Multiple Coulomb Scattering in the MICE LH2 Absorber

Gavriil Chatzitheodoridis - **PhD Student**
PhD **Supervisors**: Dr. Kevin Ronald (University of Strathclyde) & Prof. Paul Soler (University of Glasgow)

Contents of talk

- Data used
- Selection
  - TOF selection
  - Fiducial radius
  - & gradient
- Selection effect on beam
- Scattering distributions
- Future work

Data used

Data Used
User cycles 2017 – 09 -10 - 11

Optics : 3-170+M3-Test1, 3-240+M3-Test1 3-200+M3-Test2/Test1

Empty

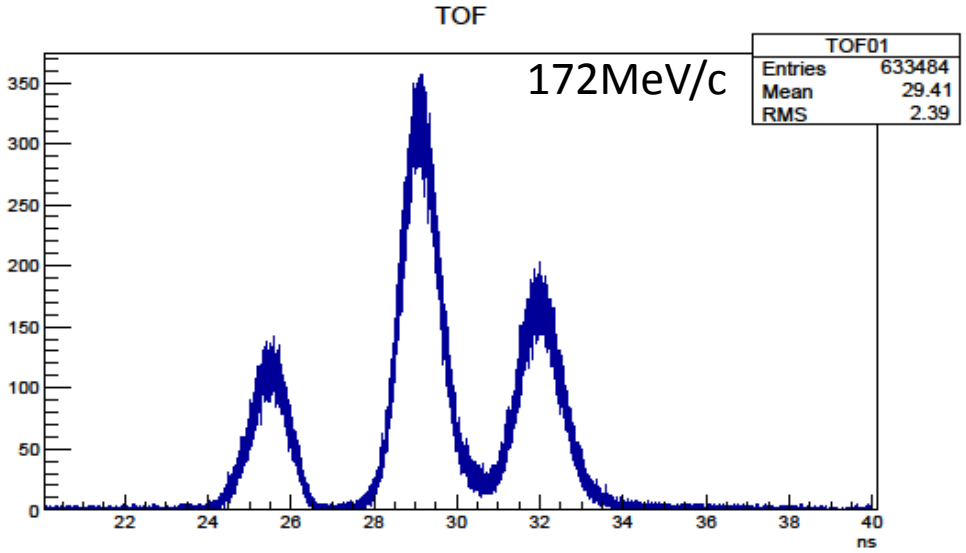
170	200	240	
10092	10093	10159	10189
10153	10156	10161	10190
10154	10157	10162	10199
10155	10158	10169	**10200**
10165	10164	10175	10201
10167	10168	10176	10208
10173	**10182**	10177	10209
10186	10183	10178	10210
10202	10203	10180	10211
	10207	10181	10159
	10093	10185	

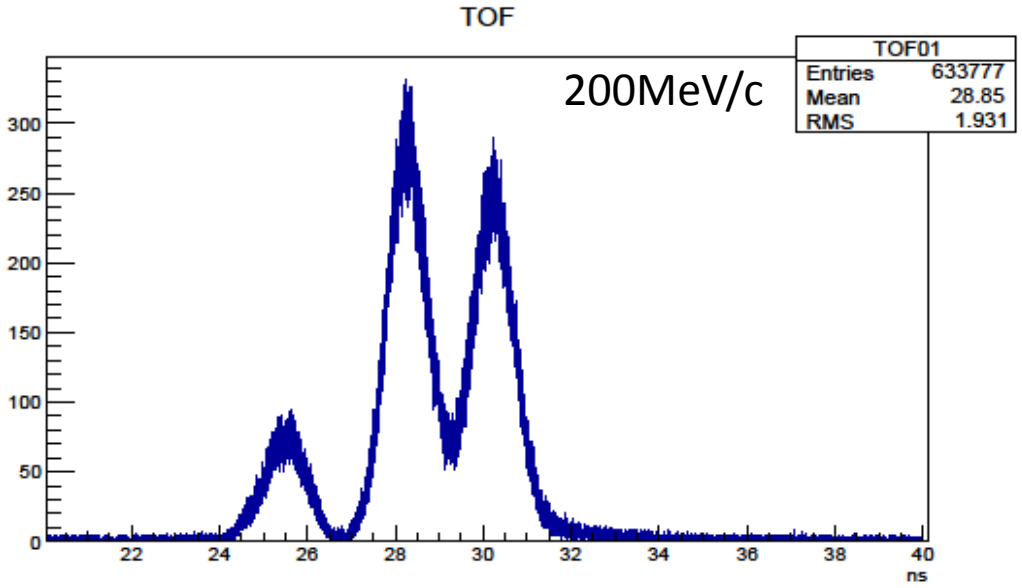
Full

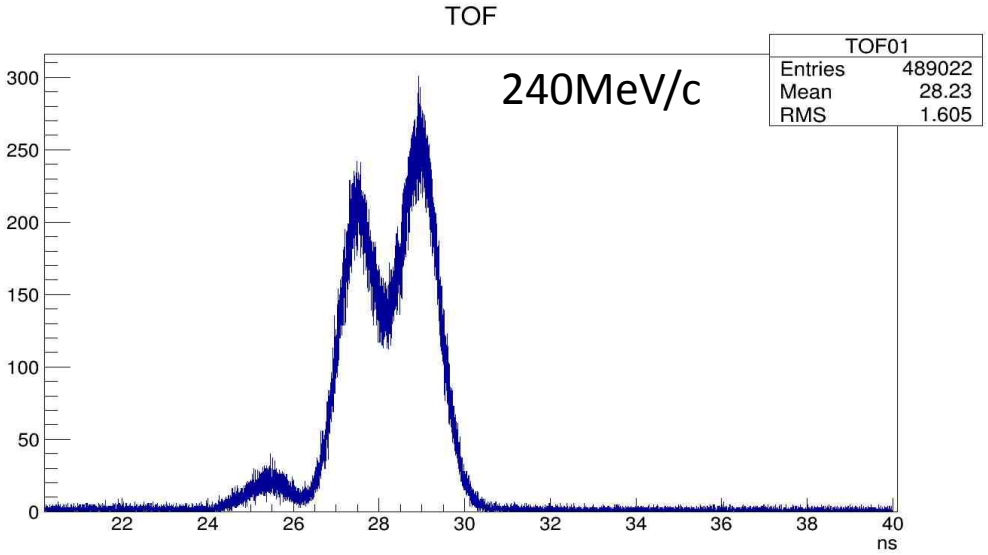
170	200	240
09772	09773	09935
09774	09776	09936
09775	09779	09937
09777	09855	09938
09778	09856	09939
09854	09857	09940
09859	**09858**	09941
09861	09860	09942
09772	09773	09943
		09944
		09935

*run numbers in bold requested for MC

TOF01 Distributions







Radial selection

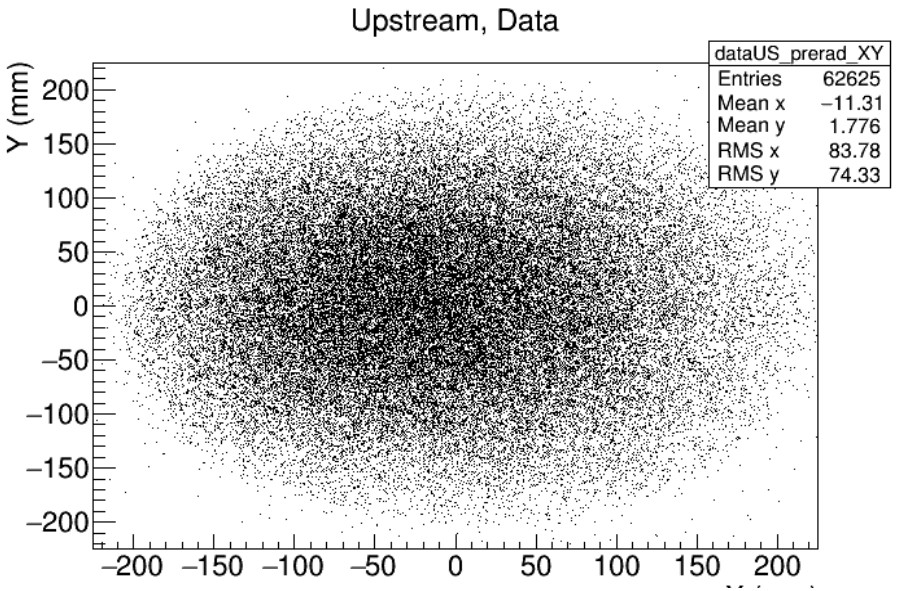
Traversed material

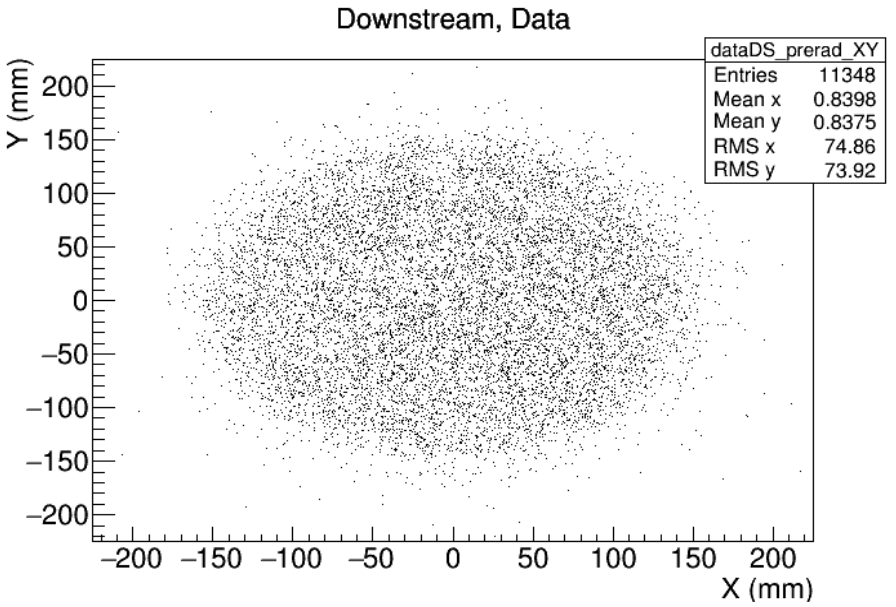
Material	Z(cm)	X_0 (cm)
Helium	113	5.671E+05
Aluminium	0.094	8.897
SciFi	0.74	42.28
LH2	30	890.5

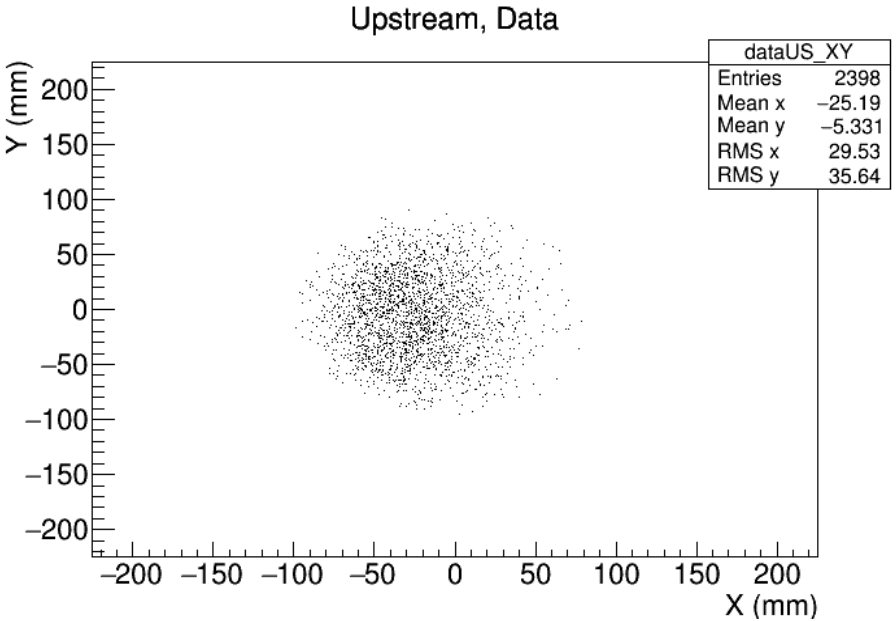
Tracks are projected from TKU to TKD (S5) with a predicted 10mrad of scattering, If the track is within the **140mm** active radius then the particle is selected.

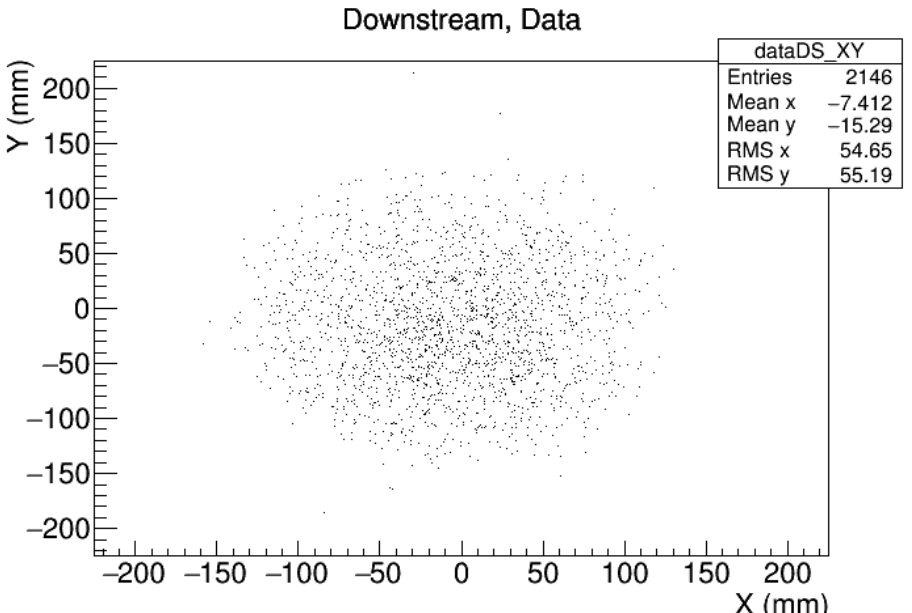
$$\Theta = \frac{13.6MeV/c}{p_\mu \beta}\sqrt{\frac{z}{X_0}}\left(1 + 0.038\ln\frac{z}{X_0}\right) \simeq 20mrad$$

Radial selection - 170MeV/c

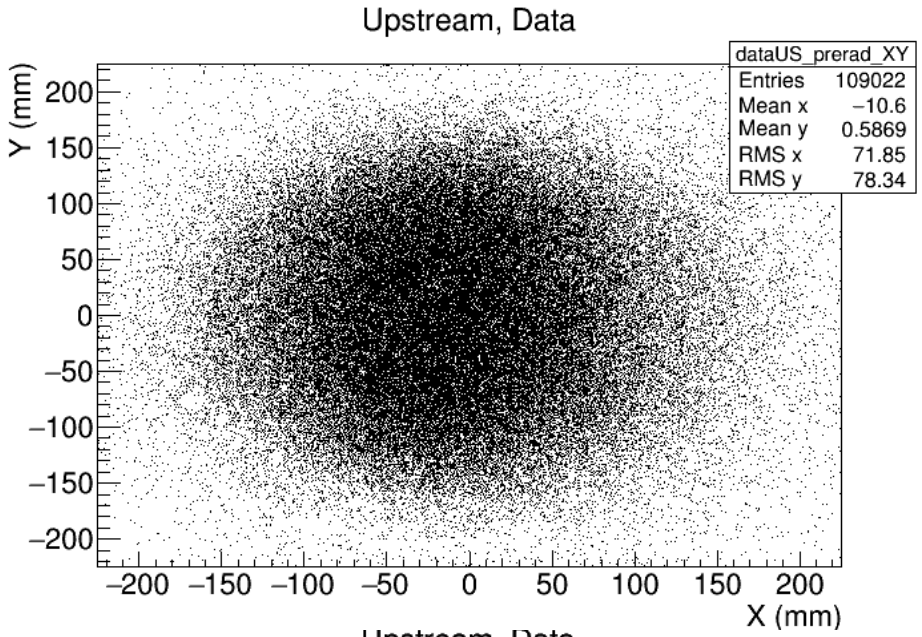


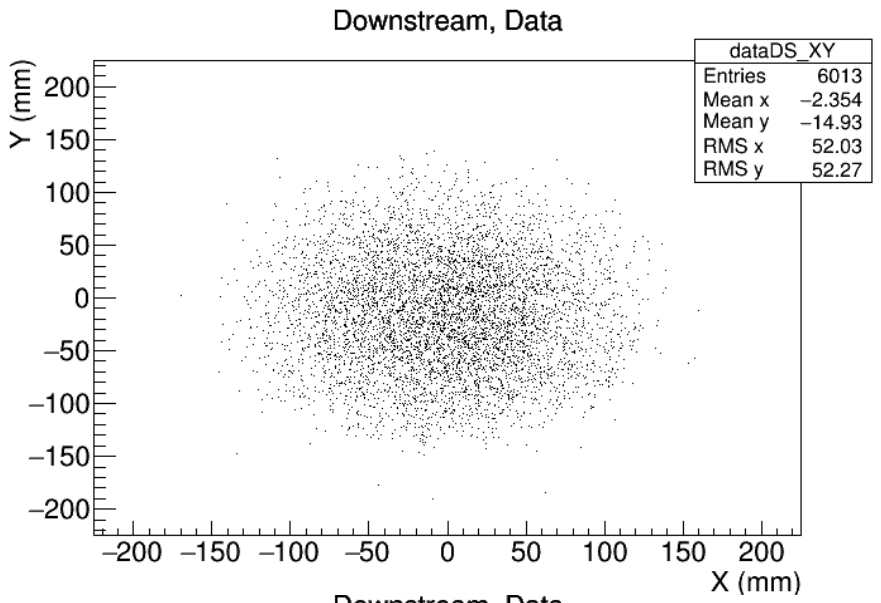


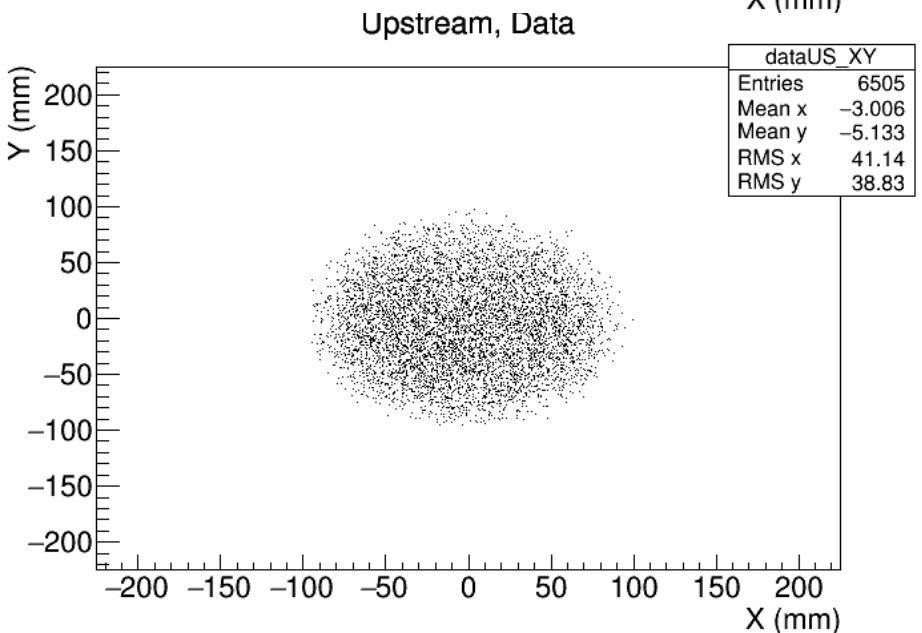


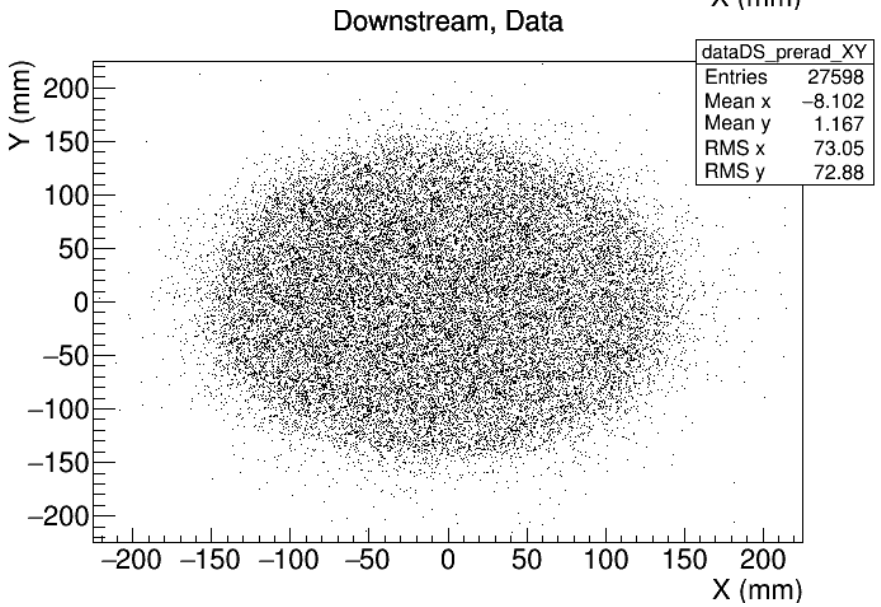


Radial selection - 200MeV/c

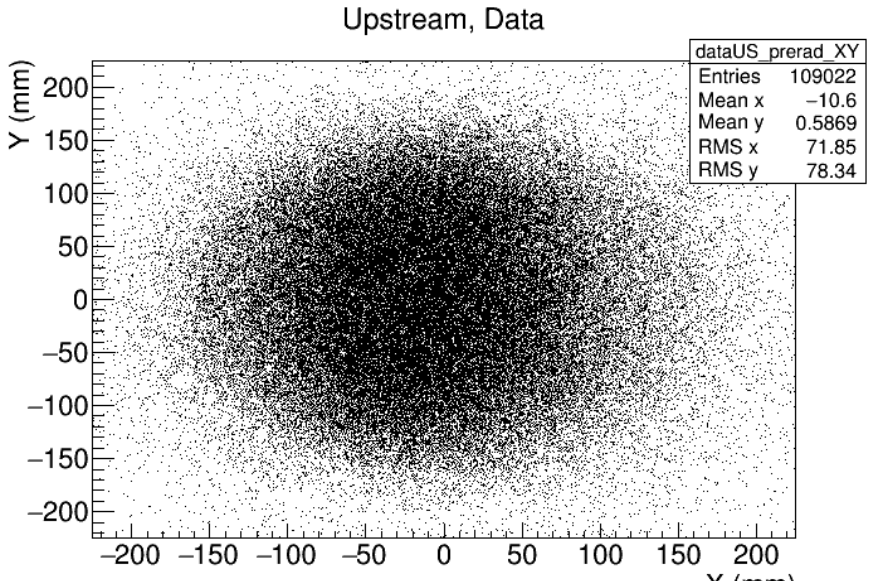


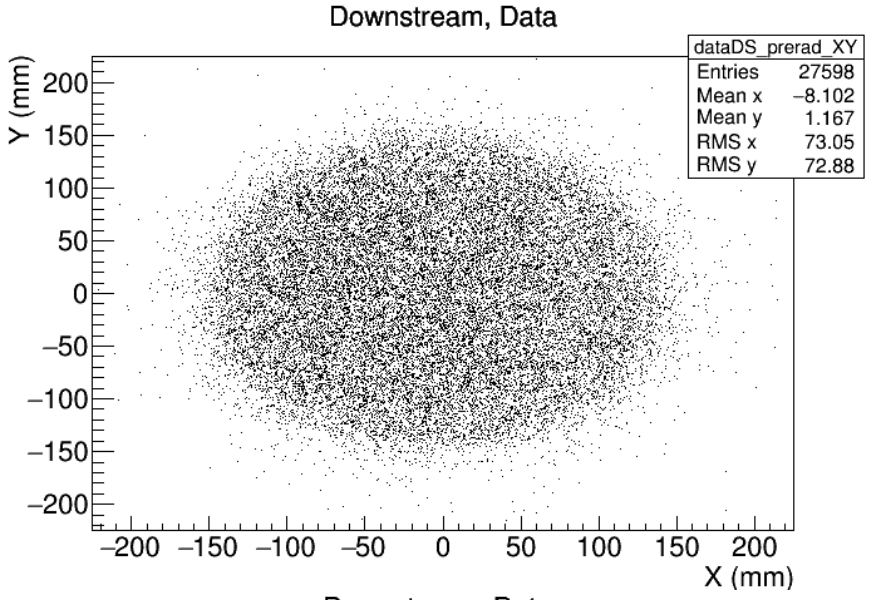


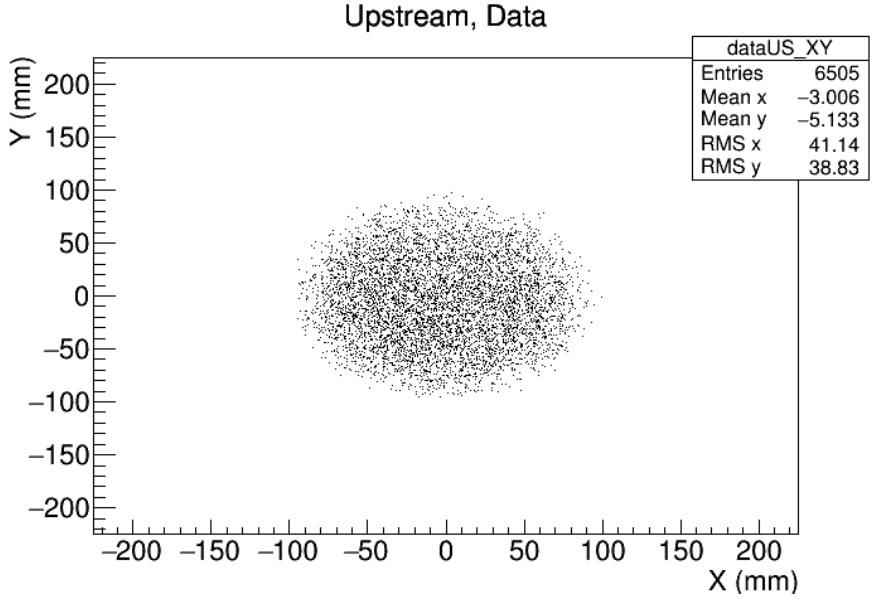


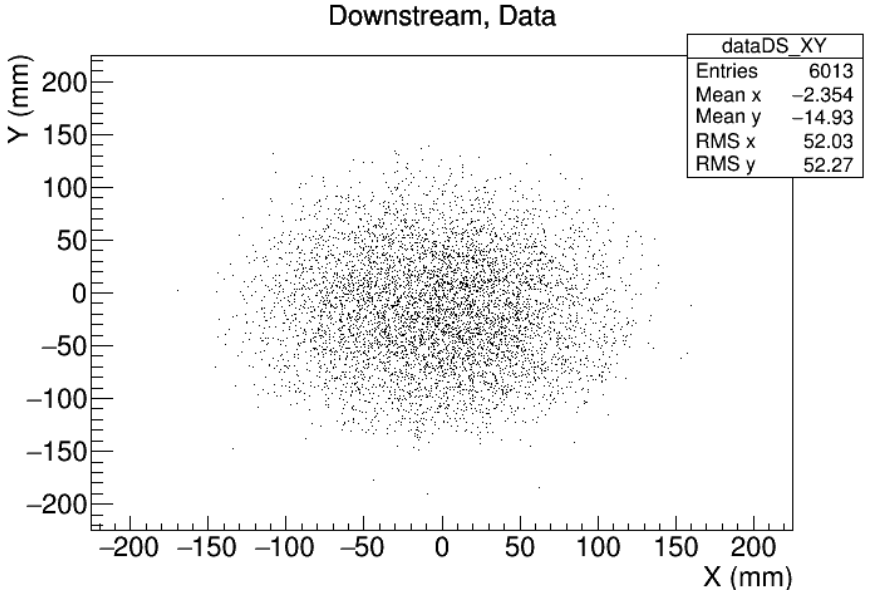


Radial Selection - 240MeV/c

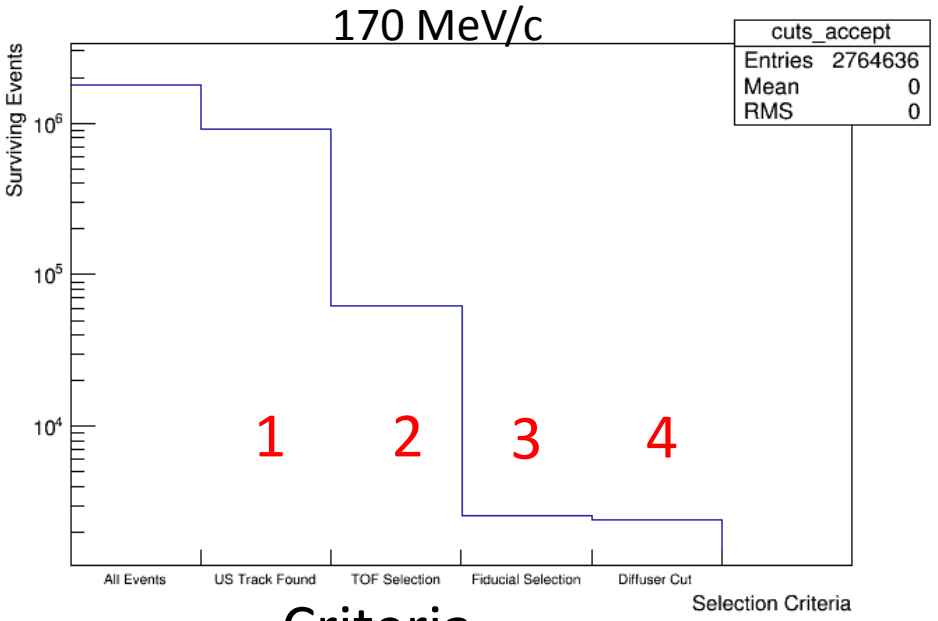


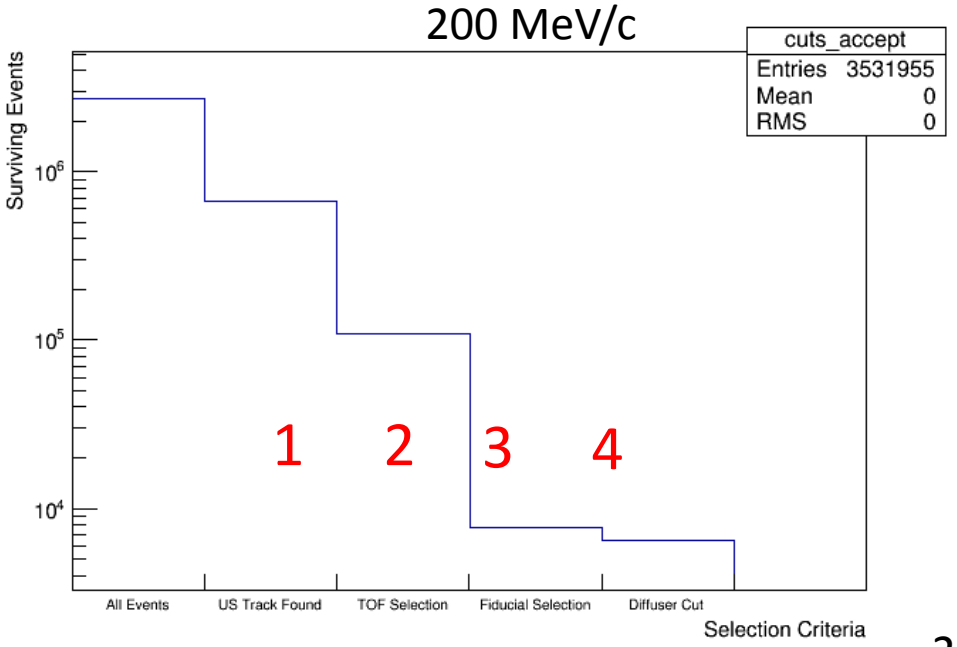






Particle Selection



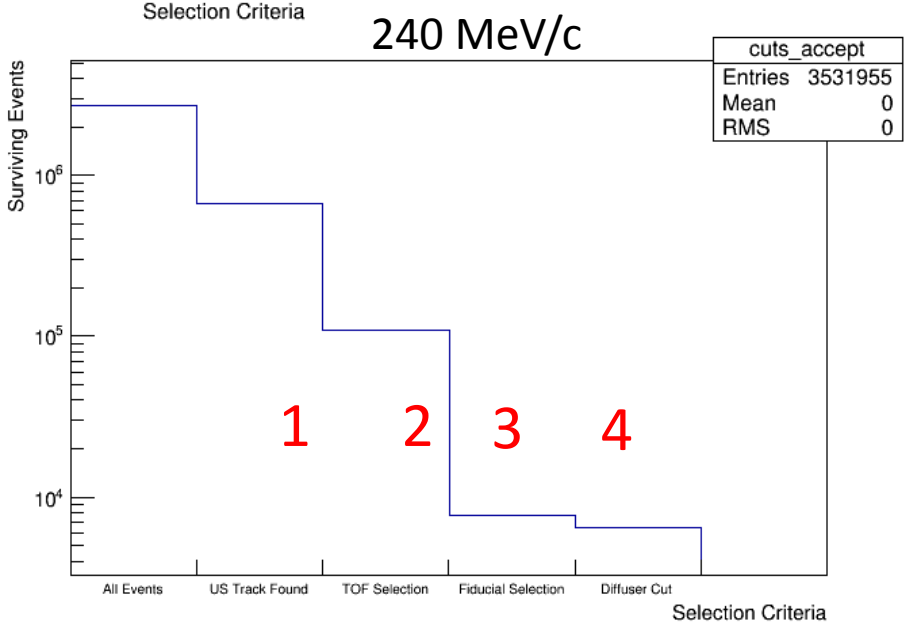


Criteria

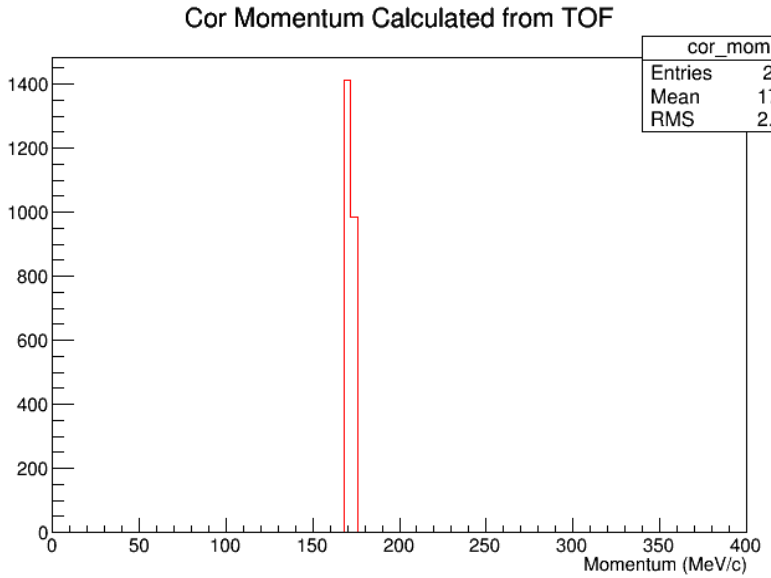
(TOF1 spacepoint present)

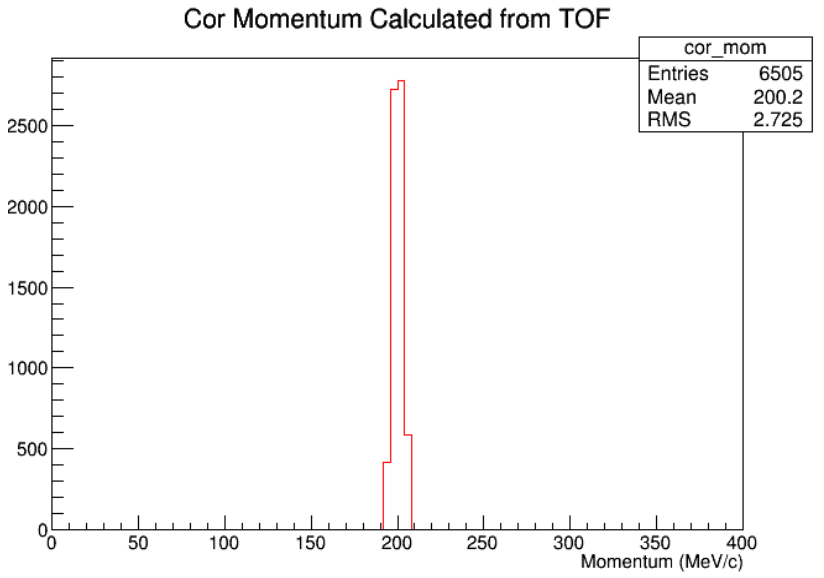
1. US track present
2. TOF selection (table)
3. Projected radius at TKD with
4. 0.01mrad of scattering < (140mm)
5. Max radius at diffuser < (90mm)

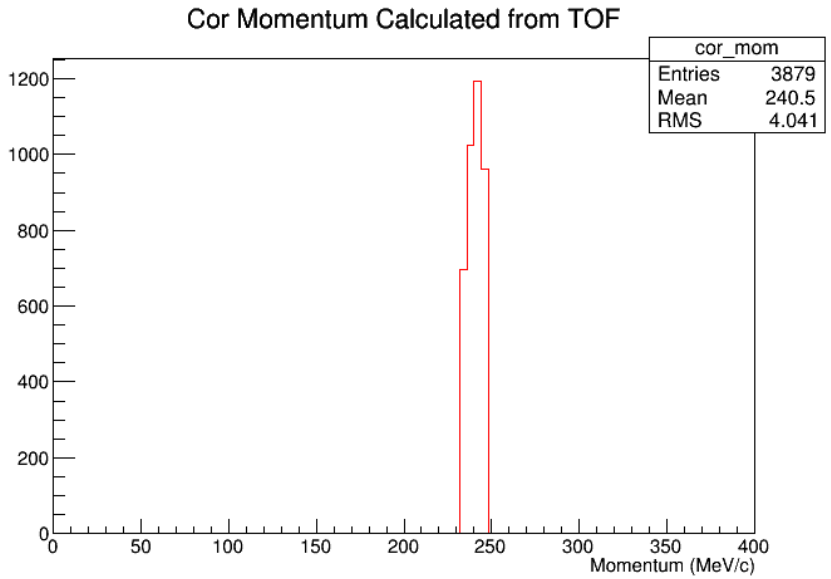
p (MeV/C)	TOF (ns)
172	28.850 ± 0.1
200	28.180 ± 0.1
240	27.500 ± 0.1



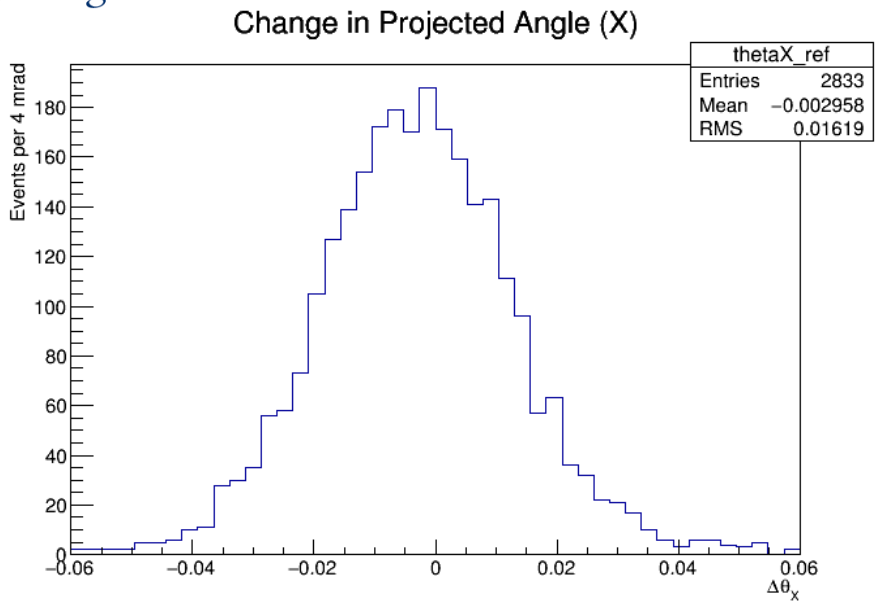
Resulting momentum

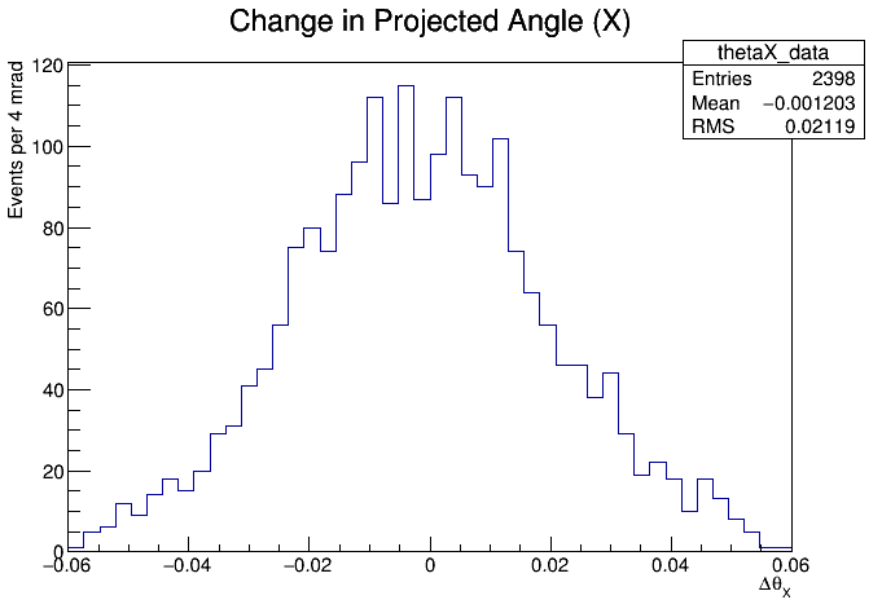


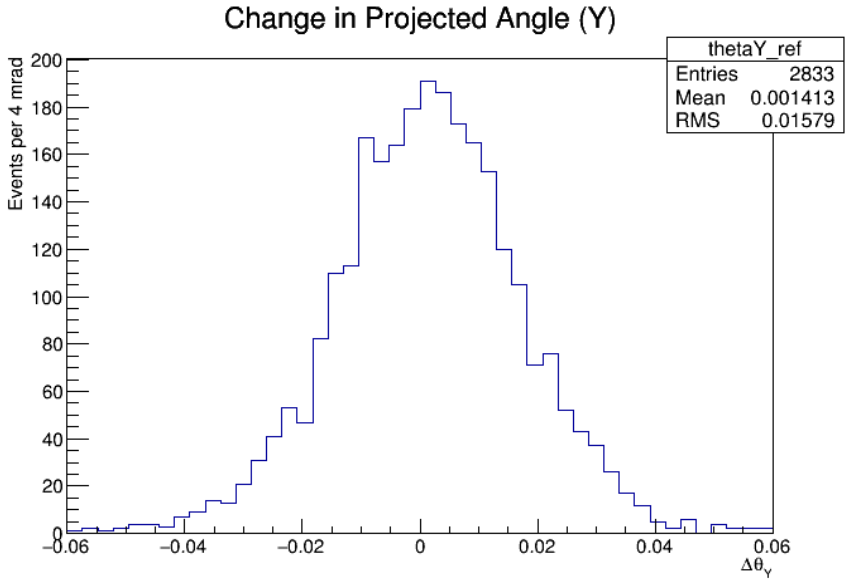


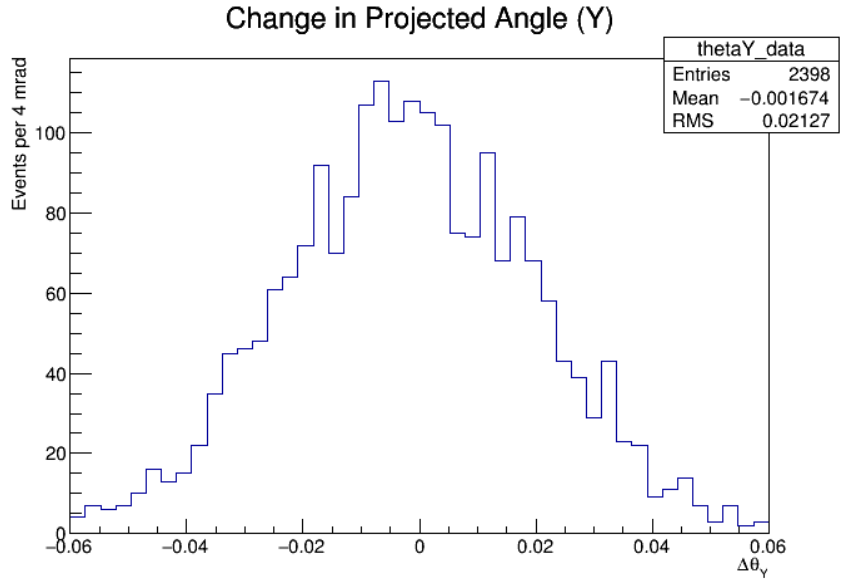


ThetaX, ThetaY - 170MeV/c

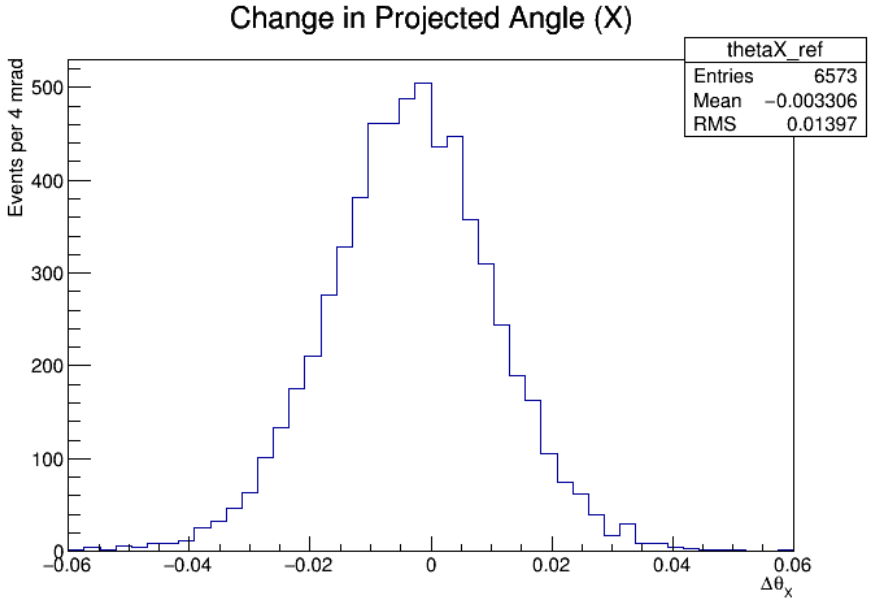


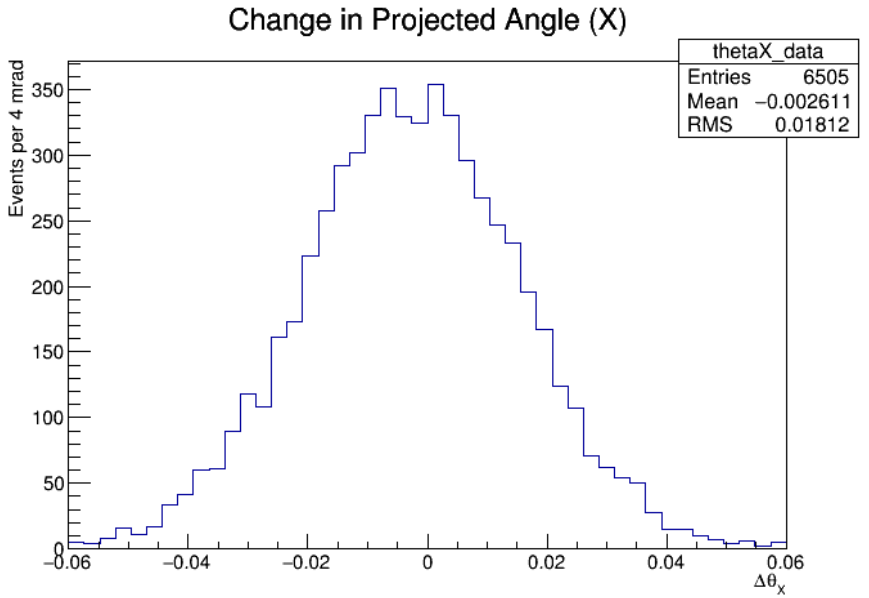


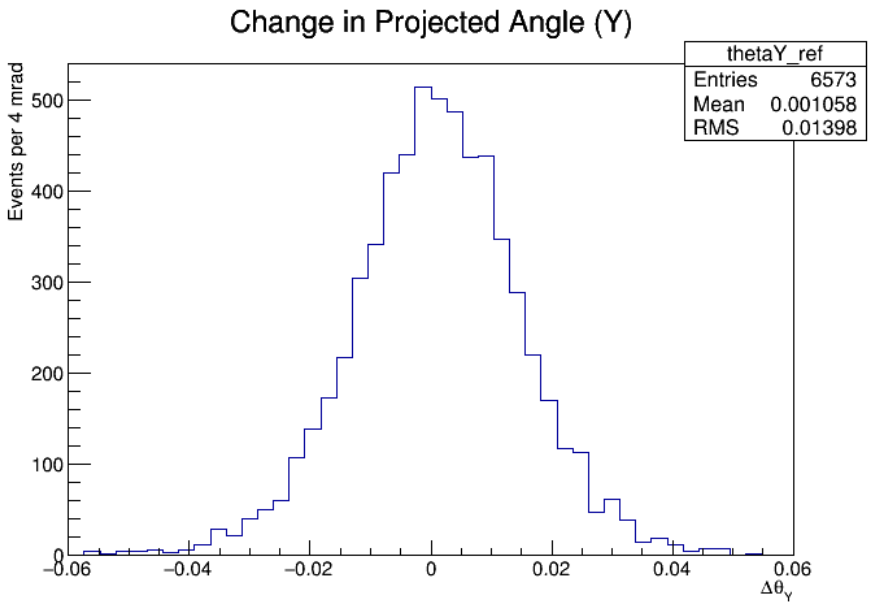


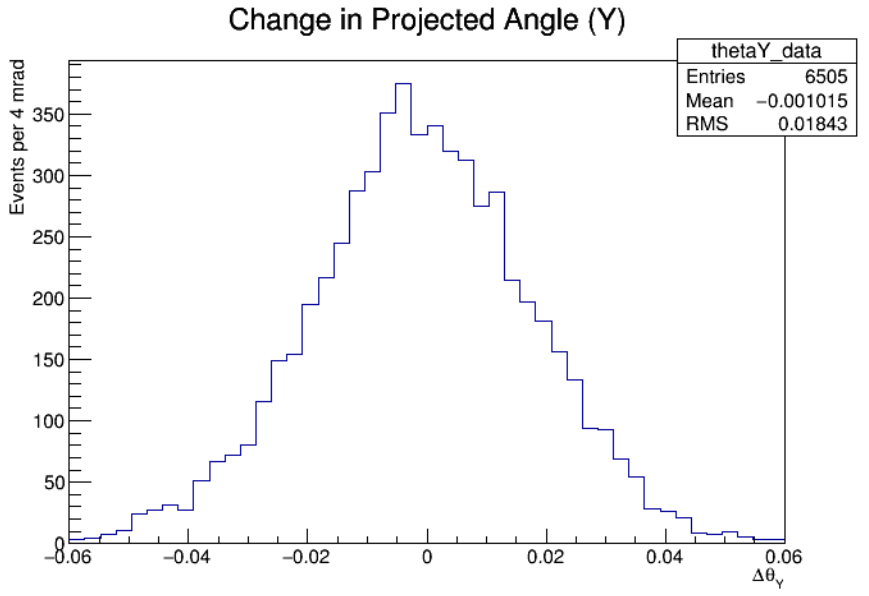


ThetaX, ThetaY - 200MeV/c

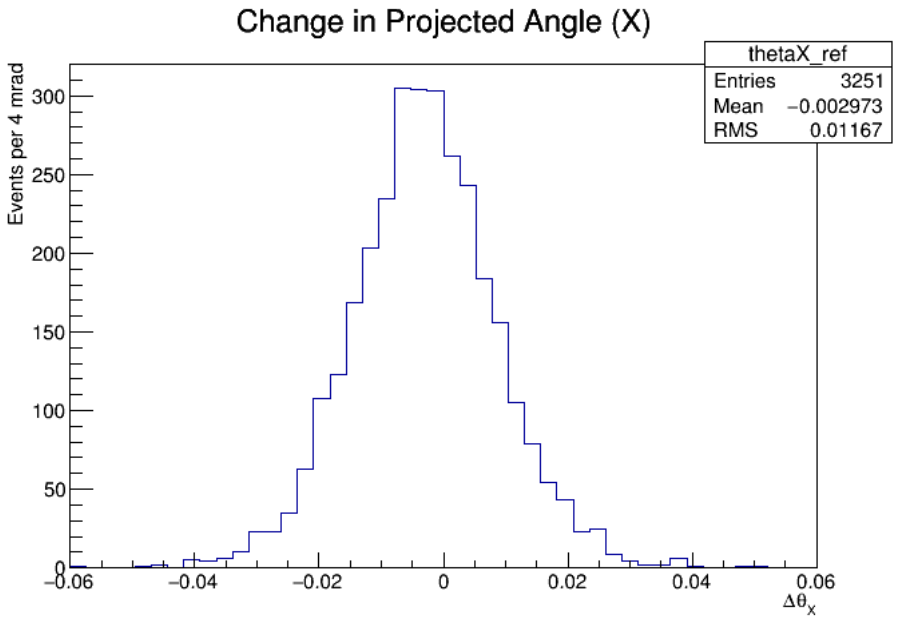


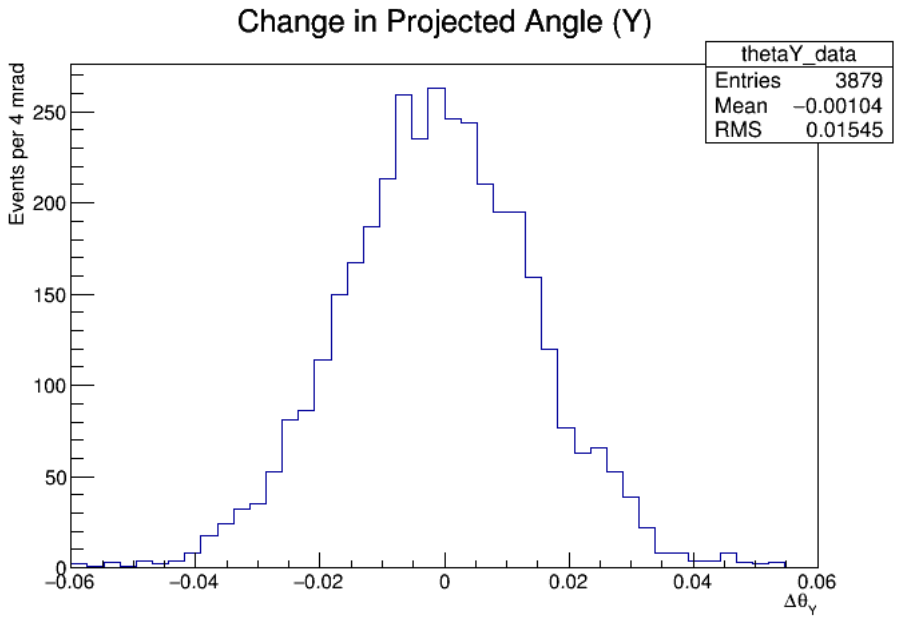


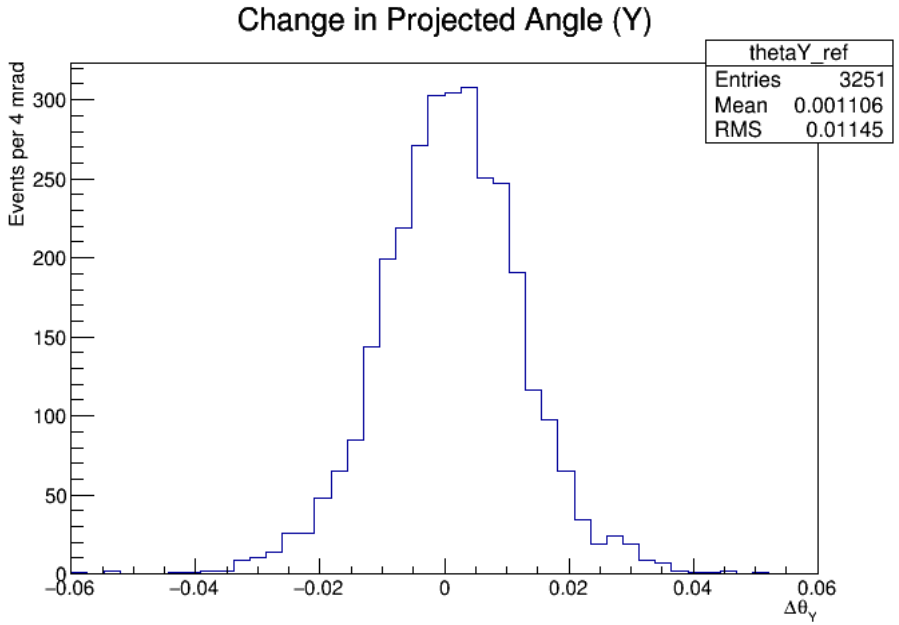


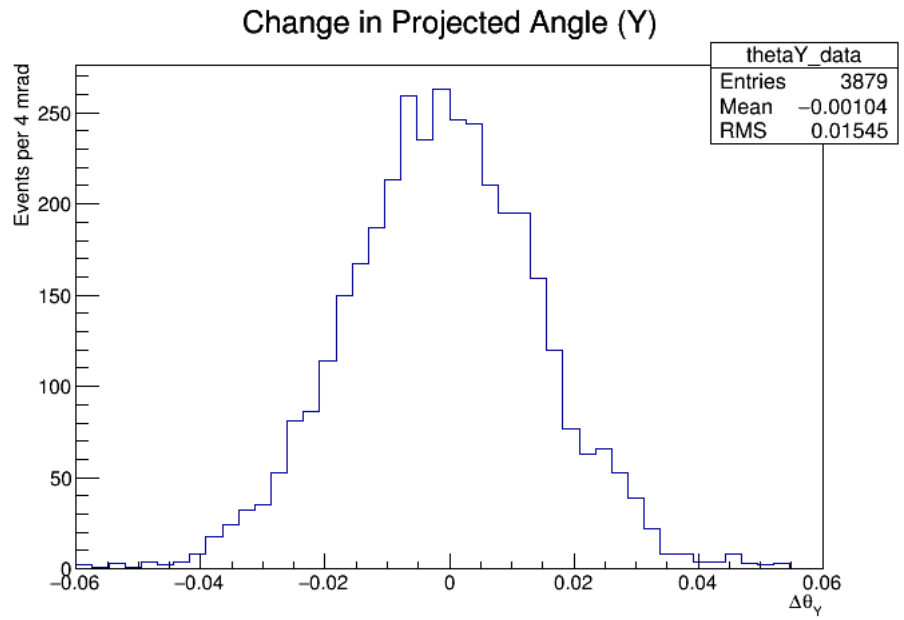


ThetaX, ThetaY - 240MeV/c









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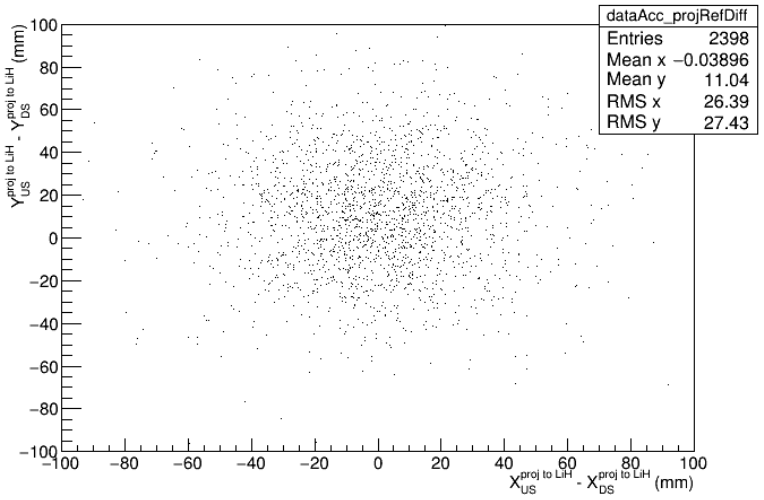
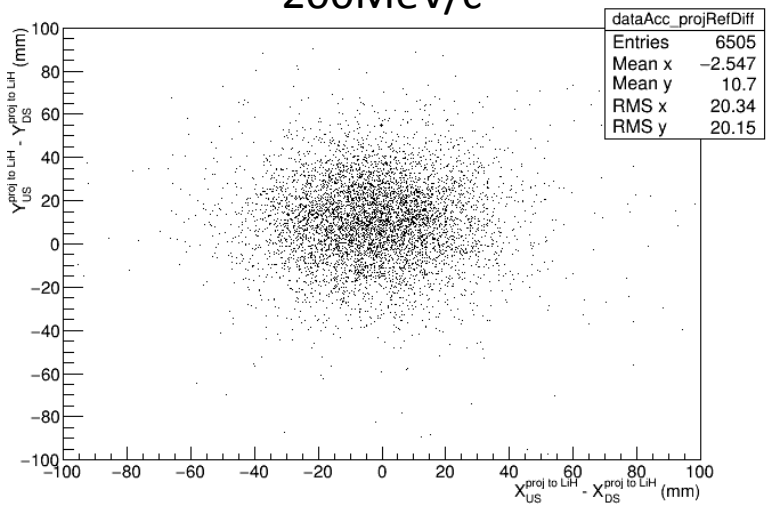
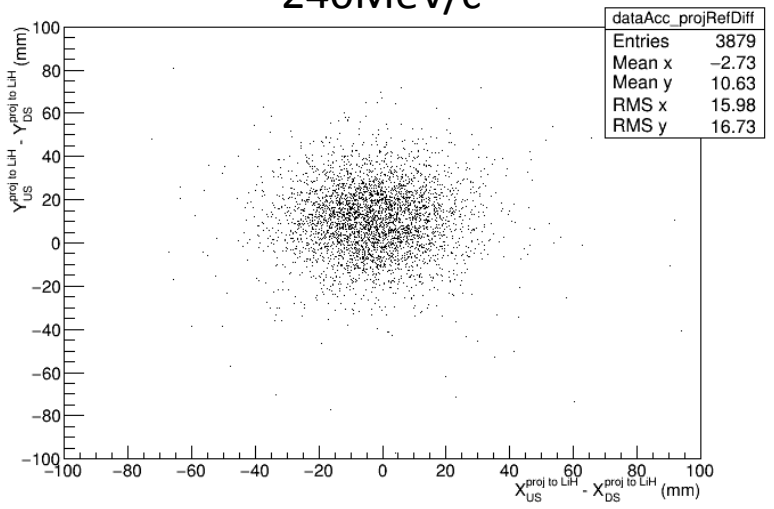
170MeV/c

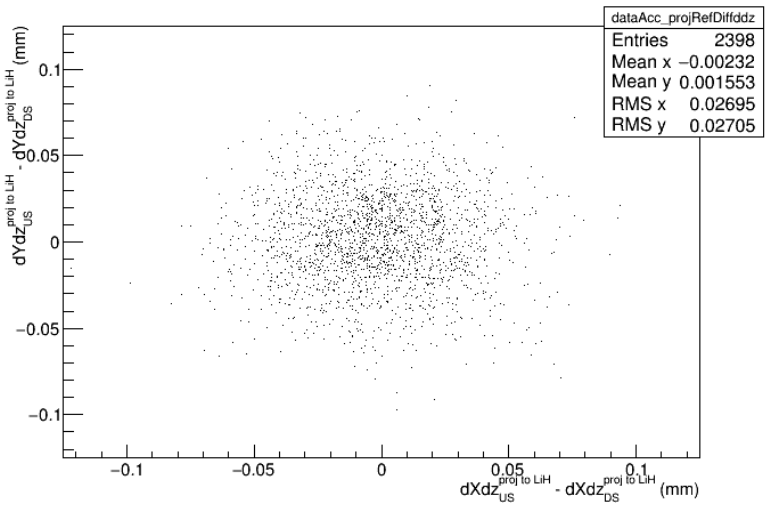


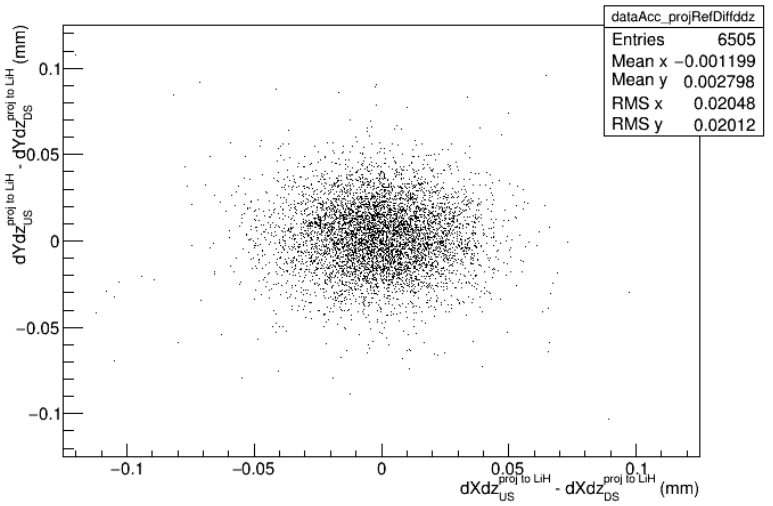
200MeV/c

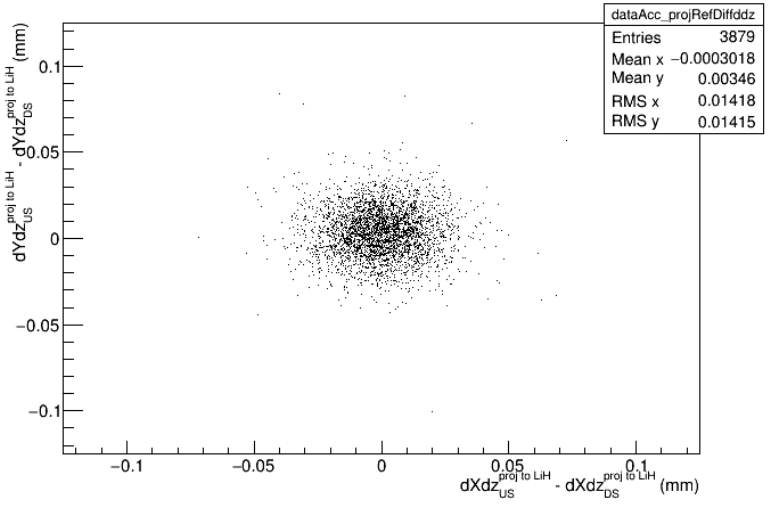


240MeV/c









Future work

- Resolve MAUS version issue
- Comparison with Monte Carlo
- Enhance PID procedure:
  - Cherenkov Detector
  - EMR/
  - KL Calorimeter
- Systematic error calculations:
  - Material fluctuations in absorber
  - Alignment
  - Angle definition
  - TOF system*
- Convolve empty absorber data with the models
  - Geant4 (Wentzel-IV)
  - Carlisle –Cobb (XY)
  - Moliere
- Quantify model/data consistency with Chi^2