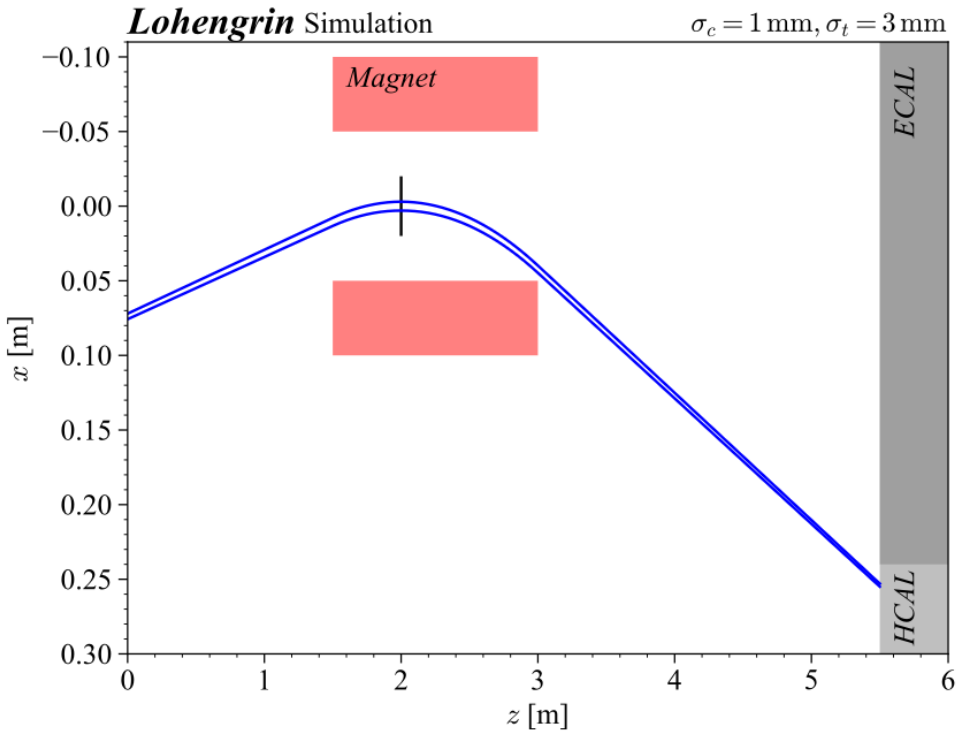


$$x_0 = x_m - l_{0\mathrm{m}} \cdot \tan\vartheta_x \quad \text{with } \vartheta_x = \theta_t + \Delta\theta^*(\theta_t)$$

$$\Delta\theta^* = \frac{\pi}{2} - \theta_t - \arccos\left(\cos\left(\frac{\pi}{2} - \theta_t\right) - \frac{l_{\mathrm{MT}}}{R}\right)$$

EXAMPLE TRAJECTORIES





STARTING WITH QED INTERACTIONS

10^7 electrons on target simulated

- 3.638.551 events with 1 Photon
  - 1.154 events with non eBrem photon
- 2.040.125 events with multiple photons
- 4.321.324 events with no photon

QED DISTRIBUTIONS