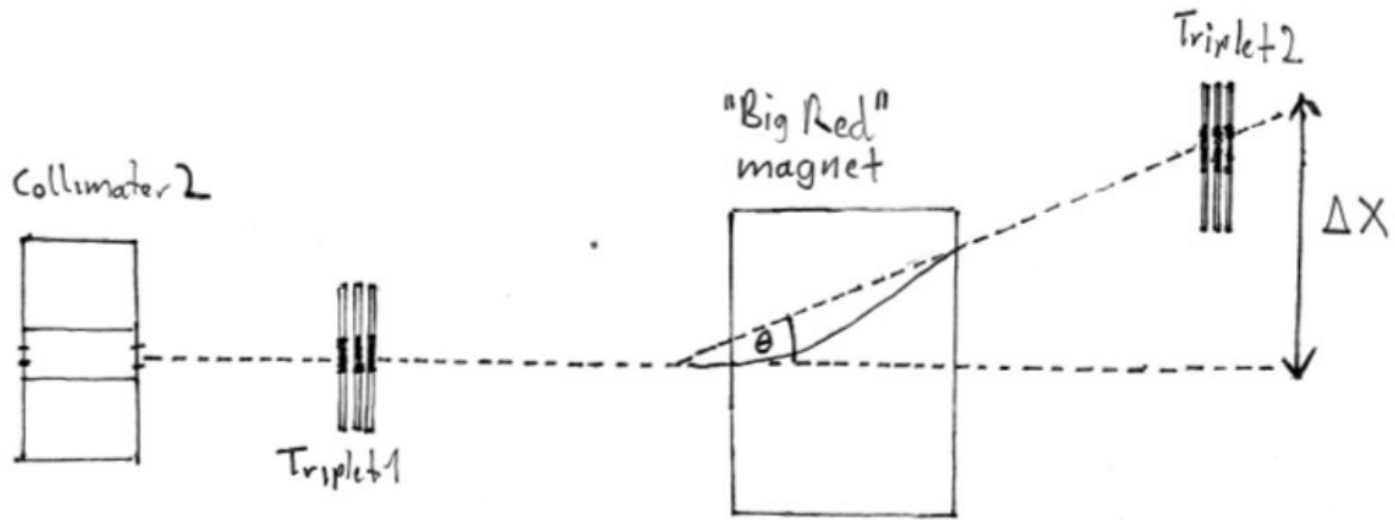


DESY TB energy & (homogeneous) scattering studies

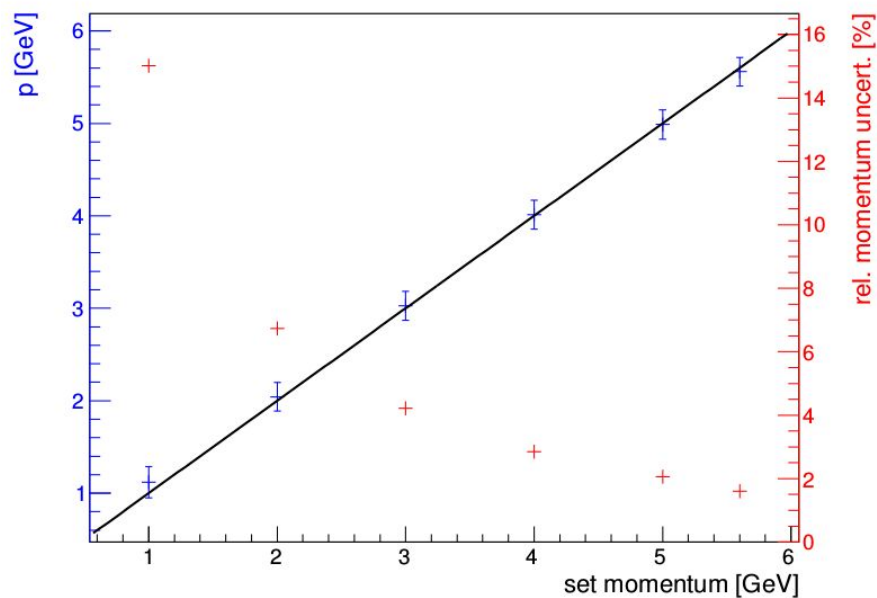
Scattering X0 day, 30.10.2017
Jan Dreyling-Eschweiler et. al.

Energy/momentum (spread) measurement

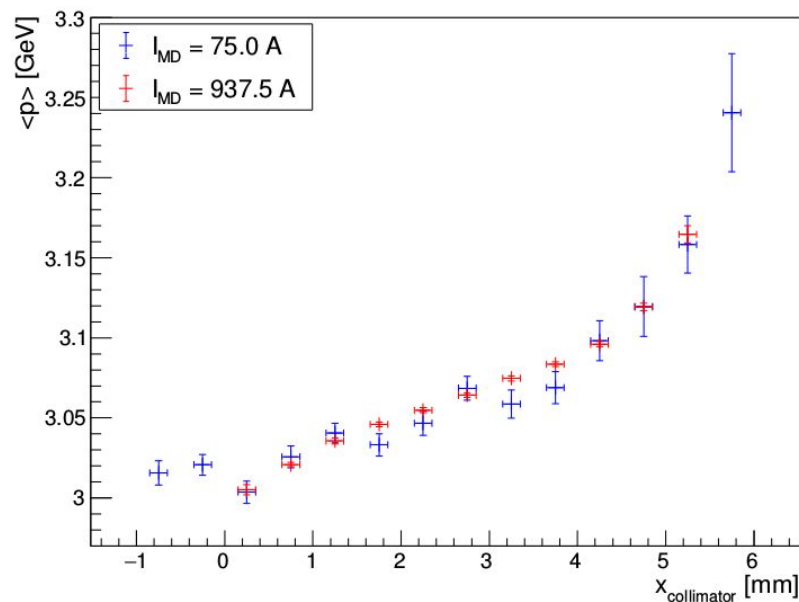


Measurement: TB21, August 2016, Torben Lange et. al.

Energy/momentum (spread) measurement



overall



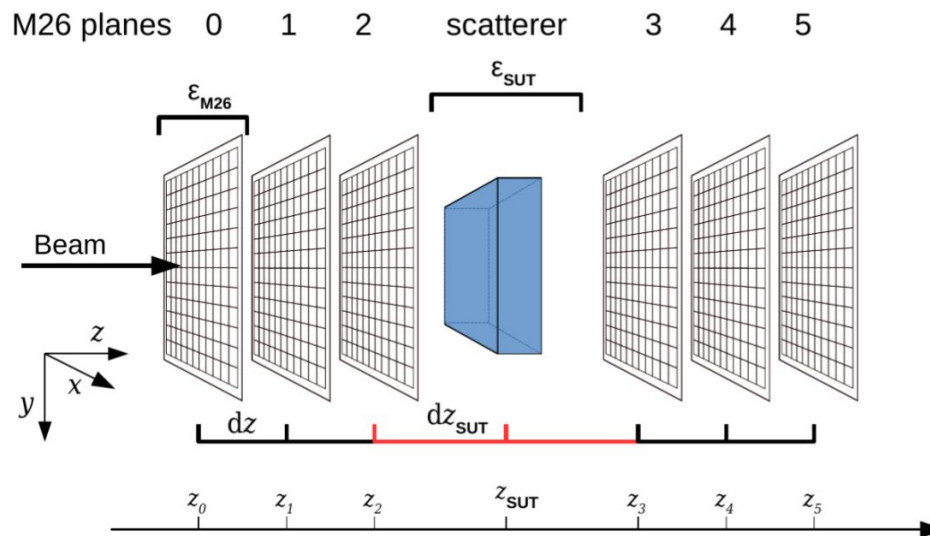
3 GeV

Analysis: "Triplet tracks", Paul Schütze

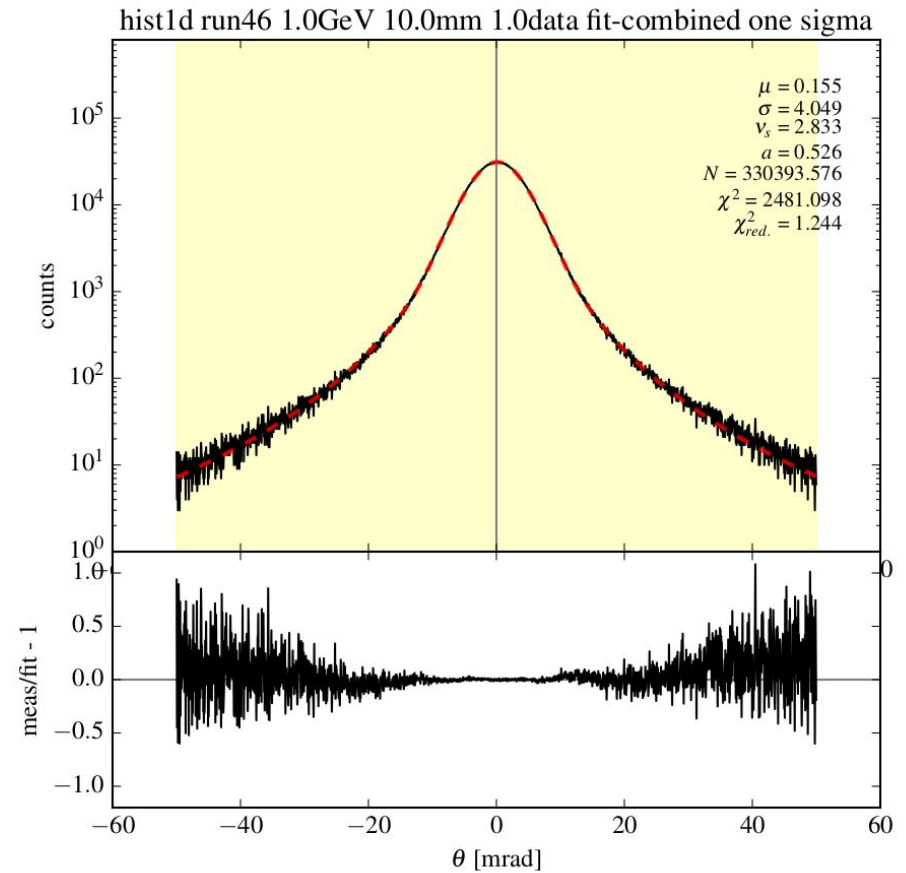
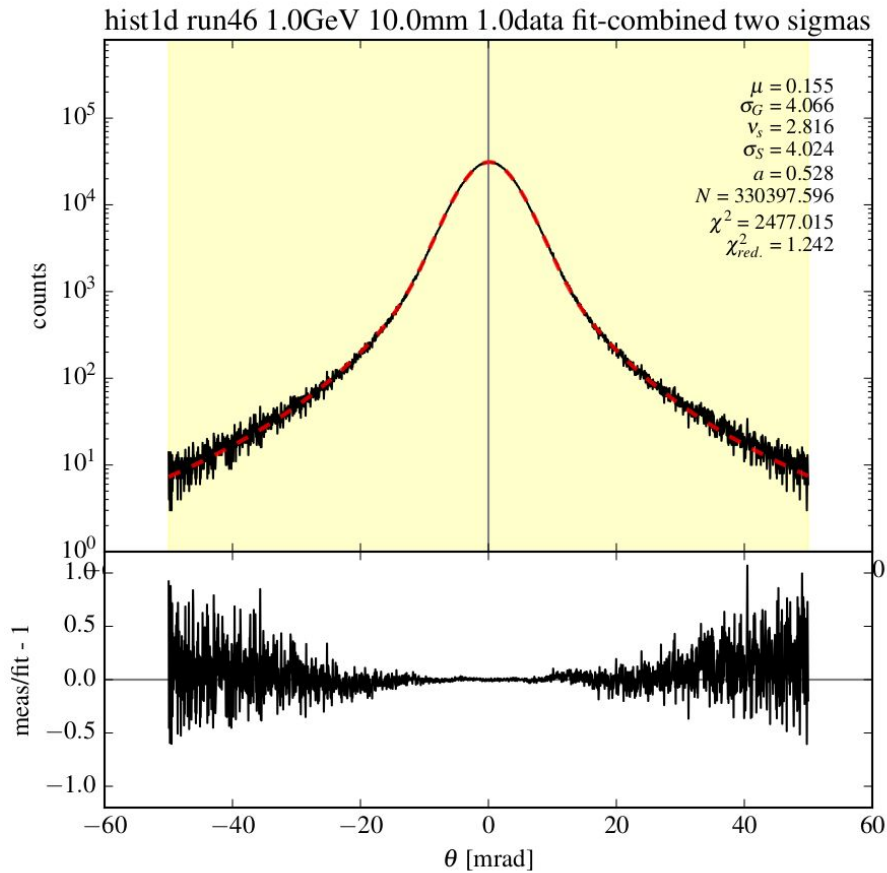
Alu targets: 13, 25, 50, 100, 200, 1000 μm

Measurement geometry

- Plane spacing $dz = 20 \text{ mm}$, $dz_{\text{SUT}} = 15 \text{ mm}$
- Total material budget telescope: $\varepsilon = x / X_0 = 4.8\text{e-}3$

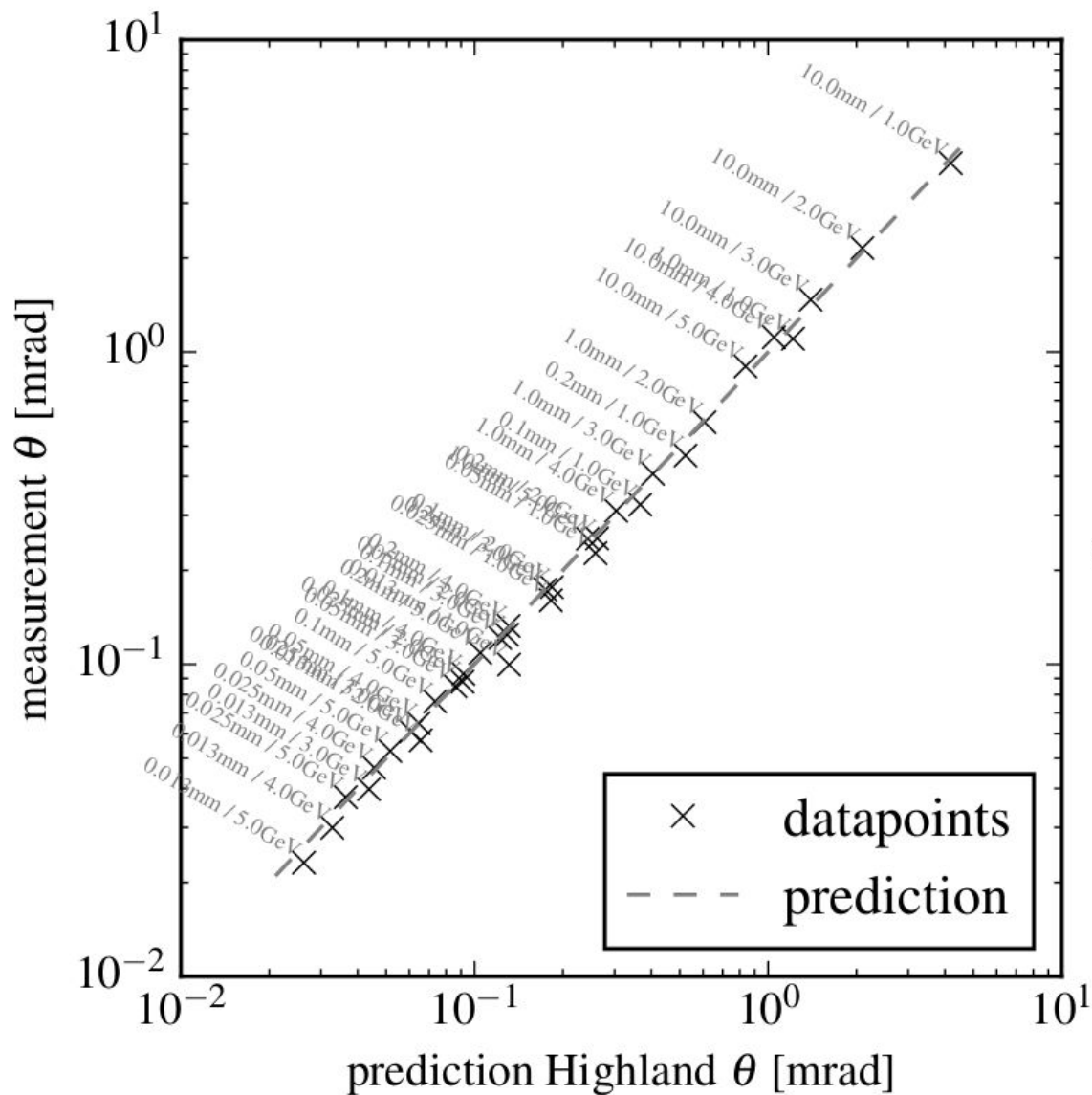


Determining the scattering angle



Study: RMS \rightarrow Gauss 98% \rightarrow Student t \rightarrow combined \rightarrow combined one sigma

Comparison to Highland prediction



$$\theta_{\text{alu}} = \sqrt{\theta_{\text{meas}}^2 - \theta_{\text{meas,air}}^2}$$

vs.

$$\theta = \frac{13.6 \text{ MeV}}{p} \cdot \sqrt{\epsilon_{\text{kink}}} \cdot (1 + 0.038 \cdot \ln \epsilon_{\text{total}})$$

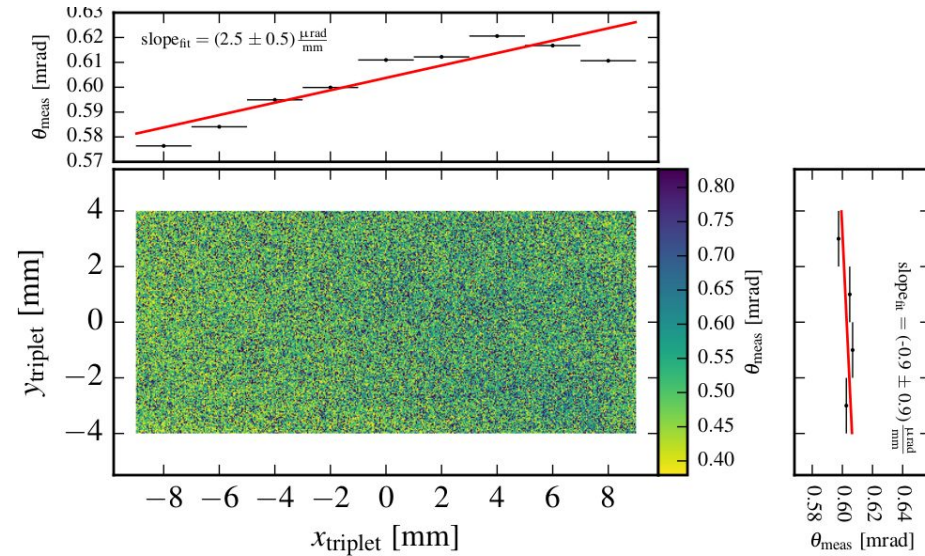
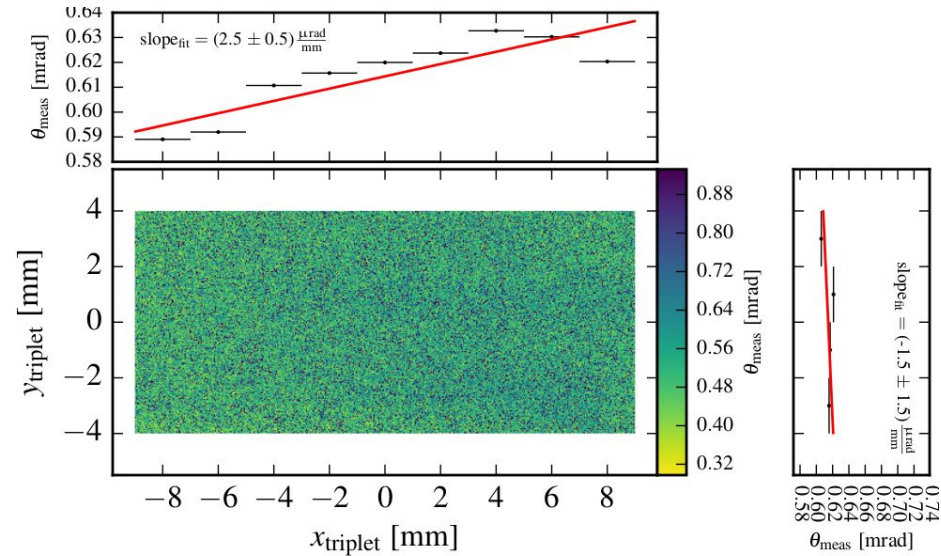
$$\epsilon_{\text{kink}} = \frac{d_{\text{SUT}}}{x0_{\text{SUT}}}$$

$$\epsilon_{\text{total}} = \epsilon_{\text{kink}} + \frac{d_{\text{Mimosa}}}{x0_{\text{Si}}} + \frac{d_{\text{Kapton}}}{x0_{\text{K}}} + \frac{d_{\text{Air}}}{x0_{\text{Air}}}$$

2d distribution(s) - example

“gblsumkxandsumky” → RMS estimator:
 $\theta(s) = \sqrt{\text{TH2.counts}} * \text{TH2.error}$

“gblsumkx2andsumky2” → quad&mean estimator:
 $\theta(s) = \sqrt{\text{TH2.content}}$



preliminary, since have to understand the results: 1GeV/air:

$$\theta^2 - \text{GBL_uncert.}^2 = \sqrt{0.60^2 - 0.39^2} \text{ mrad} = 0.45 \text{ mrad} \rightarrow (\text{Highland}) 0.7 \text{ GeV (!?)}$$

Next Steps:

check for Alu, check different binning → weighted projections, ...

Plans and Todos

- Material Scan of Lead (Pb) and Tungsten (W) → KW7
- Collimator study and Energy Dependence → KW6 ?
→ “User wish” and Source study