Optics Update

December 15,2017

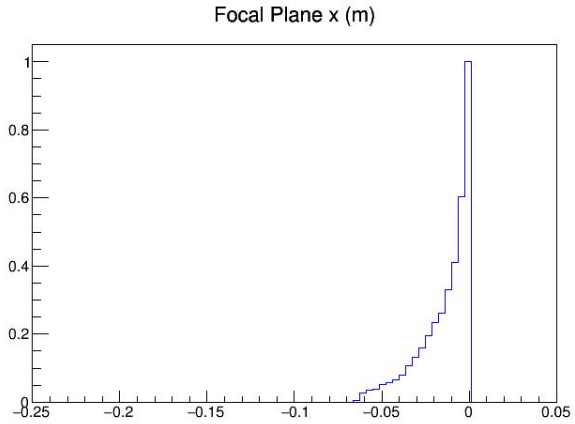
Ionization Losses

Target	dE/dx (MeV cm^2/g)	Thickness (g/cm^2)	Energy Ionization Loss (MeV)
Lead/Diamond	1.122	0.902	1.374648
Super Thin ^{12}C	1.749	0.017	0.029733

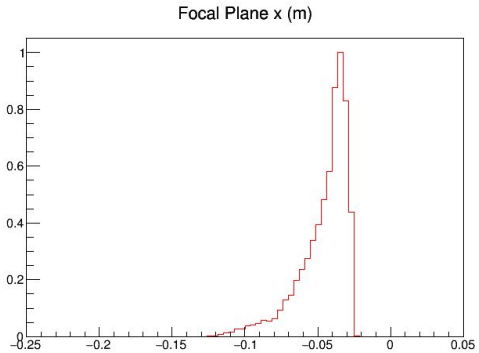
- dE = (dE/dx) * thickness
- 1063 MeV beam
- dE/dx obtained from Particle Data Group
- Offset due to ionization losses ~ 15.5 mm using $(x|\delta) = 16.73$

Checks (HRS Trans)

No raster



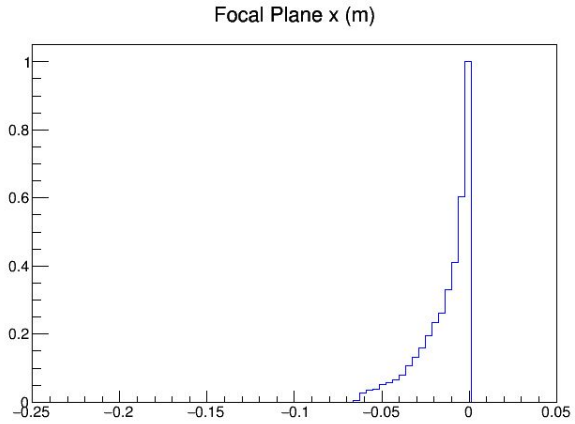
Raster (off center 1cm)



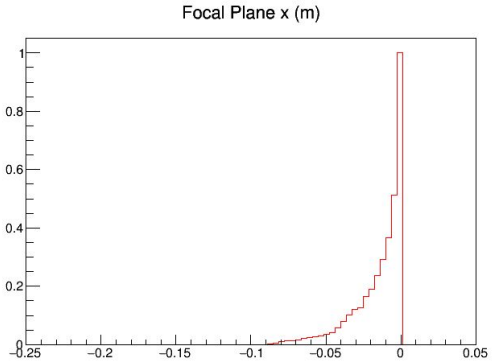
- (x|x) = -3.09
- Peak broadens due to the raster
- Expect to see ~ 30 mm offset in central value of the peak
- This is what is observed

Checks (HRS Trans)

No raster

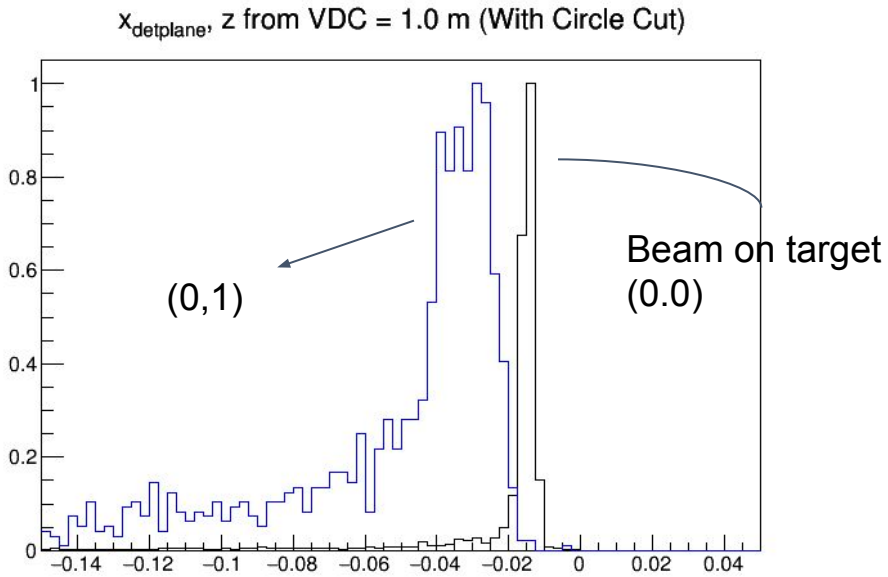


Raster subtracted



- (x|x) = -3.09
- Removed raster effects
- Broadening due to the raster is removed as well the 30 mm offset

Exploring Ionization Losses



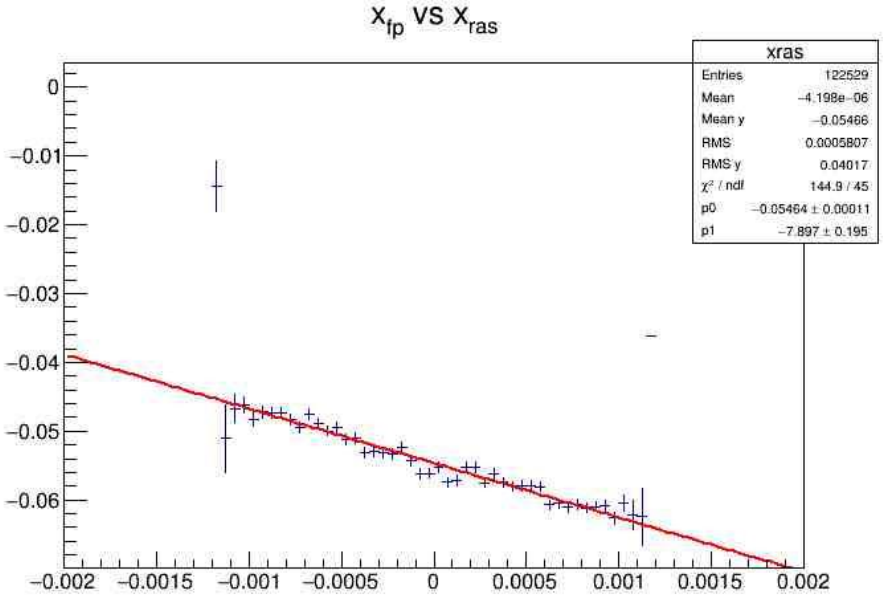
Pb/D (Sieve Out)
Super Thin Carbon (Sieve In)

- Cut on the center hole of the sieve target
- Center hole cut - $\text{sqrt}(\theta_{tg}^2 + \varphi_{tg}^2) < 0.0025$
- Sieve out has beam raster
- Sieve in has no beam raster

Beam Positions

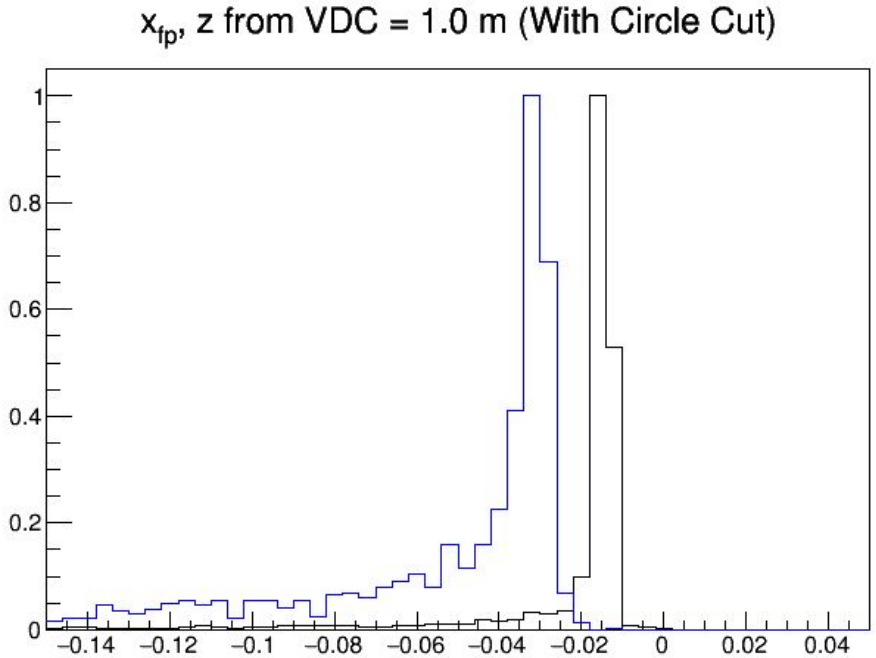
Run Number	Comment	BPMA.xpos (mm)	BPMA.ypos (mm)	BPMB.xpos (mm)	BPMB.ypos (mm)	Target.xpos (mm)	Target.ypos (mm)
27412 (0.5 μA)	Spot Check (No Target)	-0.0367491	0.280214	-0.0404017	0.974841	-0.0415	1.224
27427 (0.05 μA)	Sieve Out Pb/D	0	0	0	0	0	0
27428 (0.5 μA)	Spot Check (No Target)	-0.0248617	0.2189595	-0.102949	1.20861	-0.119	1.41263
27118 (0.5 μA)	Sieve In Thin Carbon	0.0186223	-0.0398863	-0.0597374	-0.0173224	-0.07589	-0.01267
27119 (0.5 μA)	Sieve In Thin Carbon	0.1598886	0.0253923	0..0796082	0.0304588	0.06306	0.0315
27120 (0.5 μA)	Sieve In Thin Carbon	0.0881368	-0.0146237	0.0215824	0.0280935	0.007862	0.0369

BPM Correction



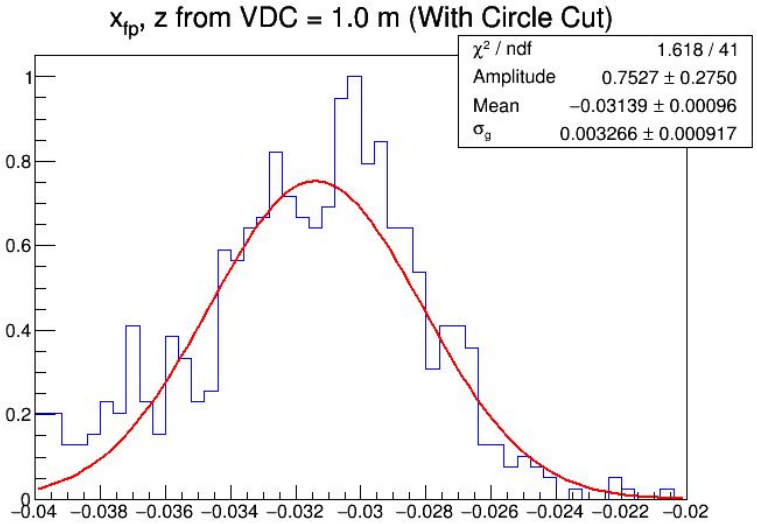
- Taking the average of the target positions of the spot checks before and after Run 27427, we can shift the raster to the central value and fit focal plane x vs x raster
- We should also extrapolate the beam position to the same central value to compare
- (x|x) = -7.897

Ionization Losses

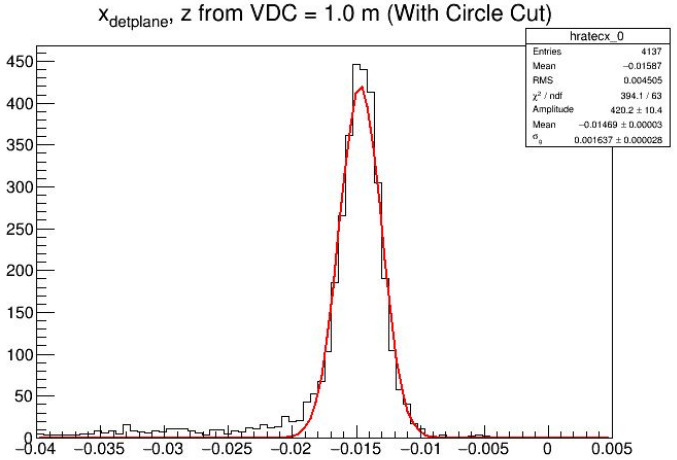


- Taking into account the BPM correction leads to this result
- We can now fit these two histograms

Ionization Losses



Lead peak position = -0.3139 m



Carbon peak position = -0.1469 m

Ionization Losses

- We predicted at least a 15.5 mm difference in the dispersive direction between the two targets (carbon and lead)

- We found 16.7 mm difference after applying the BPM correction for the lead data which had both beam offcenter and raster applied to it