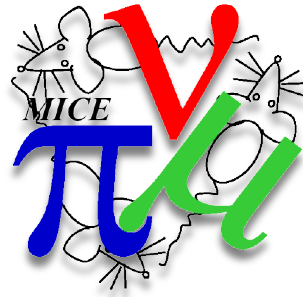


MCS in LH2 (Field-off)



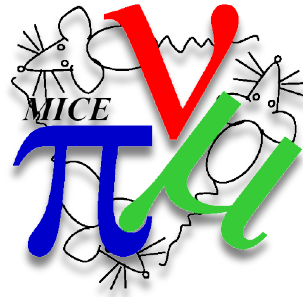
Gavriil Chatzitheodoridis

PhD **Supervisors:** Dr. Kevin Ronald &
Prof. Paul Soler

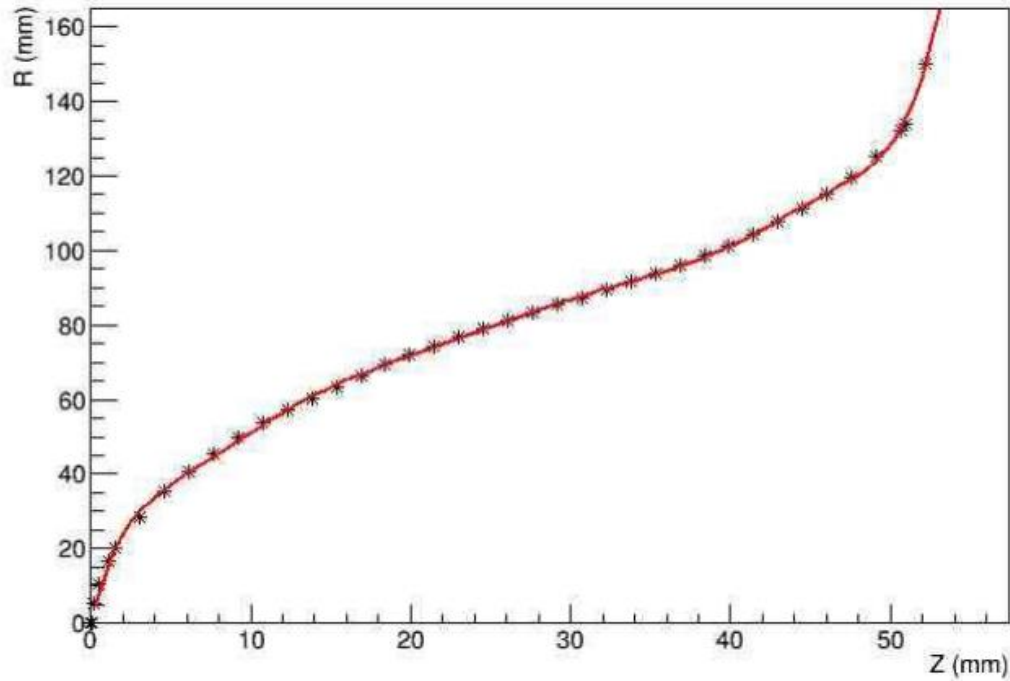
Contents

- LH2 path length method overview and results
- X-Y Position from trackers and an attempt at accessing TOF space points
- TOF Selection
- Future work

Vacuum & Absorber Al. windows

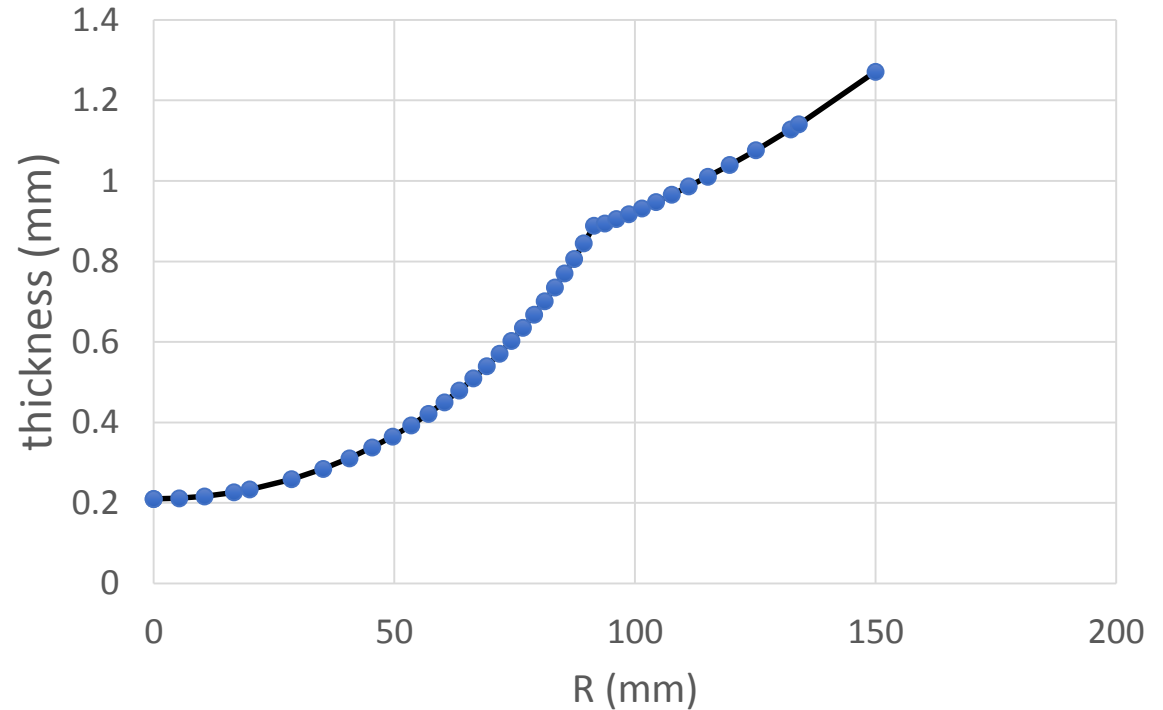


Vacuum window



* Points: Geometry
Red line: Pol. fit

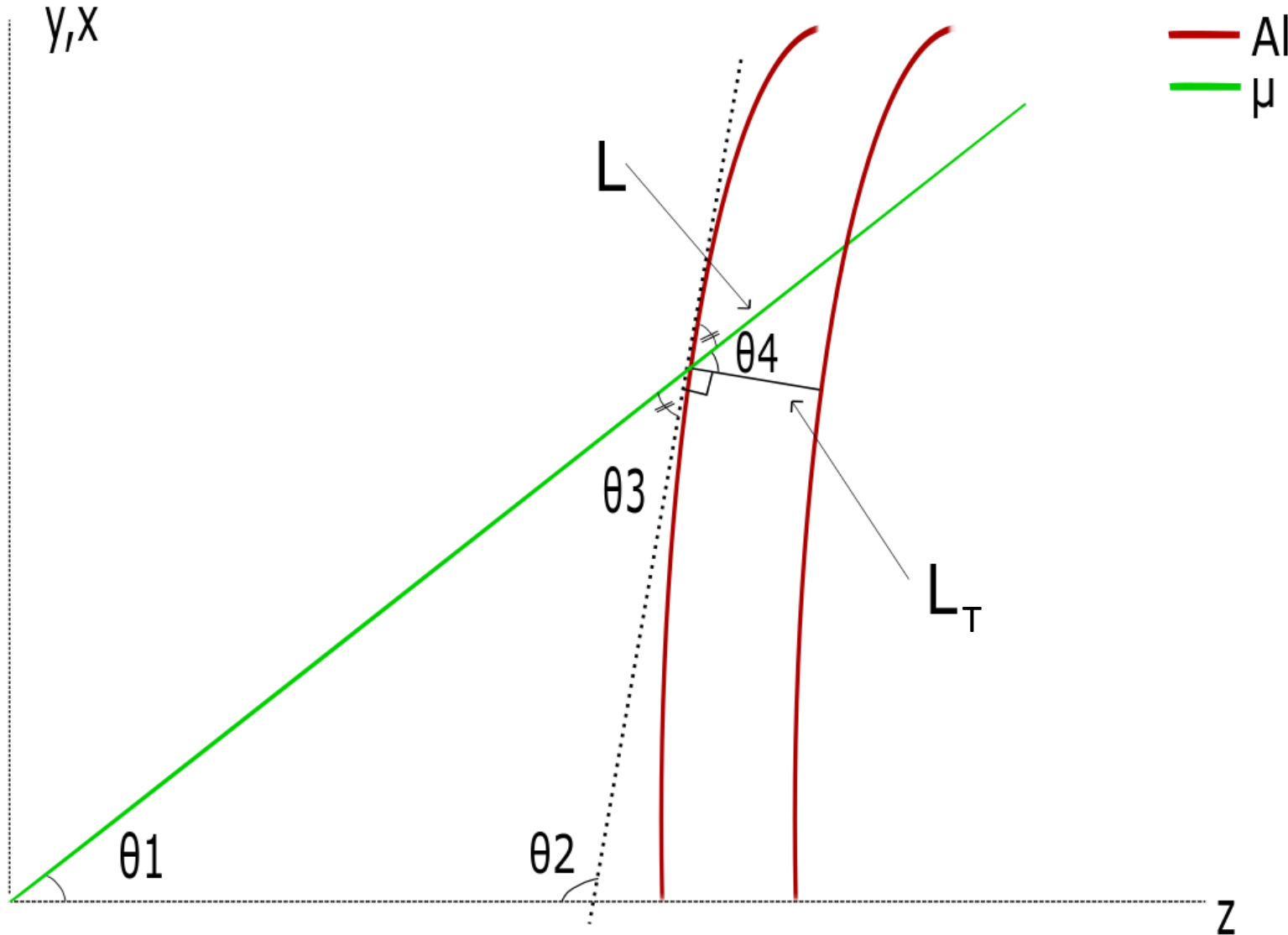
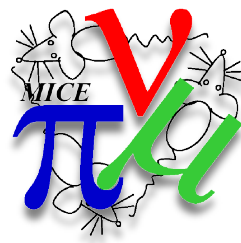
Vacuum window thickness (mm)



$$h(r) = \begin{cases} \sqrt{151.95^2 - r^2} - 2.41 - \sqrt{149.33^2 - r^2} & r \leq 92.3 \\ \sqrt{107.52^2 - (r - 158.93)^2} - \sqrt{108.88^2 - (r - 160)^2} & r > 92.3 \end{cases}$$

[1] [R.Connors et. al. 2014 LBNL "The Thickness Measurement of MICE Absorber Aluminum Window at LBNL, Report 1"]

Aluminium, direction correction



$$\theta_1 = dx/dz, dy/dz$$

$$\theta_2 = \pi - (R_2 - R_1) / (z_2 - z_1)$$

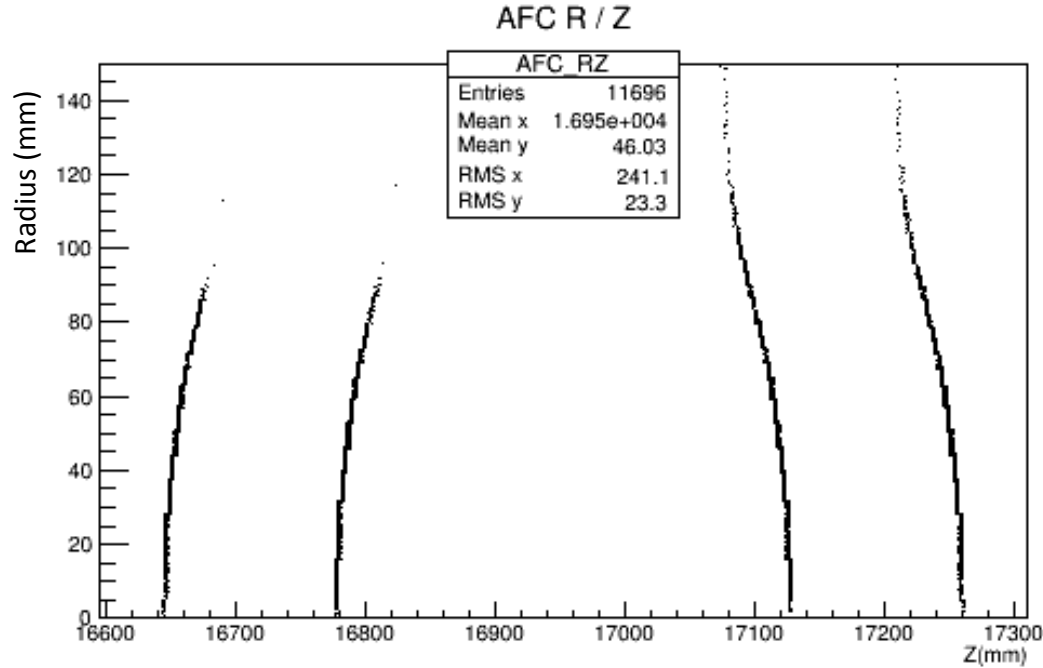
$$\theta_3 = \pi - (\theta_1 + \theta_2)$$

$$\theta_4 = \pi/2 - \theta_3$$

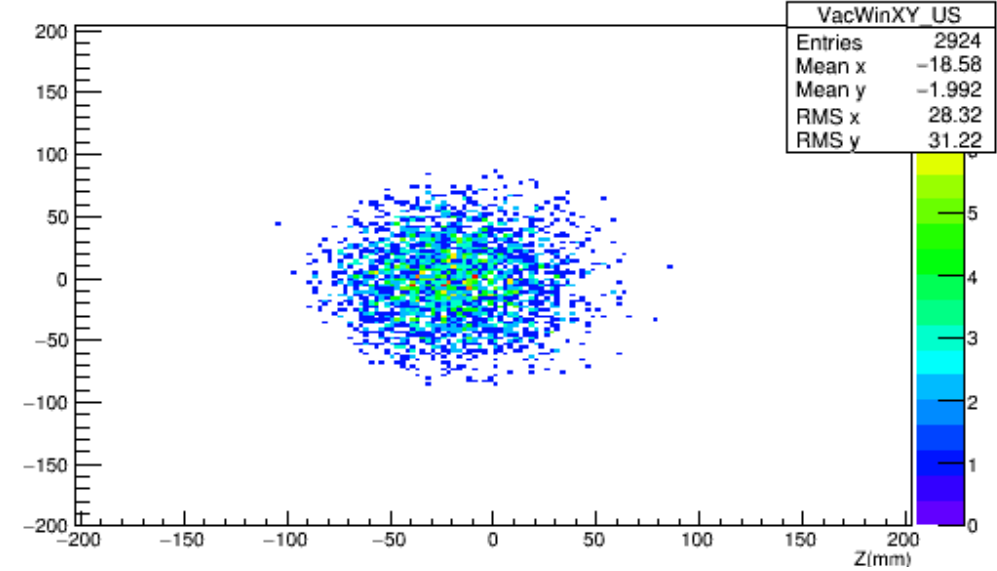
$$L = \frac{L_T \sqrt{2}}{\cos(\theta_4)}$$

LH2 Path length method

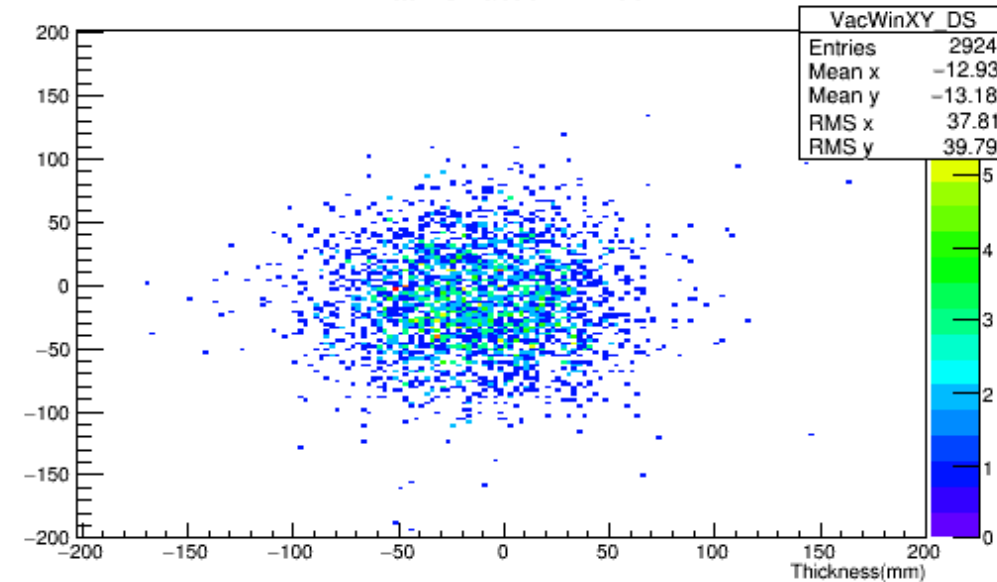
Radius of muon-window interception



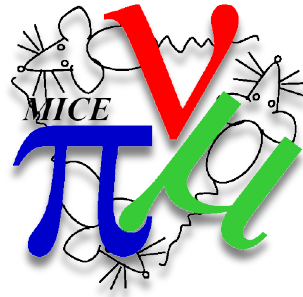
X-Y at US vacuum window



X-Y at DS vacuum window

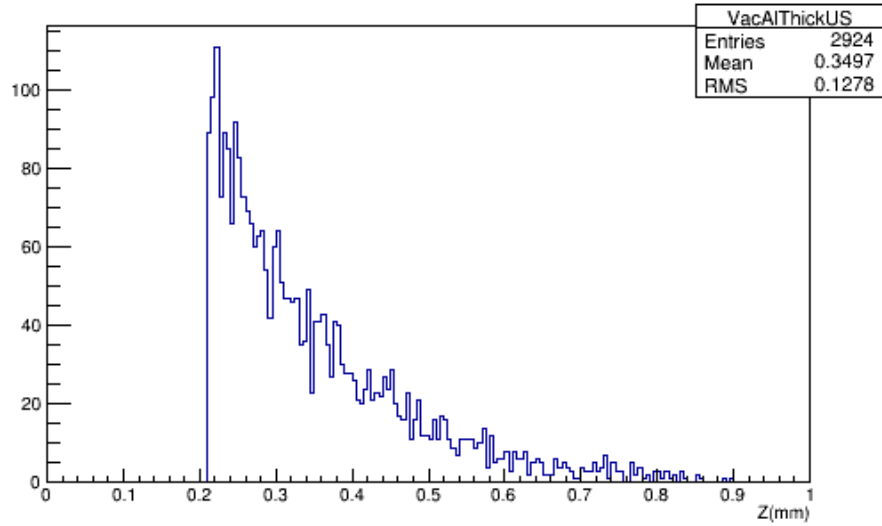


Aluminium path length



Thickness

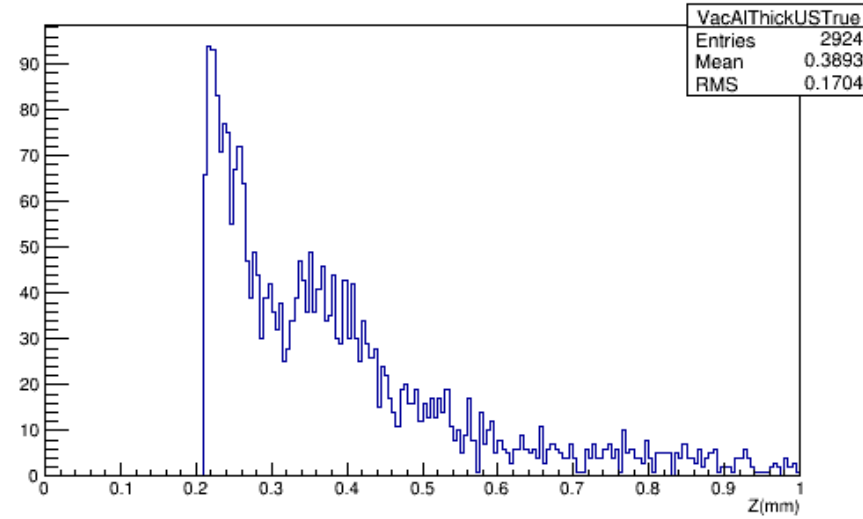
z in Al, US-Vacuum



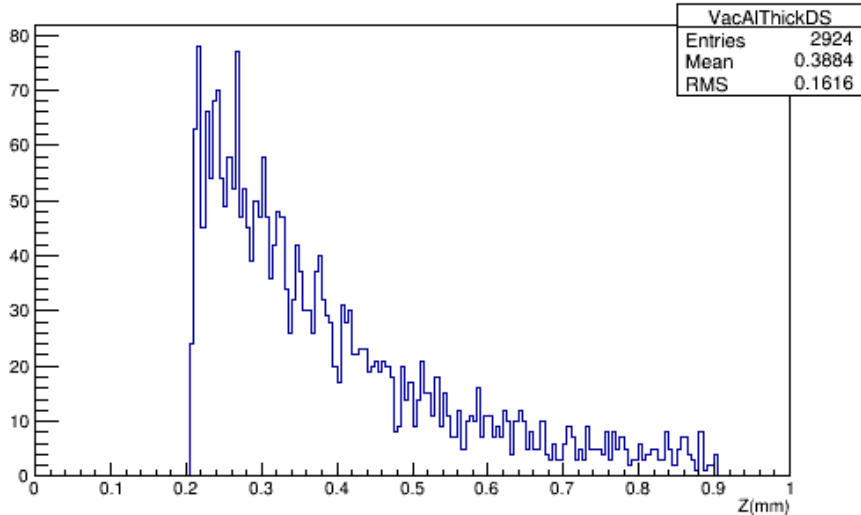
US

With correction

Path in Al, US-Vacuum

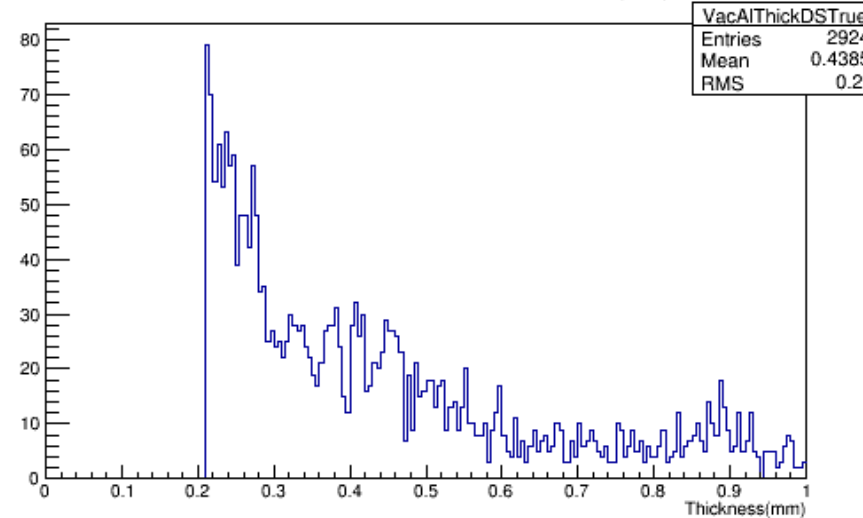


z in Al, DS-Vacuum

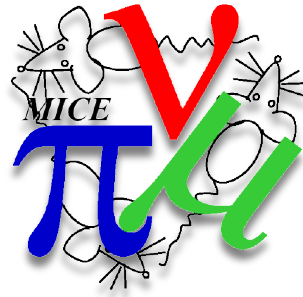


DS

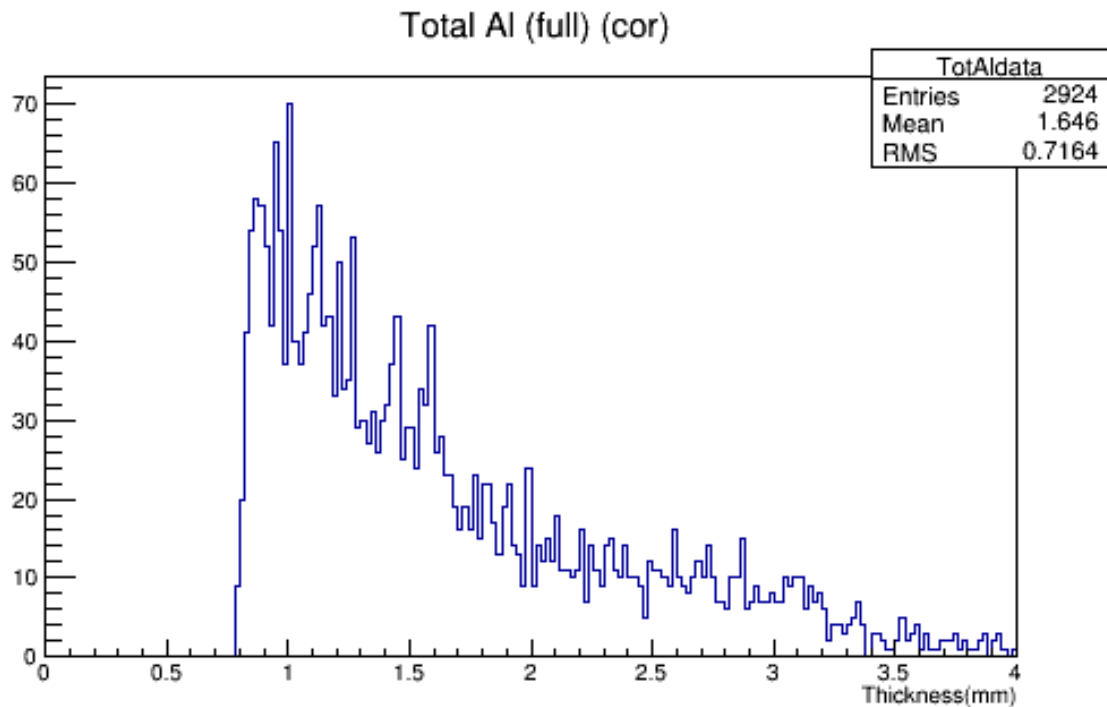
distance in Al, Vacuum window, DS (cor)



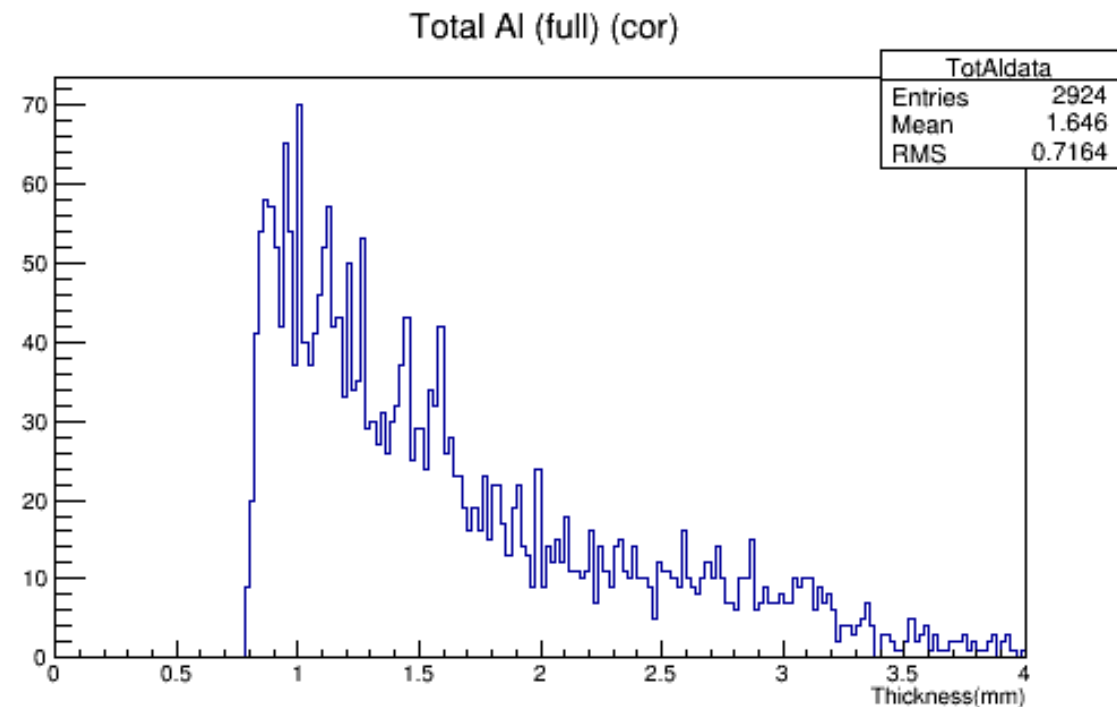
Total Aluminium path length



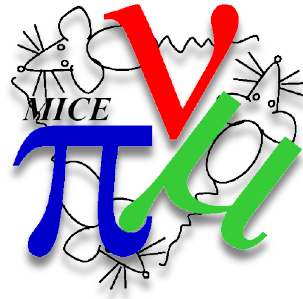
Total Al. in full absorber run



Total Al. in empty absorber run

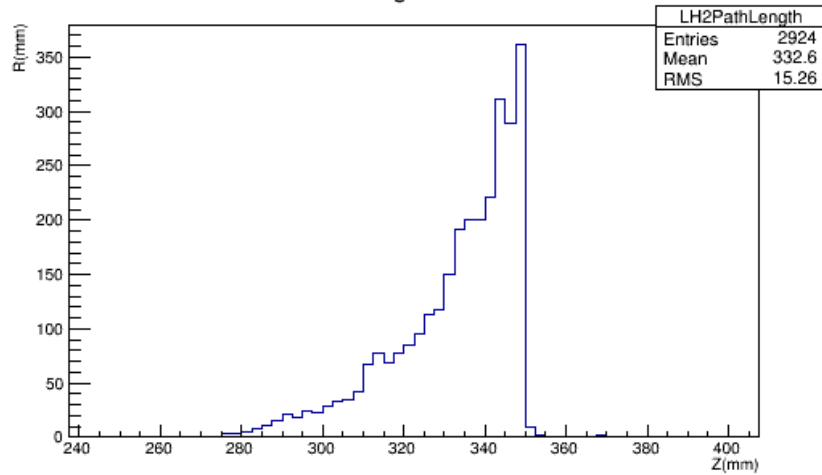


LH2 Path length - Results



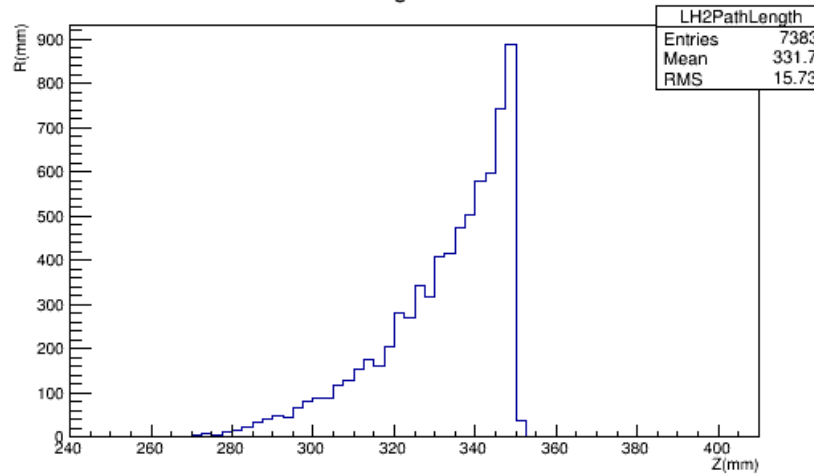
170 MeV/c

Path Length in Vessel



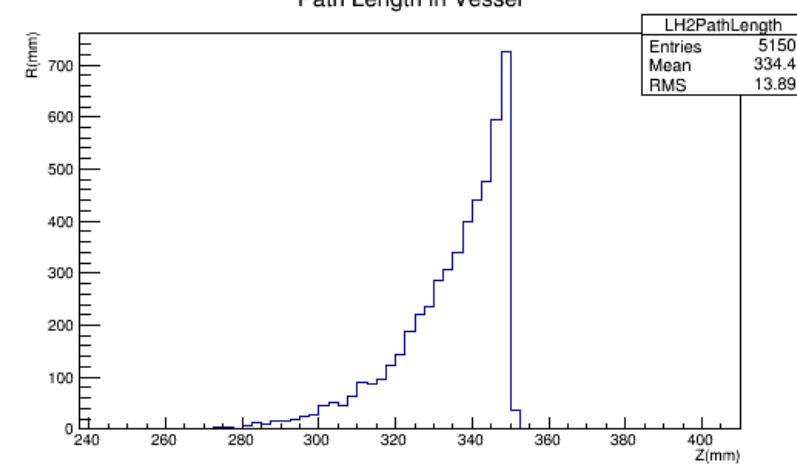
200 MeV/c

Path Length in Vessel

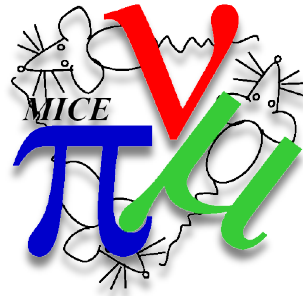


240 MeV/c

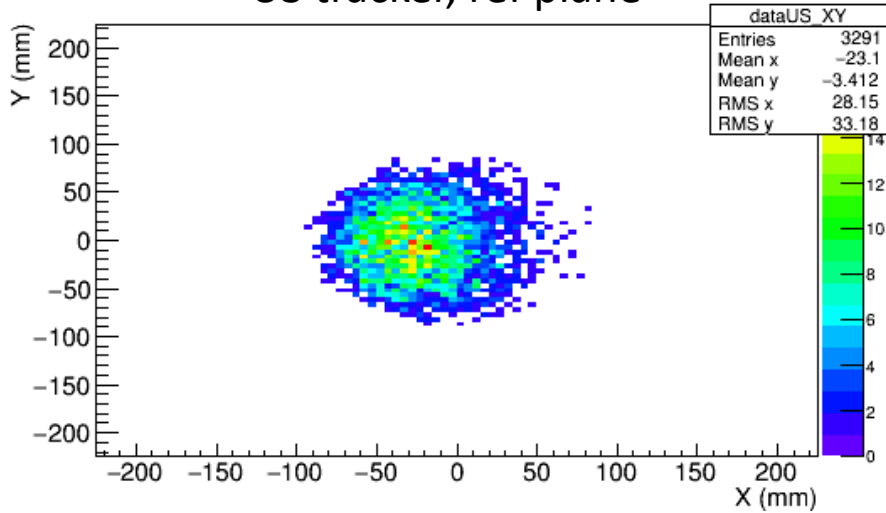
Path Length in Vessel



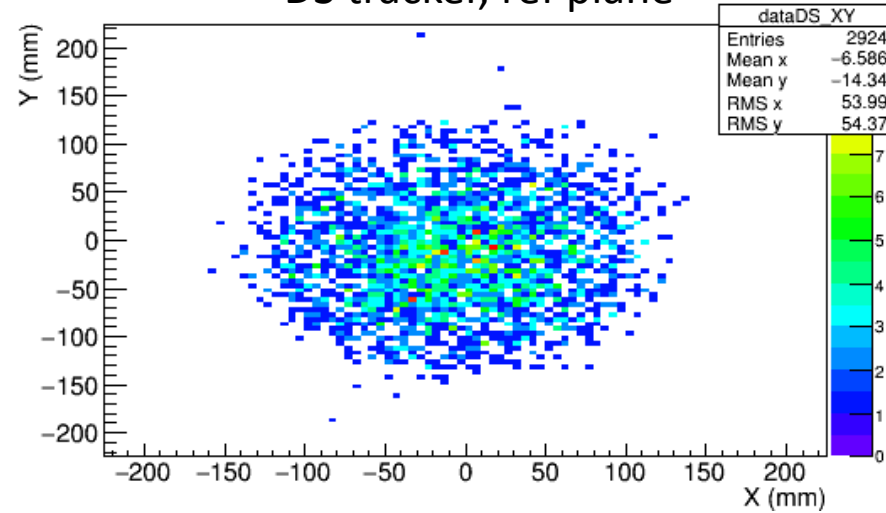
Attempt at TOF spacepoints – 170 MeV/c



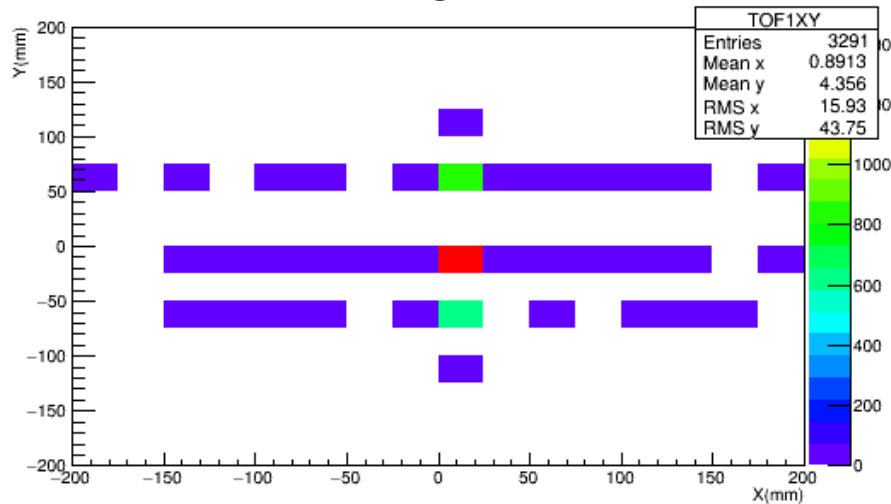
US tracker, ref plane



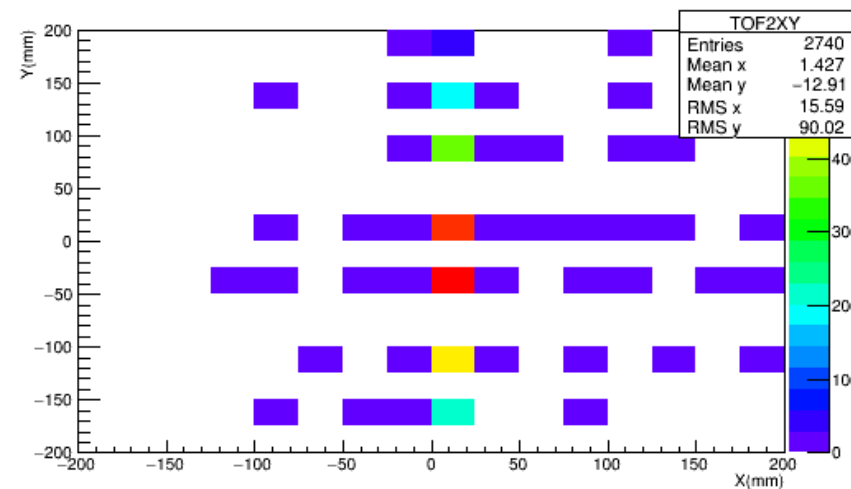
DS tracker, ref plane



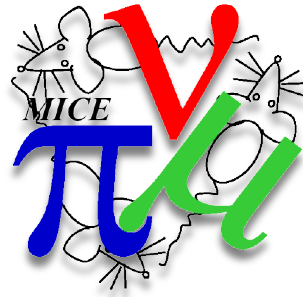
TOF1



TOF2



To do



TOF & US tracker

TOF (momentum)

Fiducial

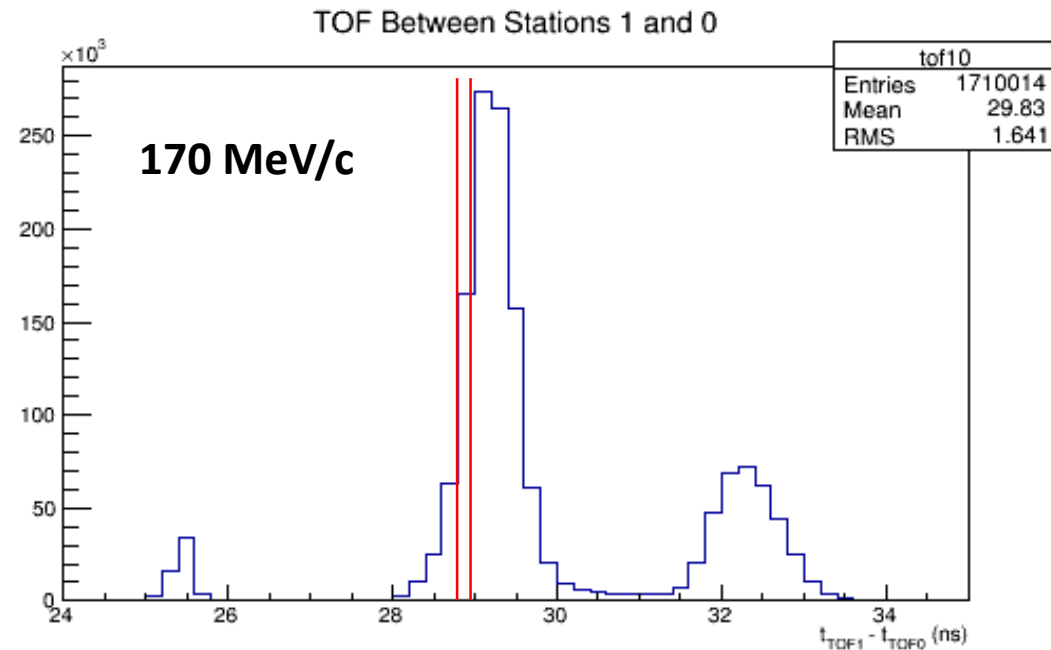
Diffuser

TOF0 & TOF 1 hits.
1 US track
1 or no DS tracks

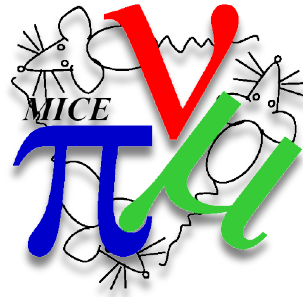
Momentum (MeV/c)	TOF (ns)
170	28.7→28.9
200	28.032→28.332
240	27.298→27.598

At DS-tracker:
R < 140mm
With 0.01mrad
scattering

At diffuser:
R < 90mm



Future work



- Normalise angle distribution by LH_2 path length (L/L_R)
- TOF scan to determine selection for correct momenta
- Uncertainty calculation method for path length
- Investigate the effect of different *empty* and *full* Aluminium path length on the convolution process
- Obtain TOF space points
- PID method