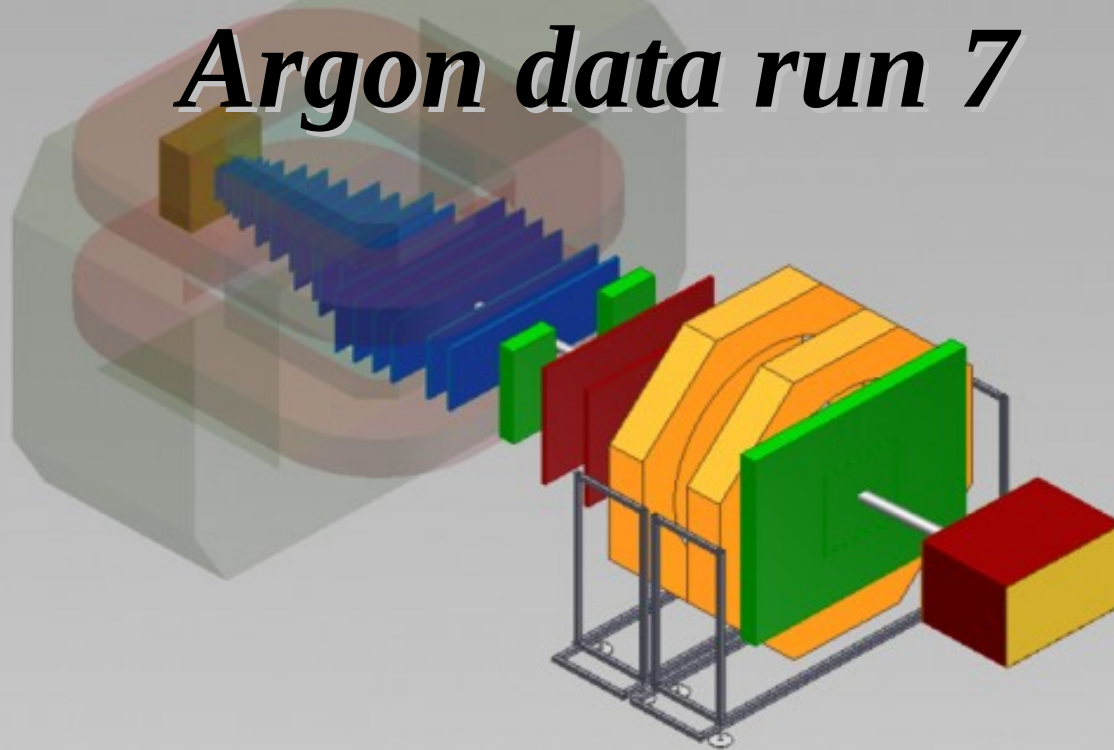


TOF700 efficiency comparison between MC and Data in Argon data run 7



Lalyo Kovachev^{1,2}, Yuri Petukhov², Vasily Plotnikov²

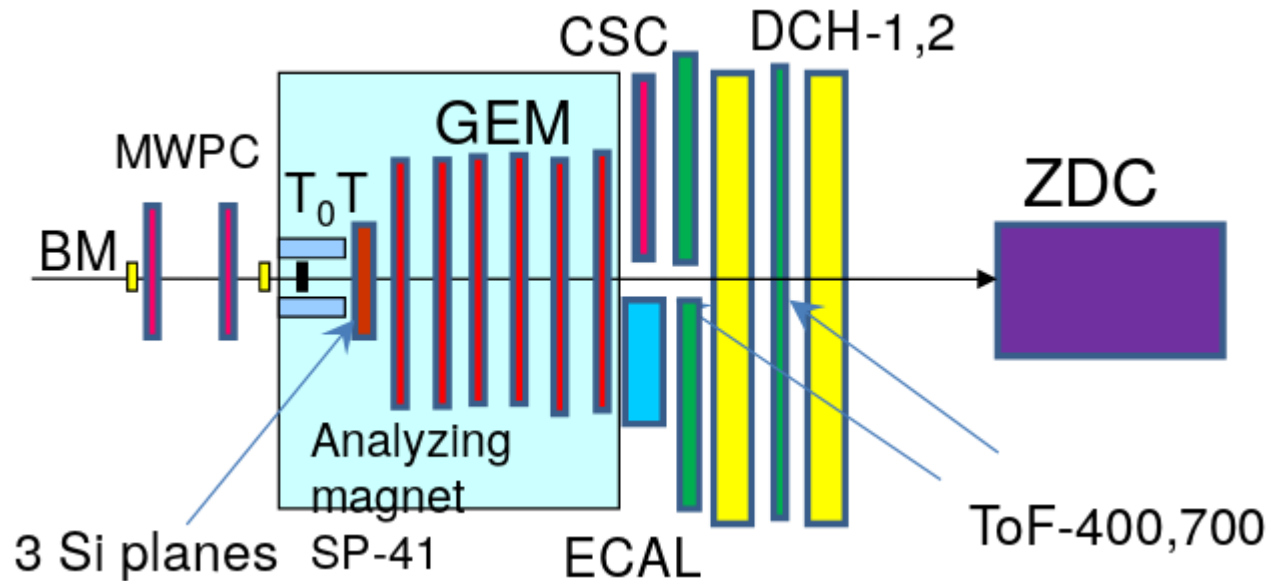
1. FPET Plovdiv University Paisii Hilendarski, Bulgaria

2. VBLHEP Joint Institute for Nuclear Research, Russia



Argon data run 7

Ar beam 3.2 GeV/n
Targets Al,C,Sn,Cu,Pb



Schematic drawing of the location of the TOF700 on the BM@N setup

TOF700 Particle Identification chain

For **Data** and **MC** we use the **same** Identification chain

We use **DCM QGSM** Generator

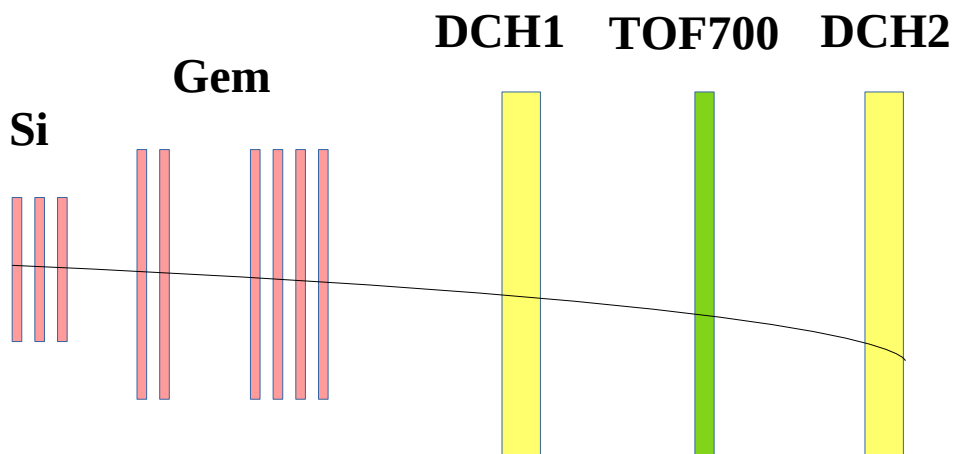
Si-GEM(data) tracks from **V. Plotnikov**

DCH tracks from **DCH group**

TOF700 hits from **Y. Petukhov**

Si-GEM tracks are extrapolated to the **DCH1** z-position and matched against the **DCH1** tracks

Successfully matched tracks are extrapolated to the **TOF700** planes and matched against the **TOF700** hits



Notations

“**Good**” **Si-GEM** tracks – those which pass cut selection.

$\mathbf{Dx}_{\text{DCH1}}$ – x-distance between **Si-GEM** and **DCH** tracks on **DCH1** plane

$\mathbf{Dy}_{\text{DCH1}}$ – y-distance between **Si-GEM** and **DCH** tracks on **DCH1** plane

$\mathbf{Dx}_{\text{TOF700}}$ – x-distance between **Si-GEM+DCH** and **TOF700** hits

$\mathbf{Dy}_{\text{TOF700}}$ – y-distance between **Si-GEM+DCH** and **TOF700** hits

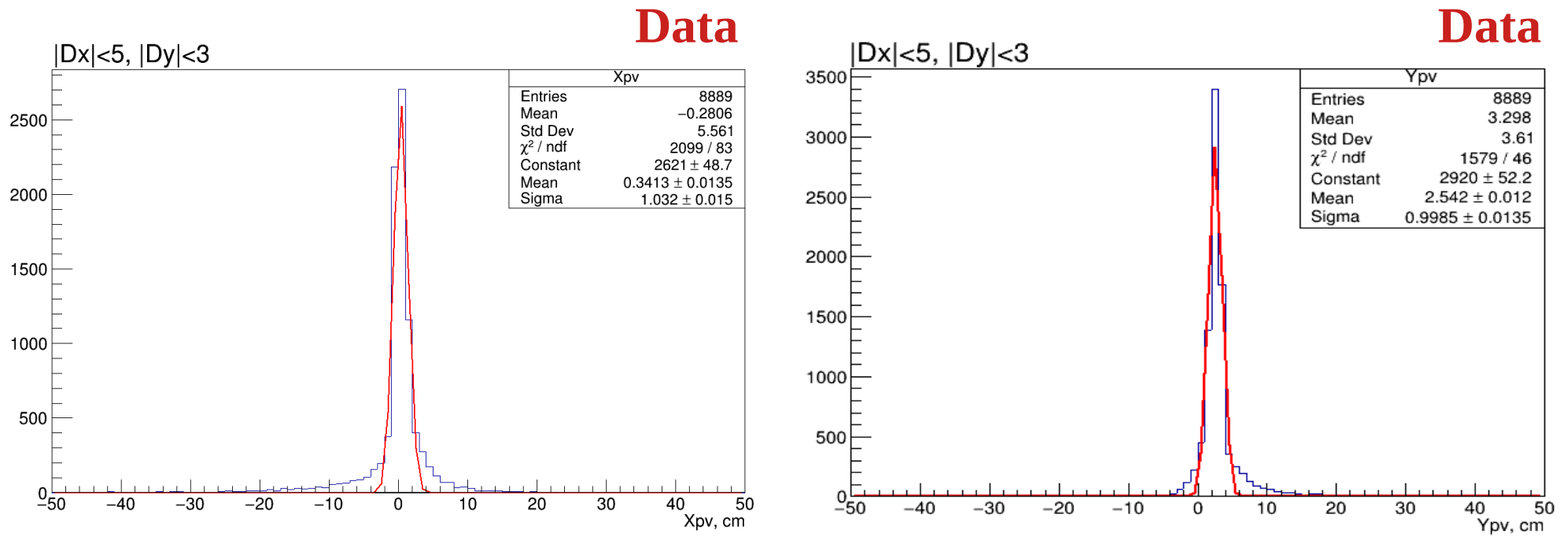
TOF700 Efficiency – $\text{TOF700}_{\text{eff}} = \frac{N_{\text{matched tracks}}}{N_{\text{extr tracks}}}$, where

$N_{\text{matched tracks}}$ is the number of tracks extrapolated to **TOF700** and matched to hits

$N_{\text{extr tracks}}$ is the number of all good tracks extrapolated to **TOF700**

$N_{\text{true matched trs}}$ is **Si-GEM+DCH** tracks matched to **TOF700** hits and belong to the **same MC track (id)**

Si-GEM tracks Cut Selection

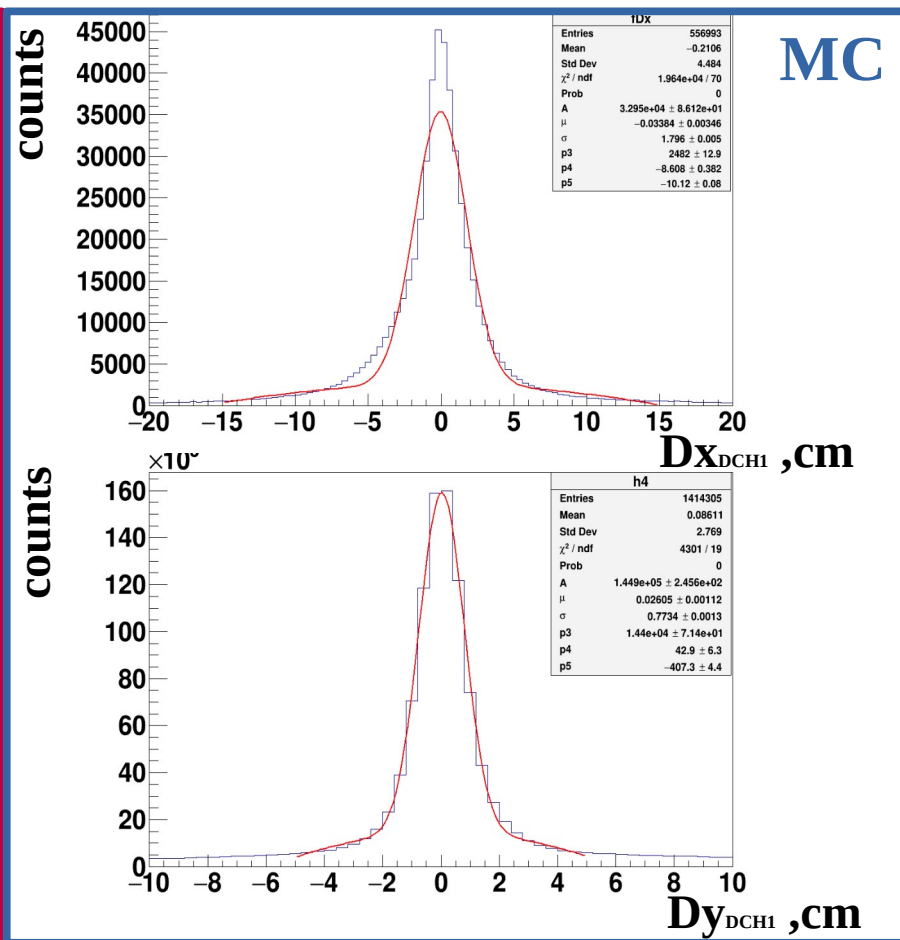
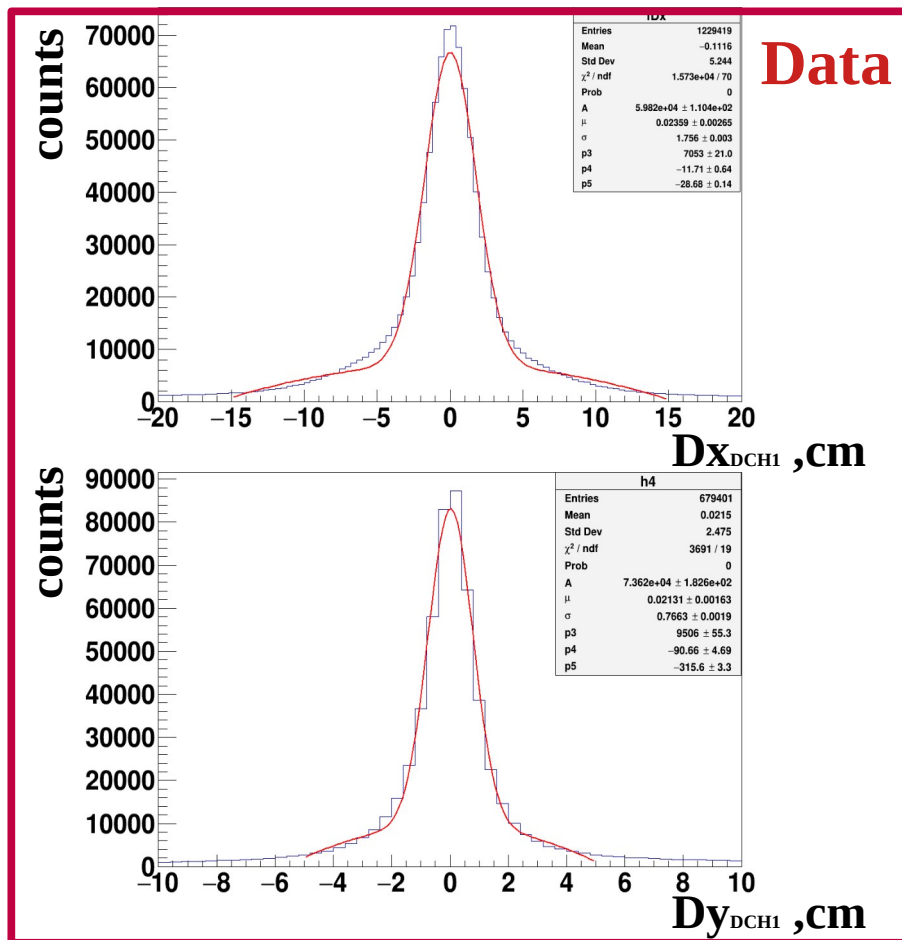
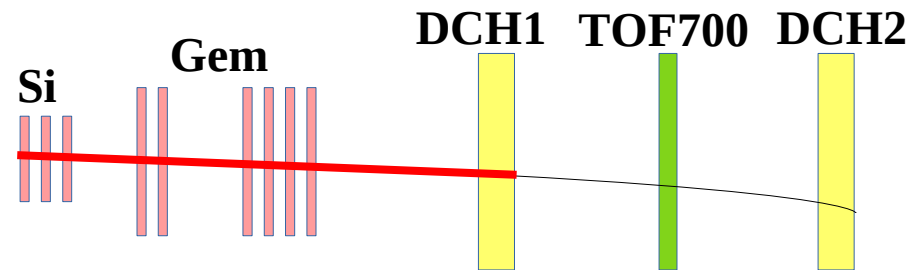


Number of **Silicon** hits > 1 && **GEM** hits > 3

(to skip fake tracks and tracks with bad parameters)

Primary vertex cut ($-3.5 < X_{pv} < 4.0$ and $-1.0 < Y_{pv} < 6.0$) for track's **length** calculation

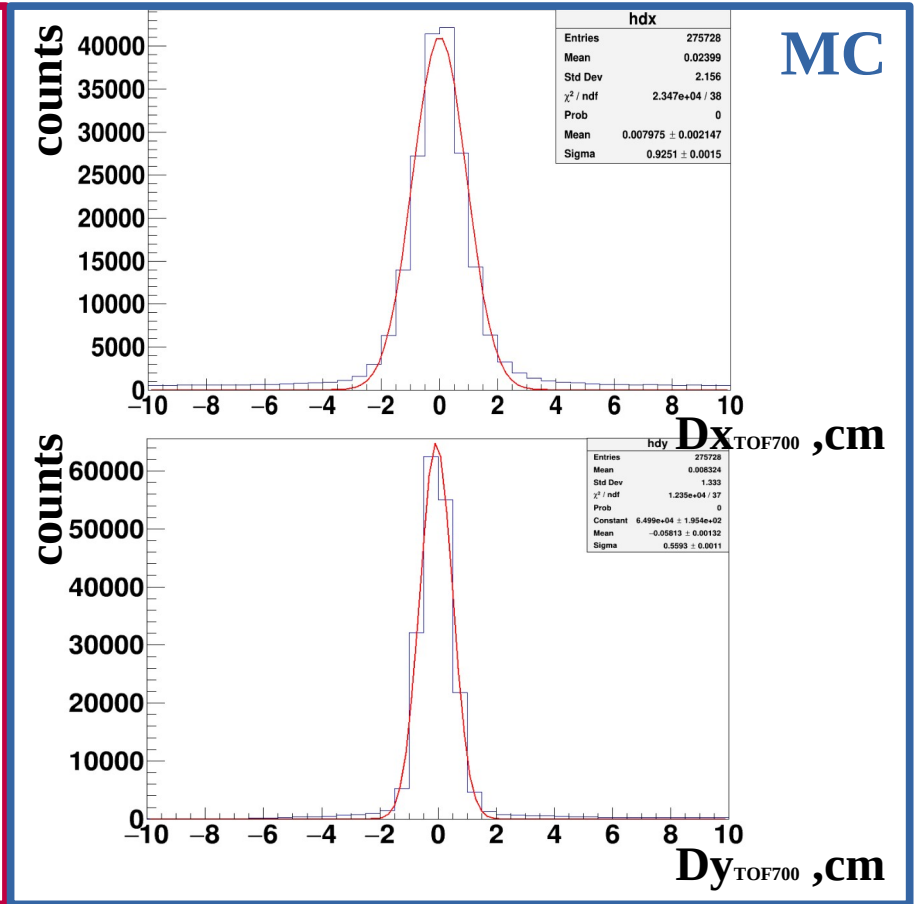
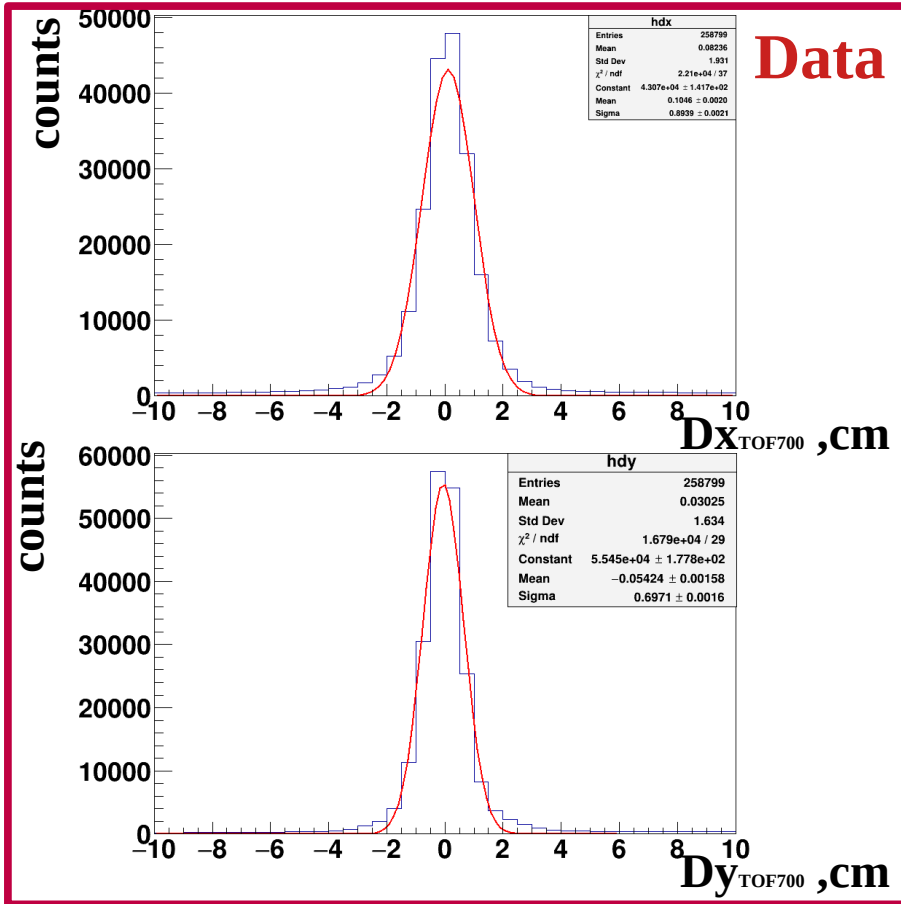
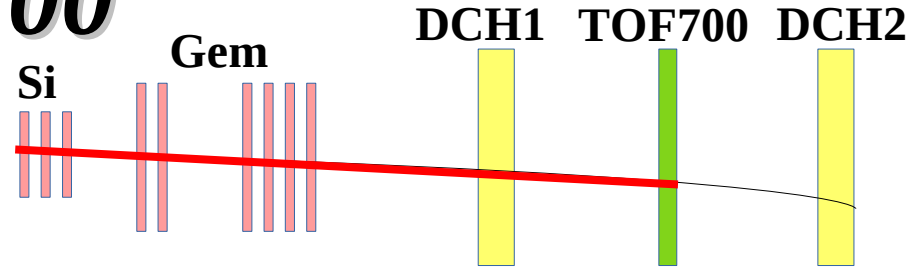
Si-GEM-DCH1 Matching Criteria



Function: **Gaus+pol2** $\sigma Dx \sim 1.7$, $\sigma Dy \sim 0.75$
 Matching criteria: $|Dx| < 5 \text{ cm}$, $|Dy| < 2 \text{ cm}$

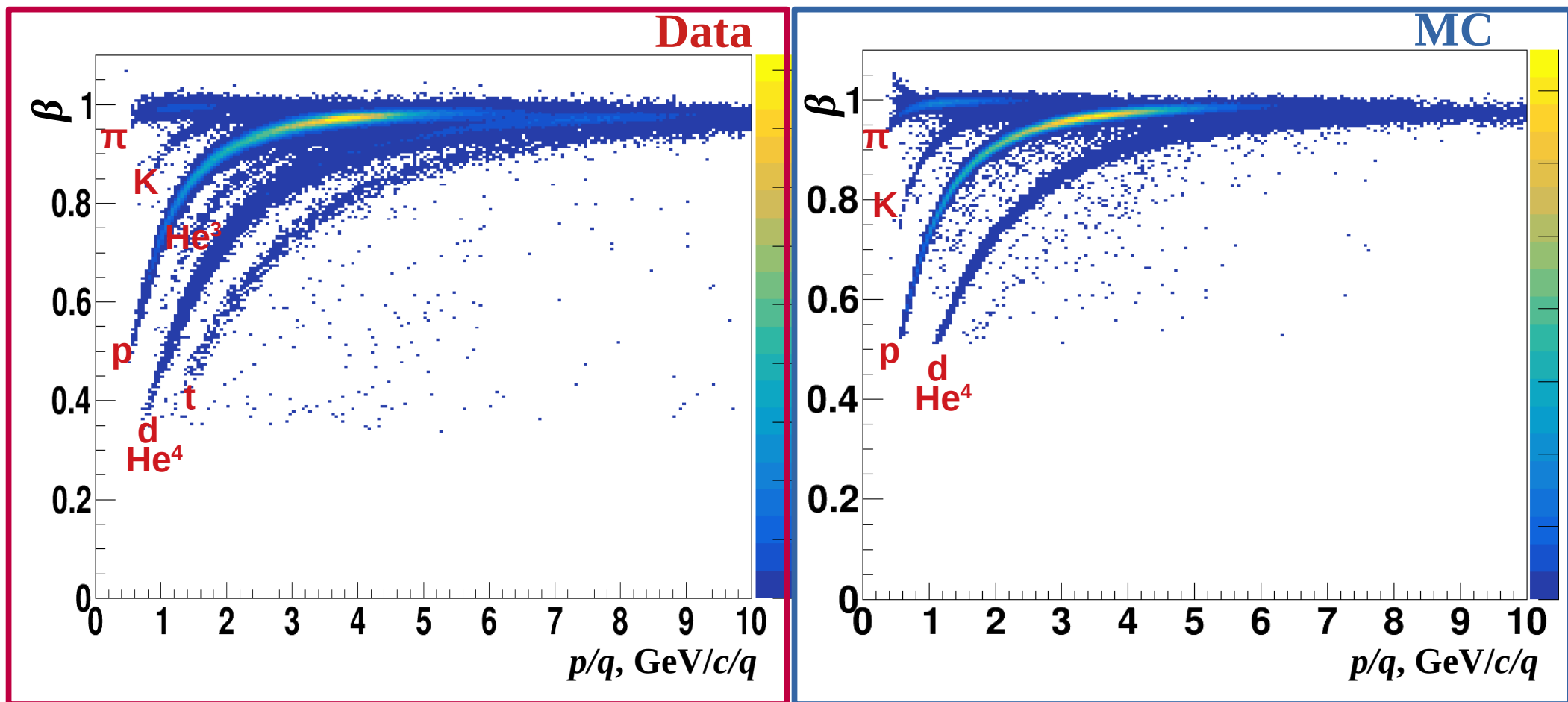
Si-GEM-DCH-TOF700

Matching Criteria



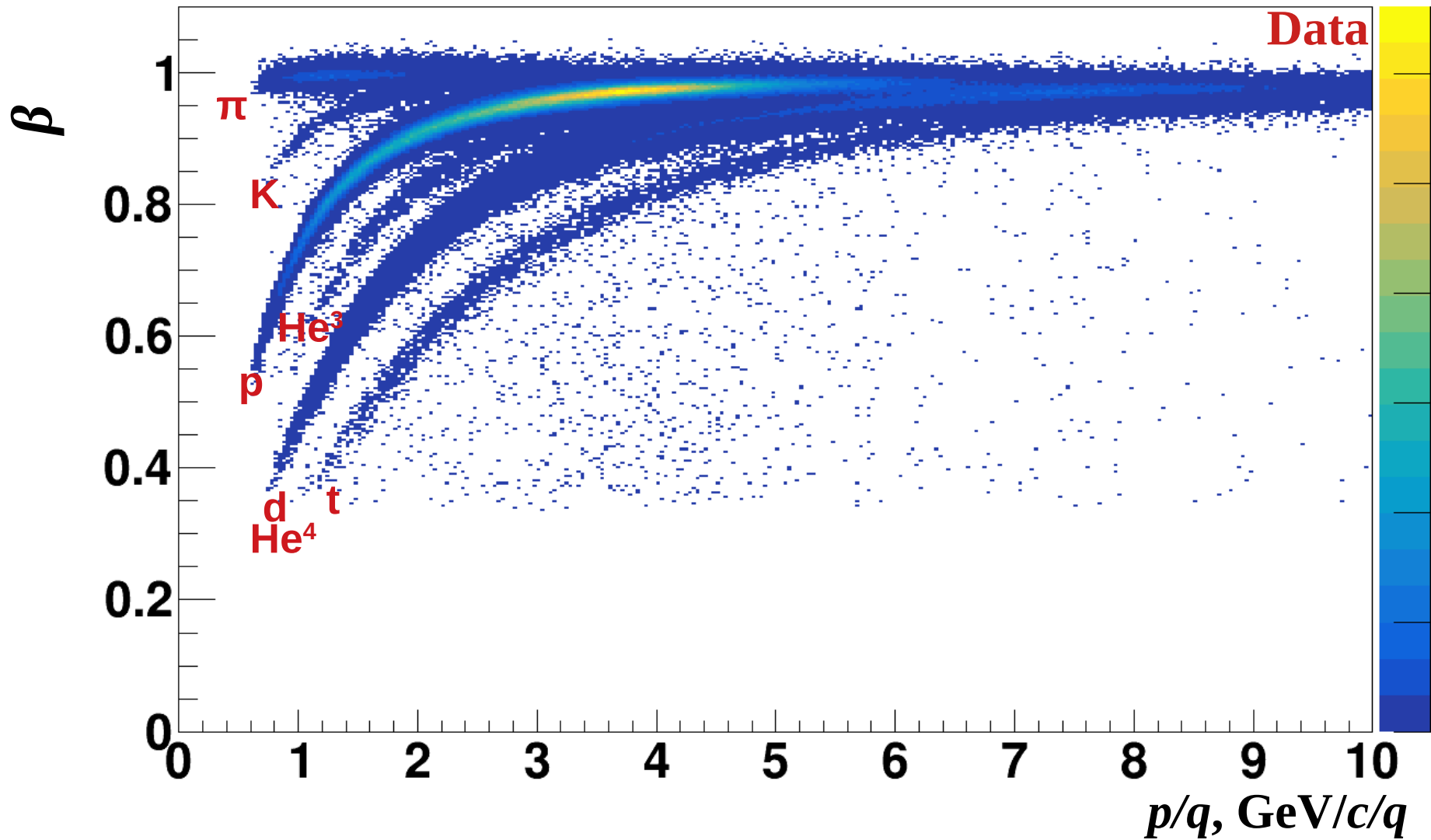
Function: **Gaus** $\sigma_{Dx} \sim 0.8$, $\sigma_{Dy} \sim 0.65$
 Matching criteria: $|Dx| < 2.5$ cm, $|Dy| < 2$ cm

β vs p/q



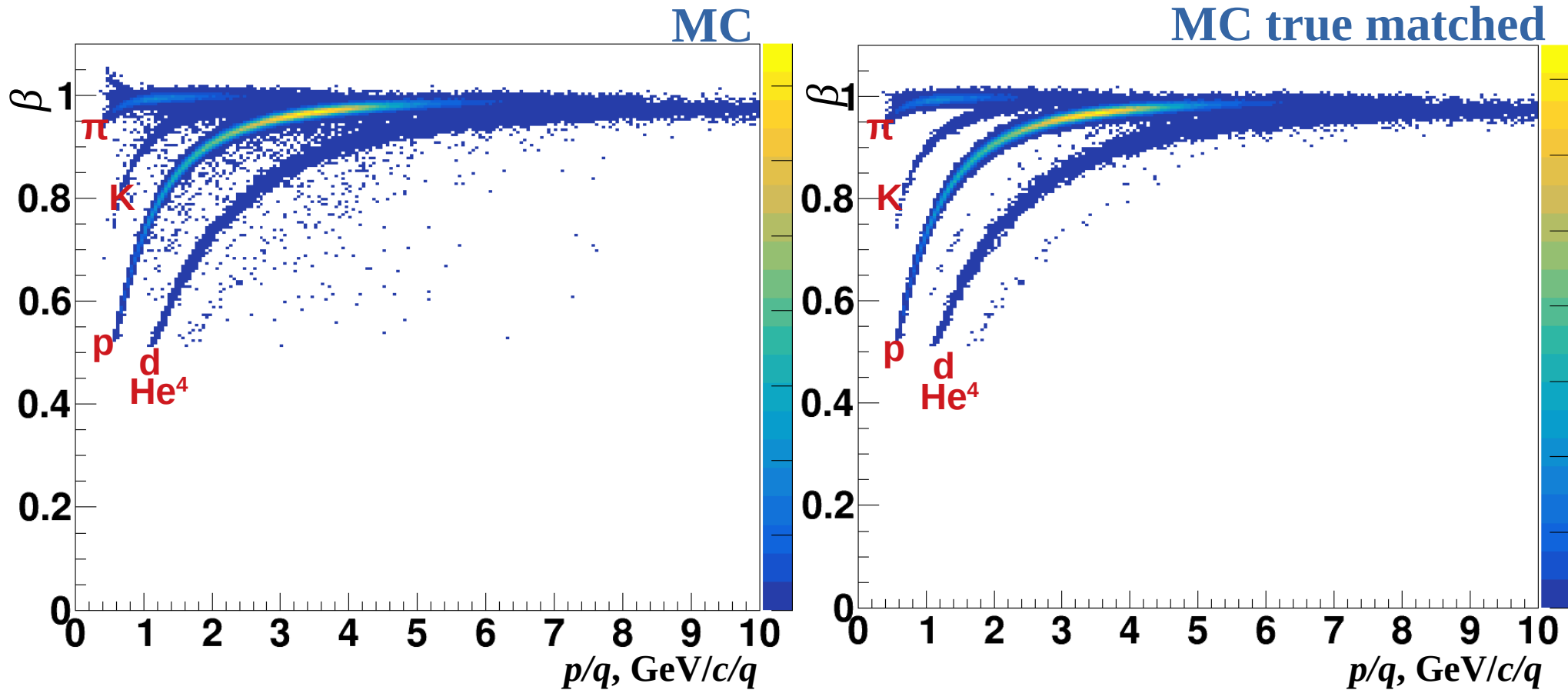
Data plot chosen to represent **similar statistics**
actual data statistics on the next slide

β vs p/q



Data plot, but with **larger** Argon data sample.

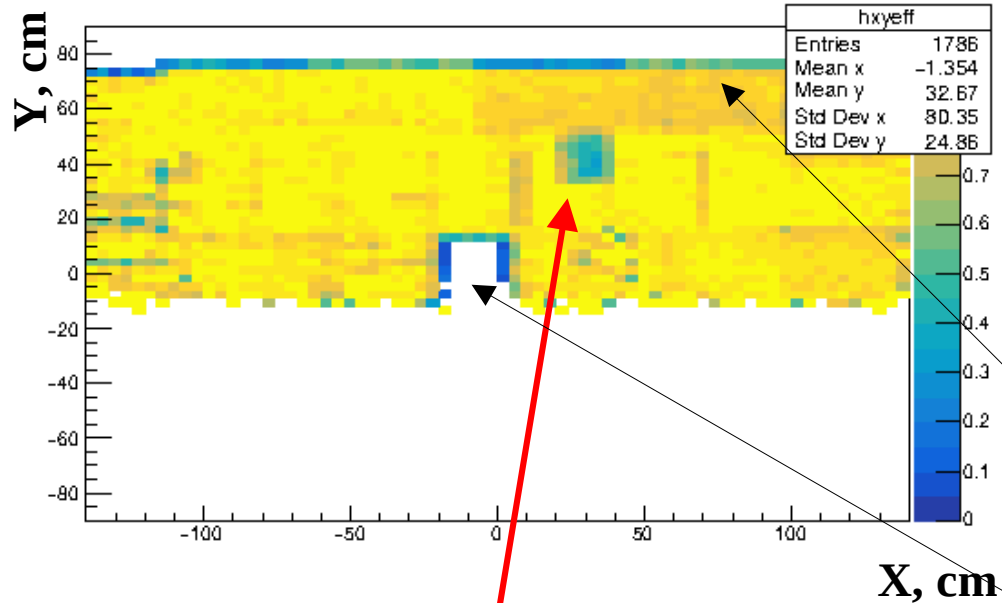
β vs p/q True Match



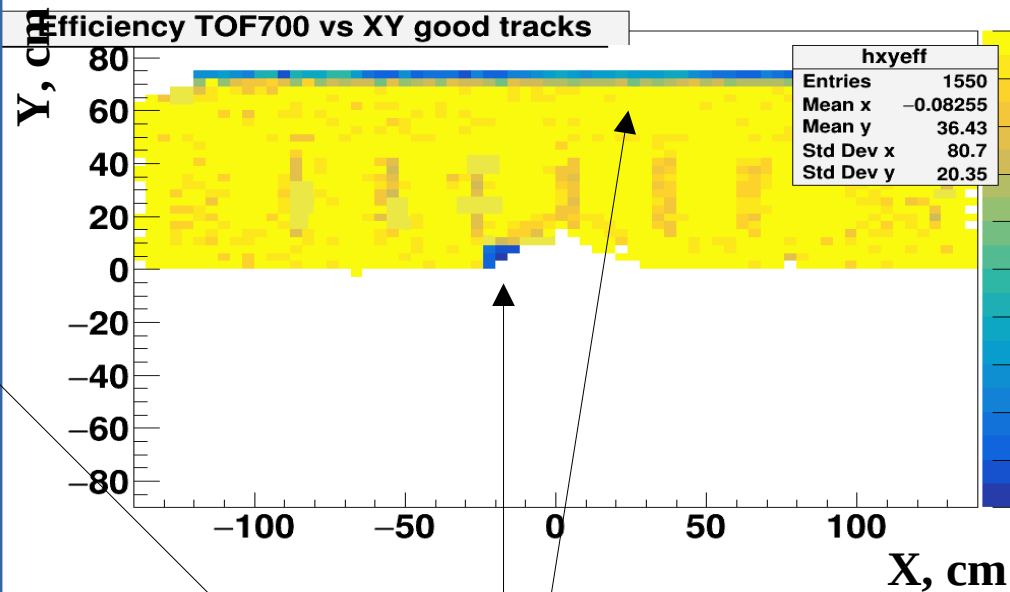
True matched tracks are “Good” Si-GEM- tracks
matched to TOF700 hits and belong to the same MC track (id)

Efficiency for a good track Si-GEM + DCH matching with hit TOF700.

Data



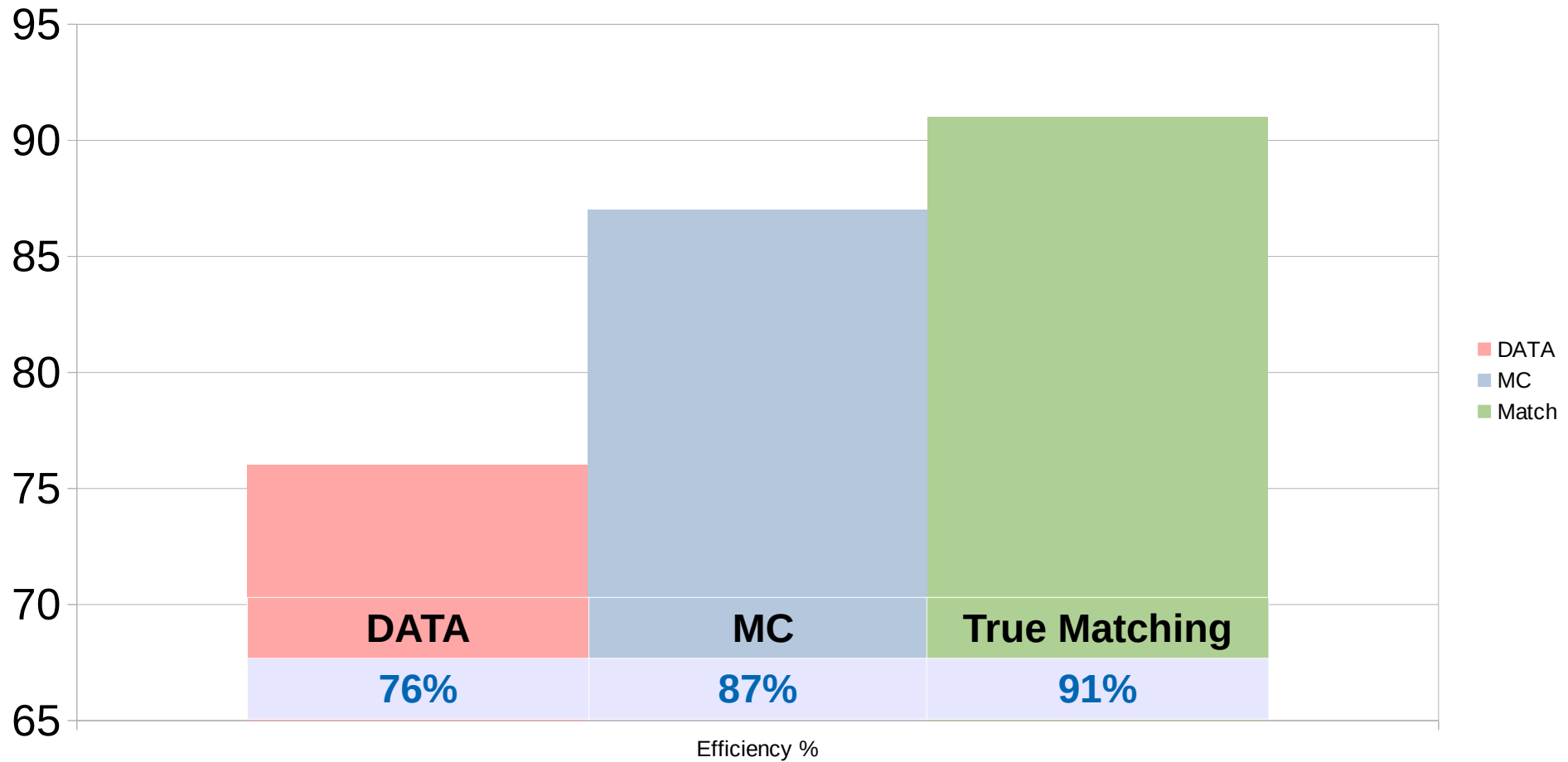
MC



Small square dip in efficiency at XY in the region (30,40) caused by a incorrect work of chamber 5.1

Small edge effect

TOF700 Matching Efficiency

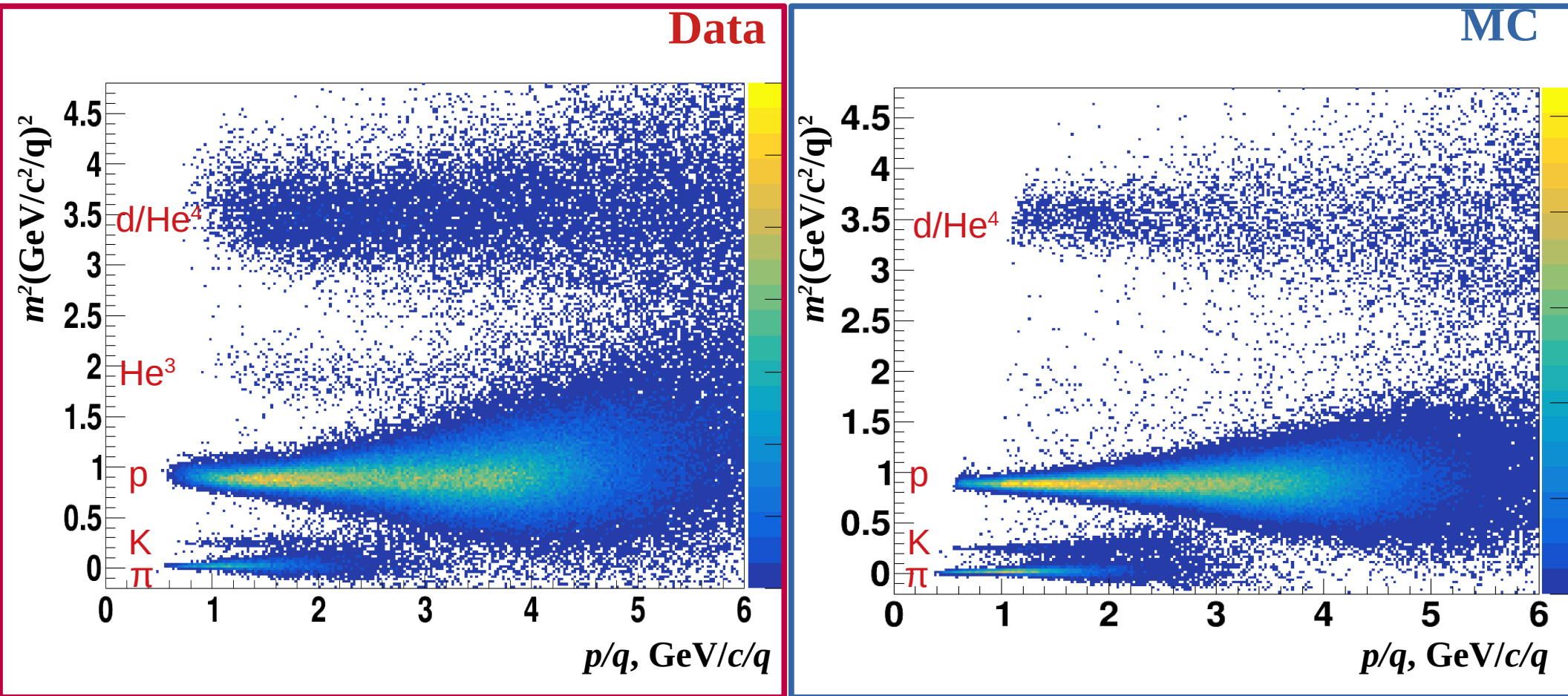


$$E_{DATA} = \frac{N_{\text{matched tracks}}}{N_{\text{goodtracks}}}$$

$$E_{MC} = \frac{N_{\text{matched tracks}}}{N_{\text{goodt tracks}}}$$

$$E_{\text{true matching}} = \frac{N_{\text{true matched trs}}}{N_{\text{matched tracks}}}$$

Dependence of m^2 vs p/q

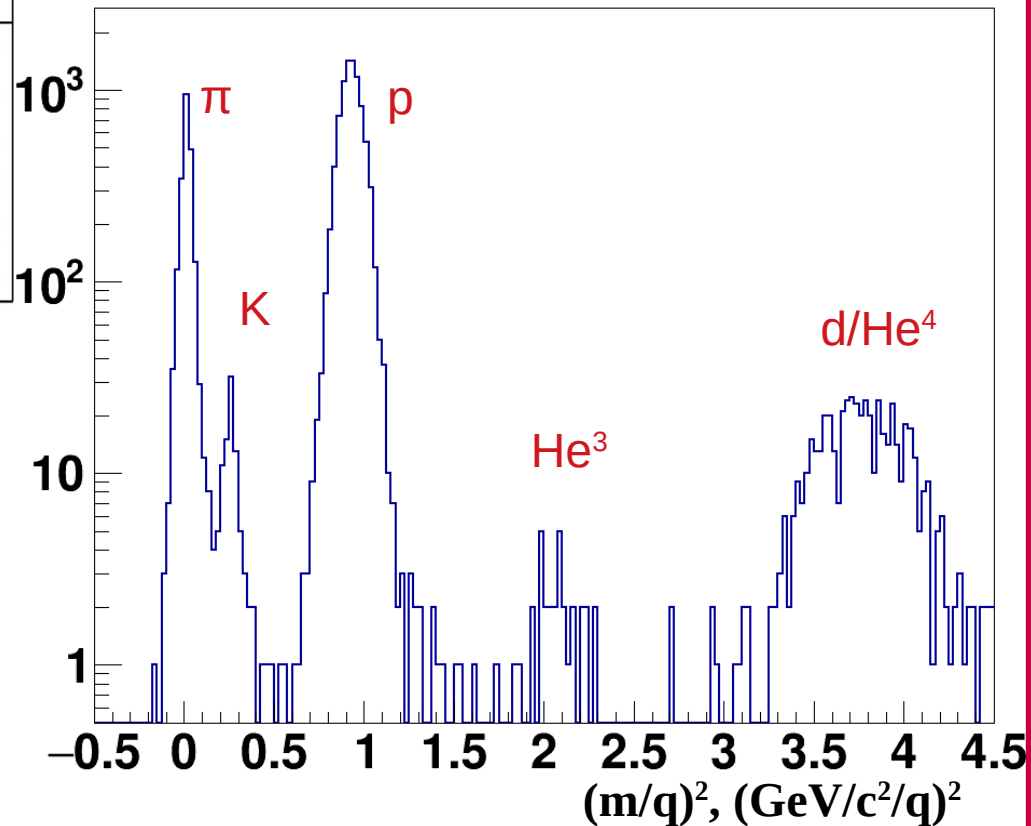
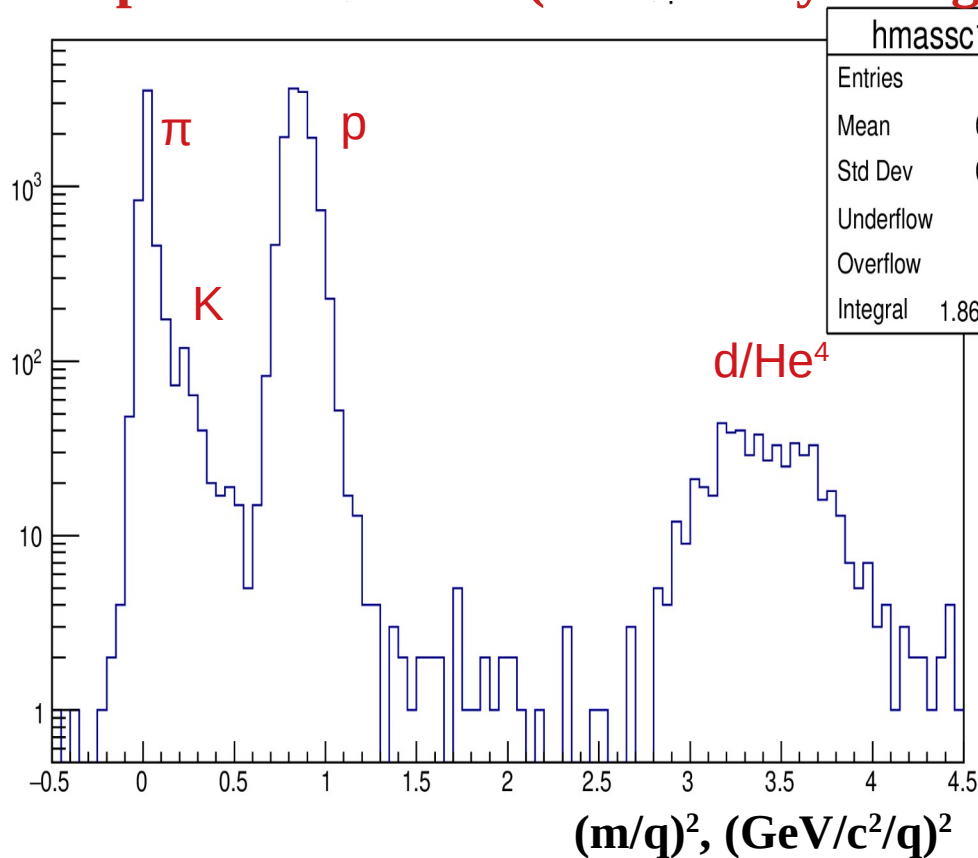


There is a **negligible** momentum systematics effect.

Particle separation of TOF700

Data previous results (from half year ago)

Data current result



Reconstructed mass square of momenta **below** 1.5 GeV

Conclusion

- * The analysis of TOF700 efficiency was performed. It showed sufficient efficiency for both the detector and matching procedures.
- * Preliminary results of the efficiency estimation in MC were obtained and as we expected, is higher than Data. The efficiencies will be checked on another generator and efficiency in MC will be adjusted to Data.
- * PID procedure allows for separation of π , K , p , He^3 , d/He^4 , t in the area of up to 2 GeV/c. Separation of higher momentum regions requires a decrease in the time of flight error.
- * Further analysis and calibration should improve identification and results.
- * The aim of the analysis is to correct spectra for acceptance and efficiencies and extract yields of π , K , p , **nuclear fragments**.

Thank you for your attention!