Update on Bachelor Thesis: Detection of ions with the ATLAS Foward Proton Detector

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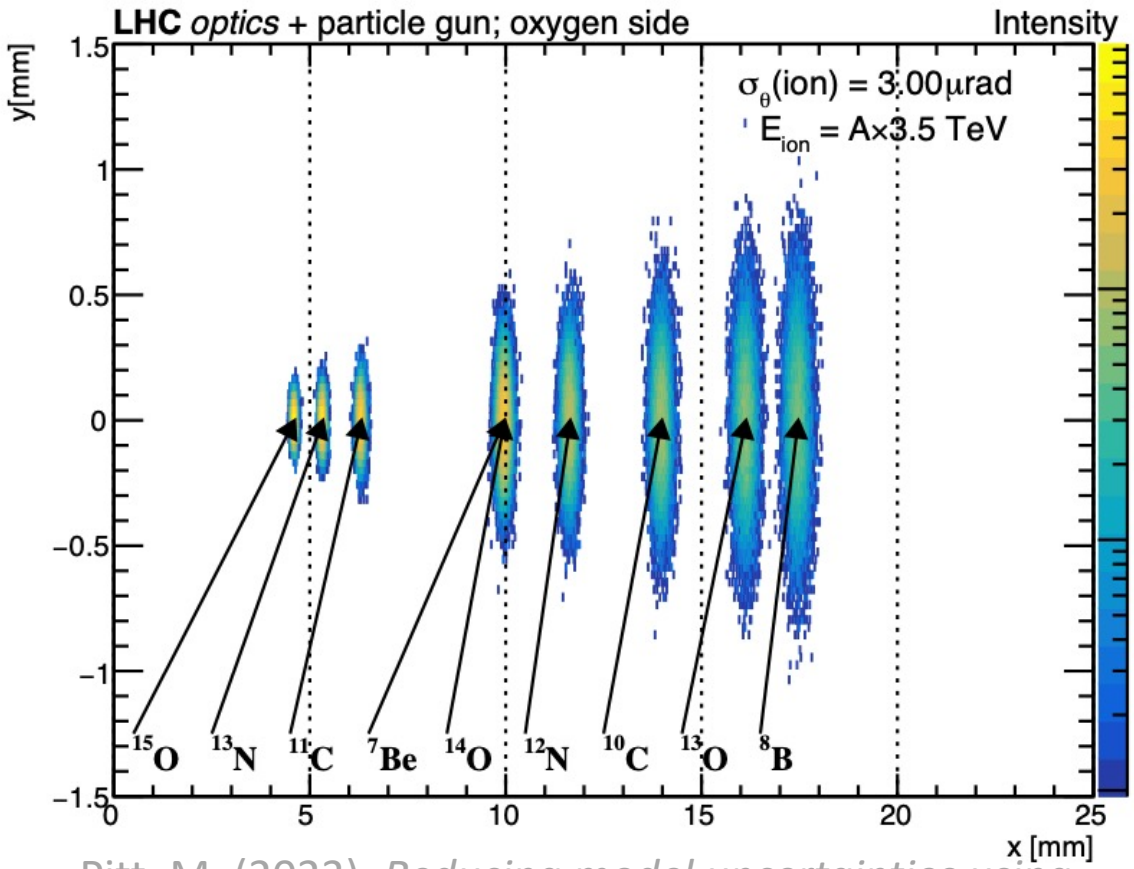
Summary

Before: checked if code/TWISS file works for oxygen, generated first plots

Currently: generating plots with event generators, first plots for other ions

Goal: use different ions and examine if it is possible to use AFP for mass spetroscopy

Plot for CMS



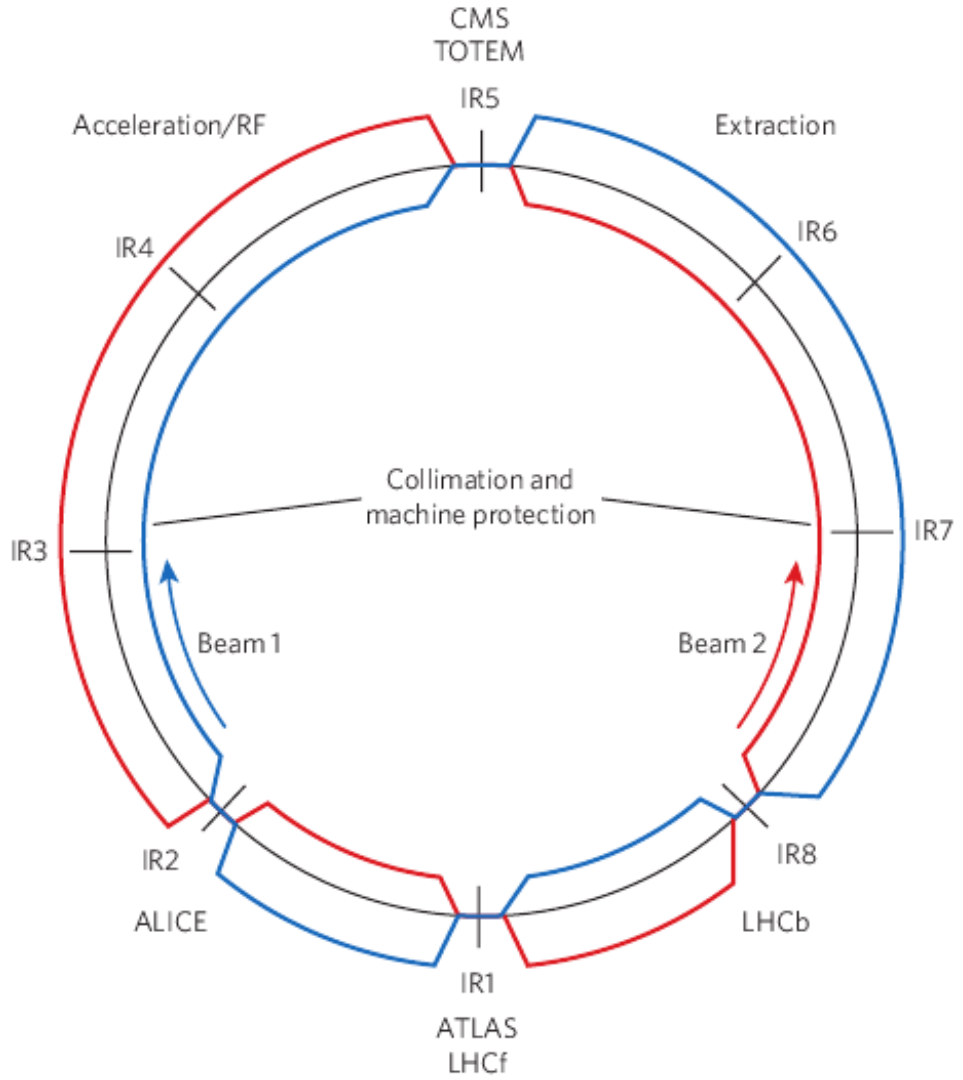
Pitt, M. (2023), *Reducing model uncertainties using proton-oxygen collisions with proton/neutron tagging at the LHC*
https://arxiv.org/pdf/2308.03052.pdf

Summary

Previously: Used a TWISS file with oxygen on beam 2

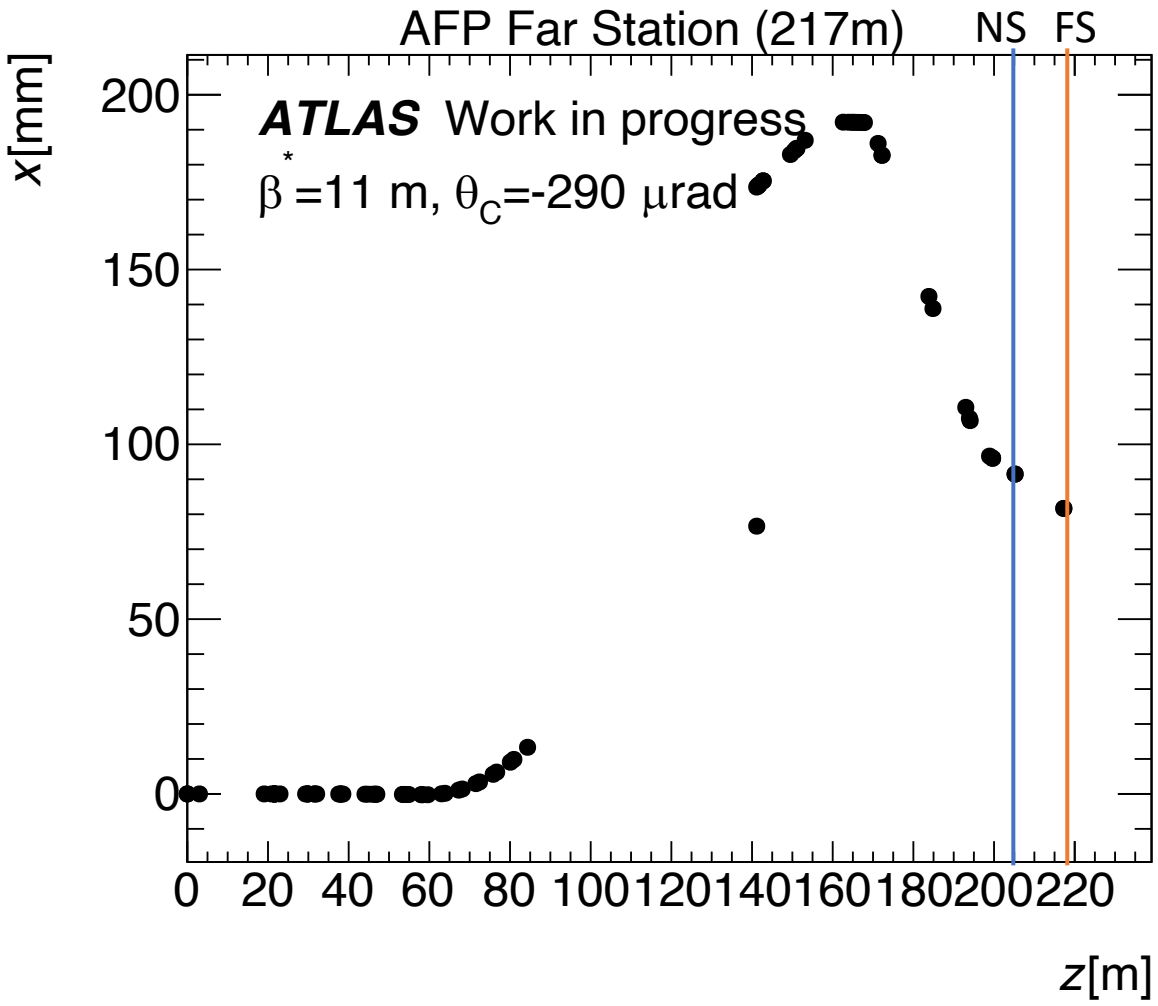
Beam 1: circulates clockwise
Beam 2: circulates anti clockwise

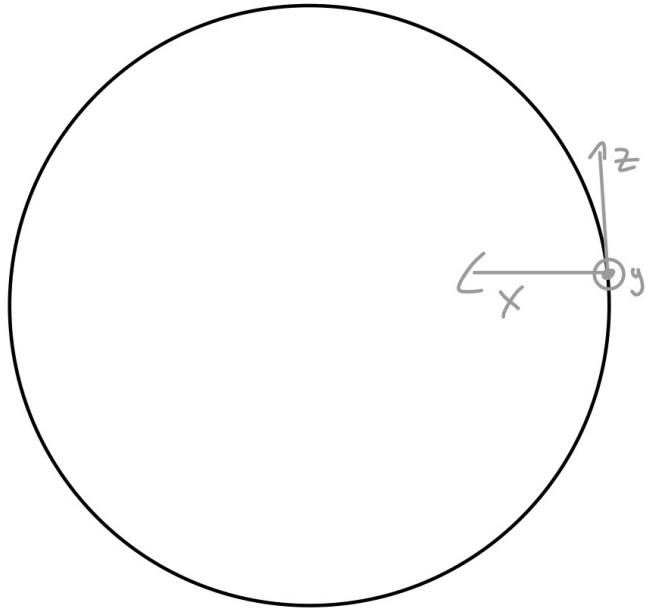
Learned that this setup does not work correctly



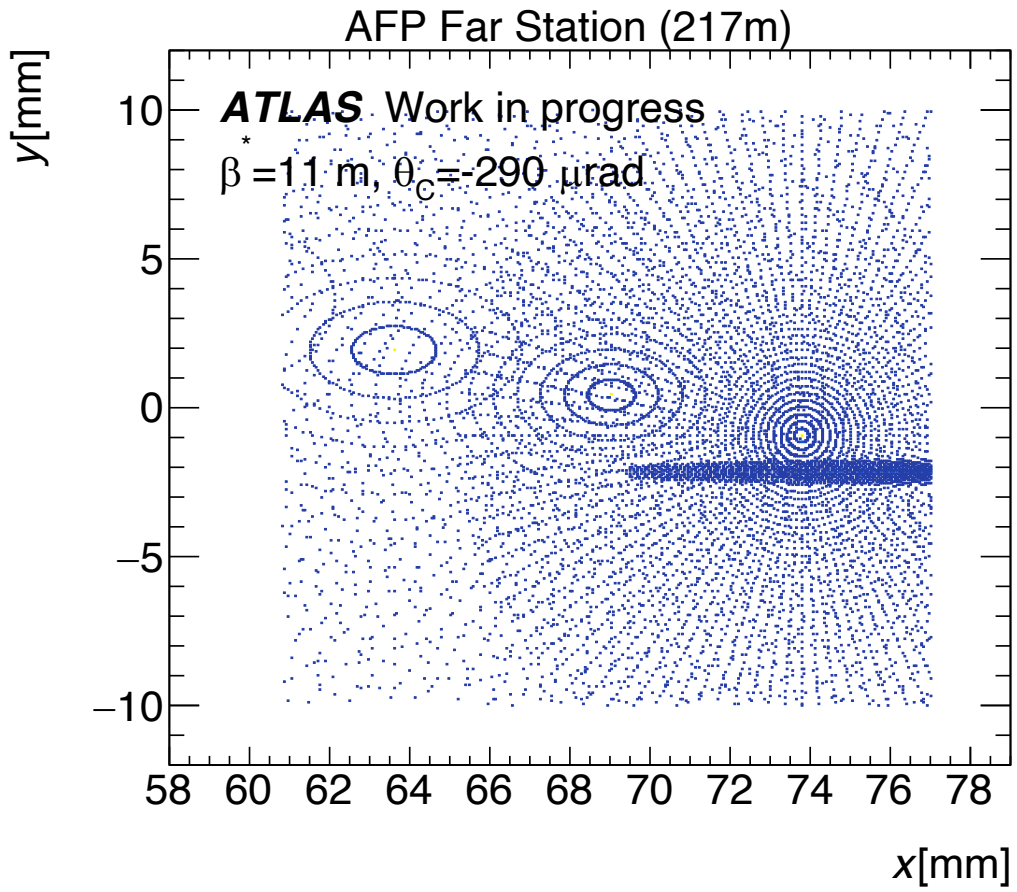
https://www.researchgate.net/figure/1-LHC-schematic-LHC-is-composed-of-8-arcs-and-8-long-straight-sections-LSS-Two_fig1_41152283

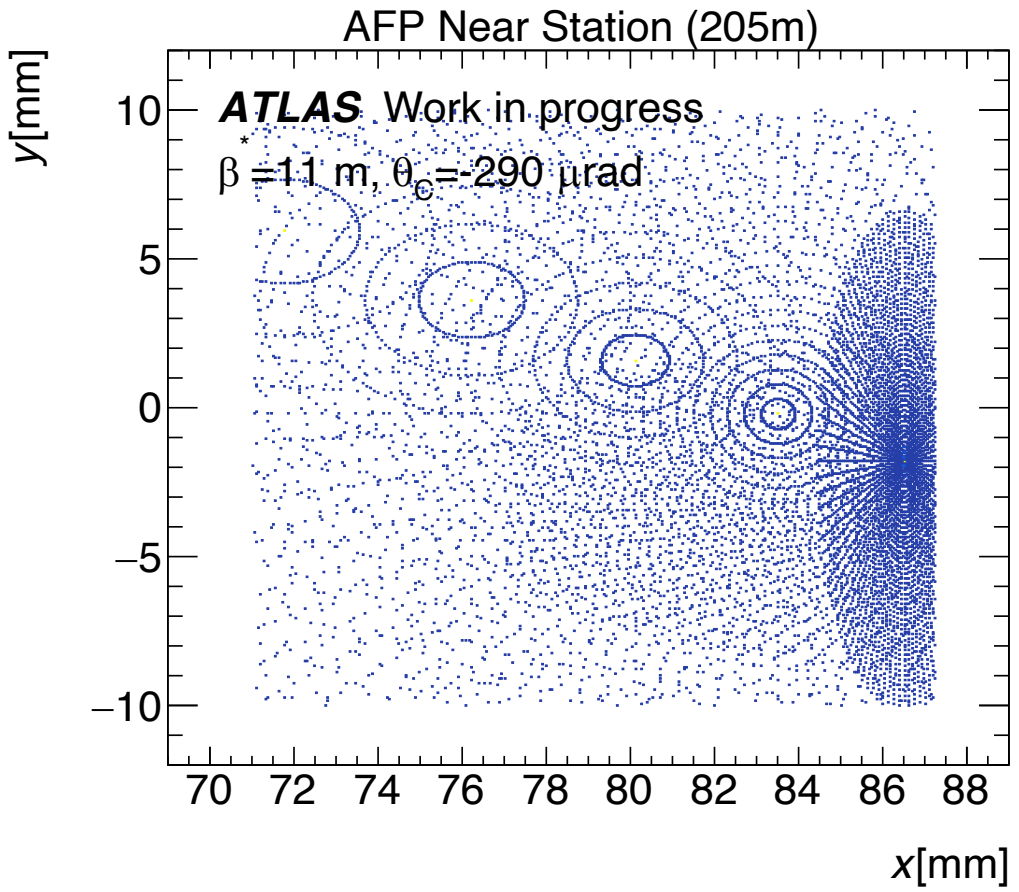
Beam trajectory for x-z plane





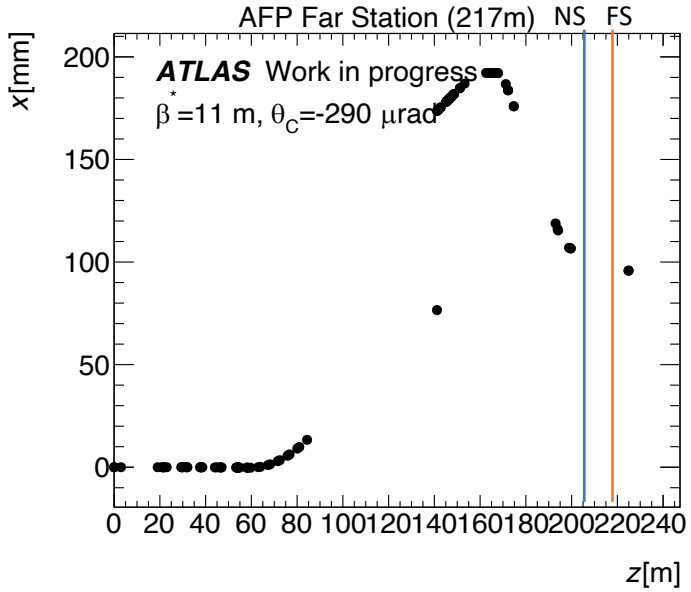
Elliptic Plot for oxygen and AFP



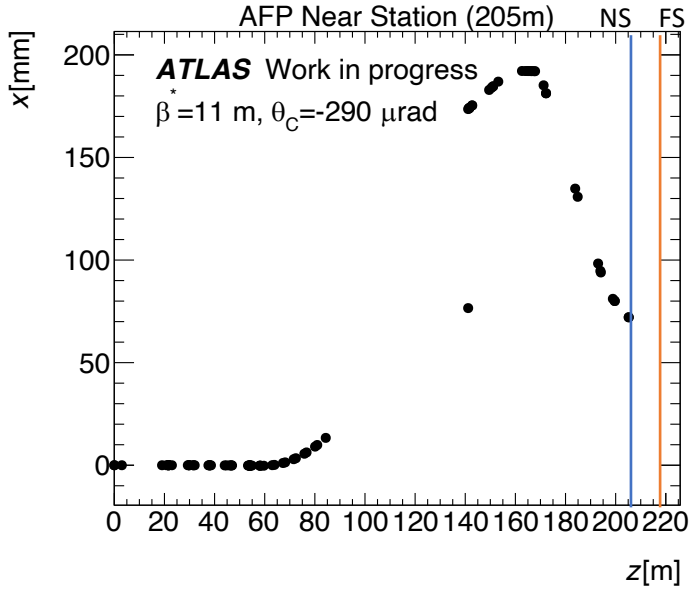


Different beam settings

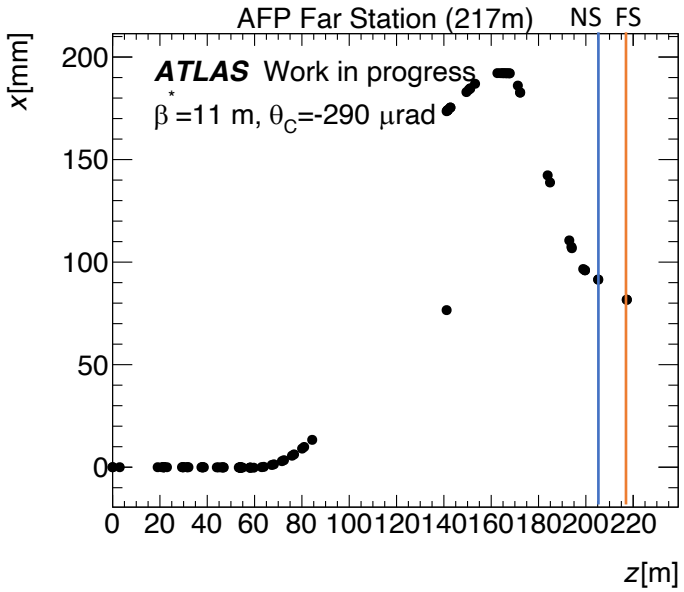
Oxygen on beam2



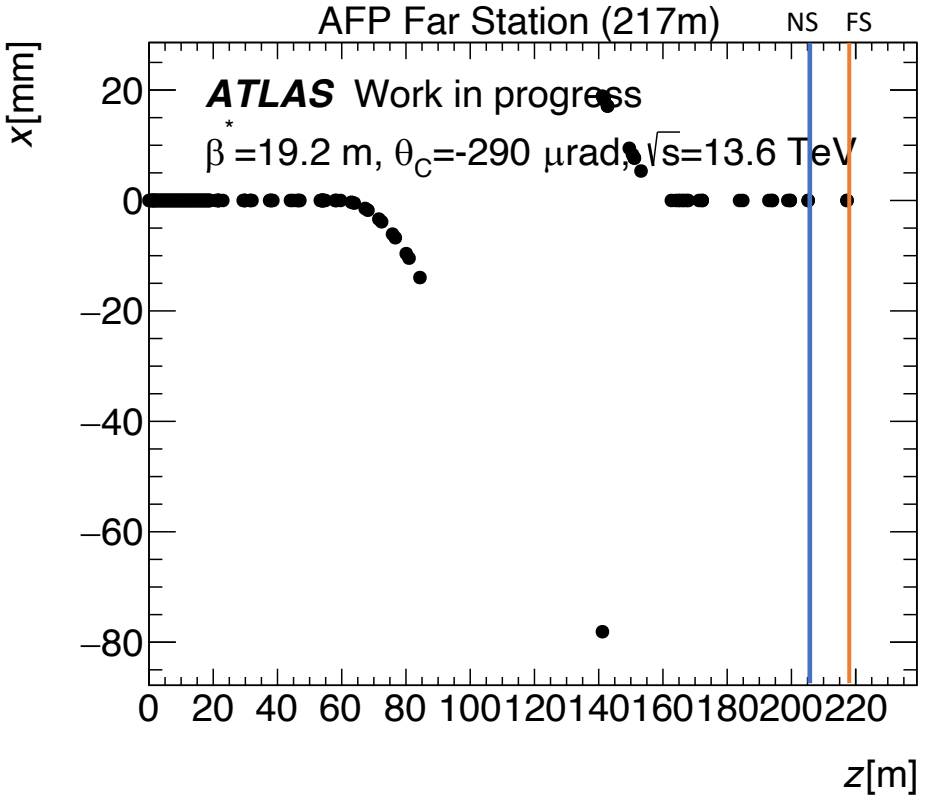
Oxygen on beam1 with pp optics



Oxygen on beam1 heavy ion

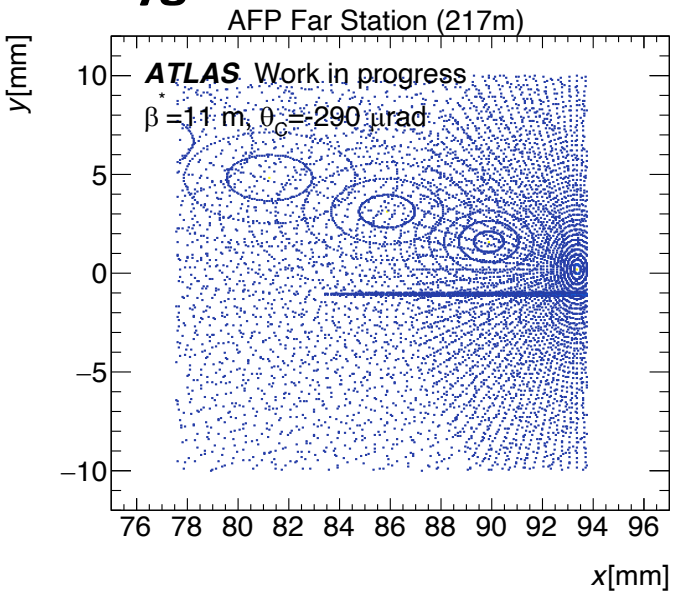


Proton

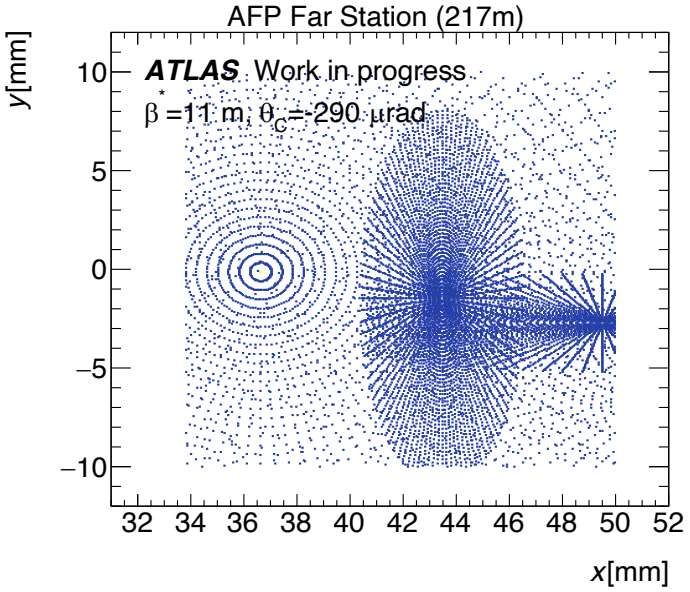


Different beam settings

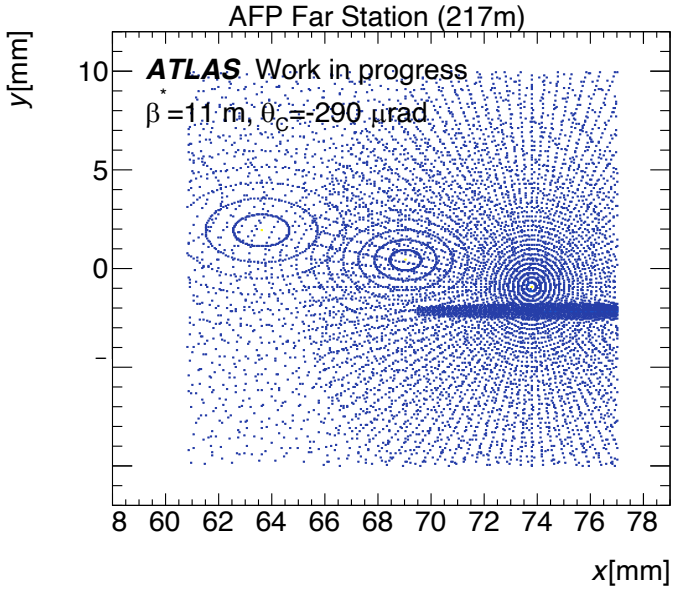
Oxygen on beam2



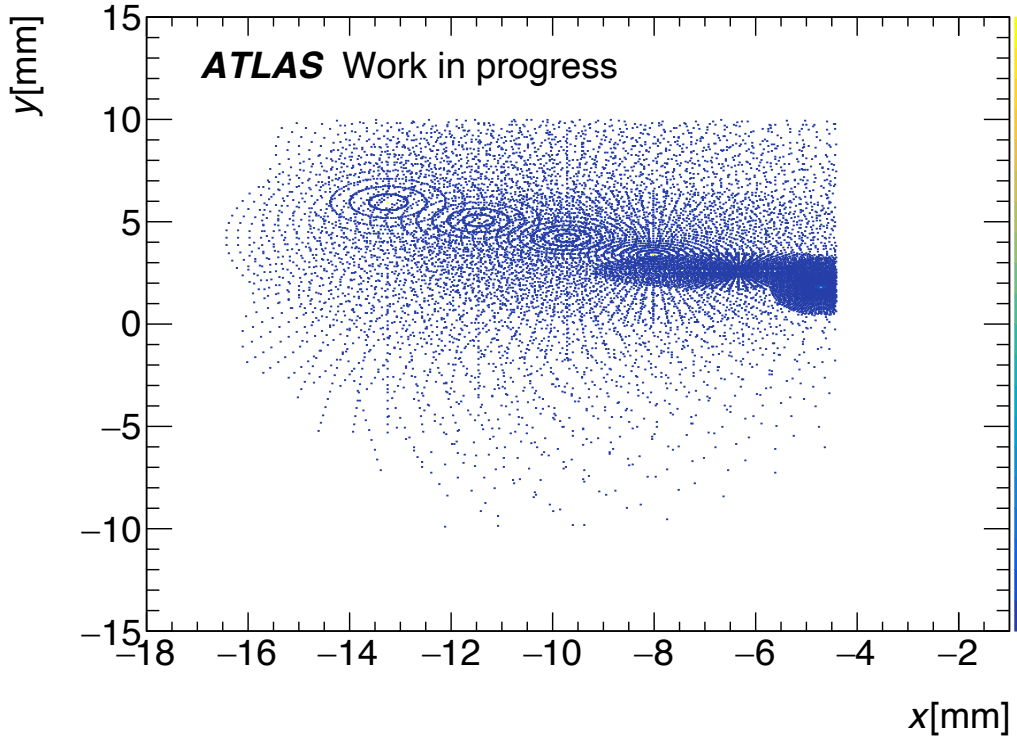
Oxygen on beam1 with pp optics



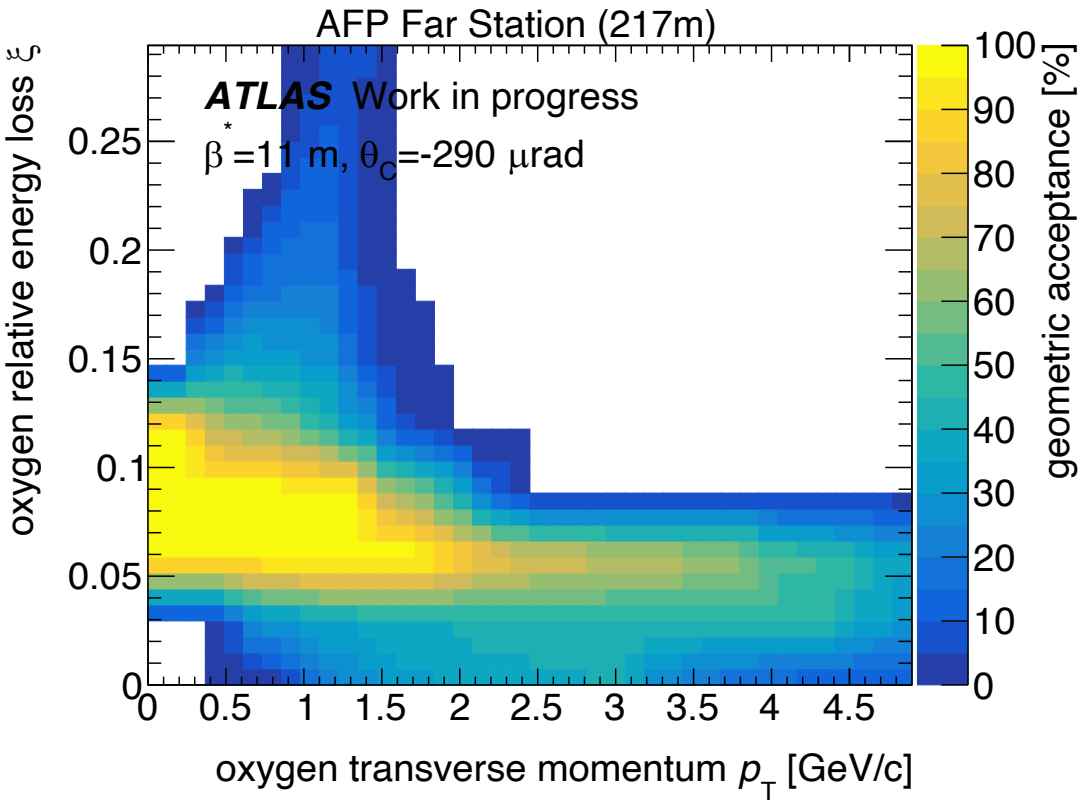
Oxygen on beam1 heavy ion

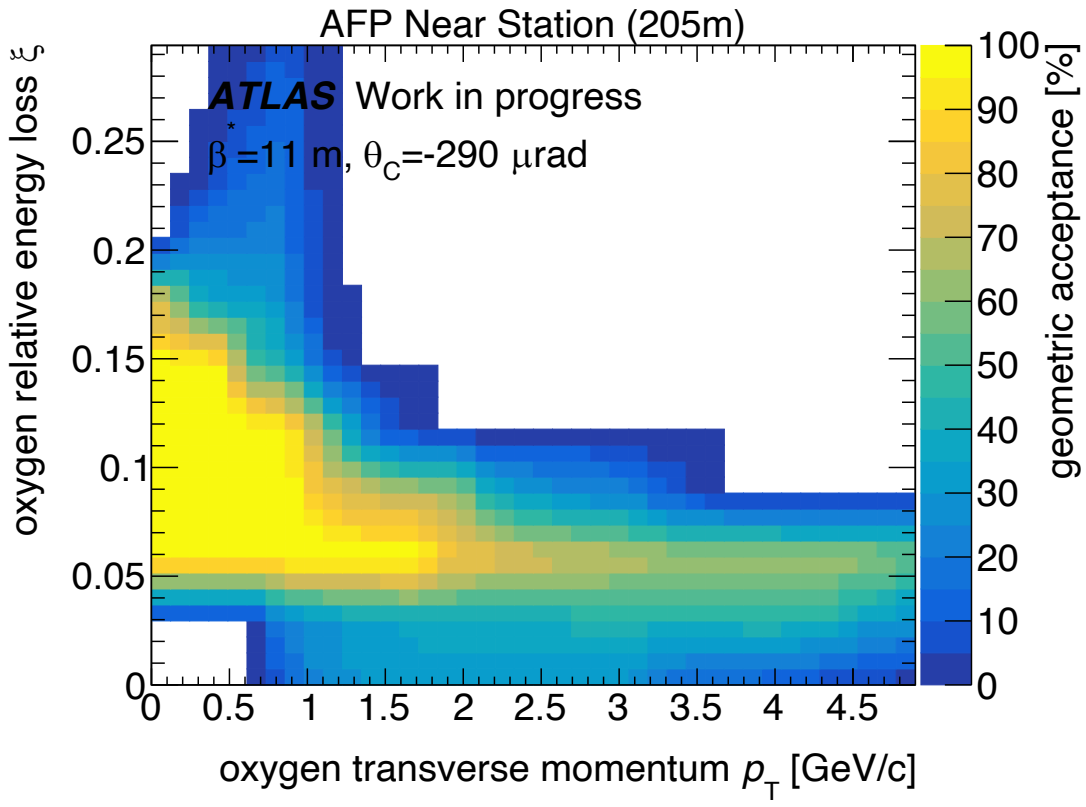


Proton



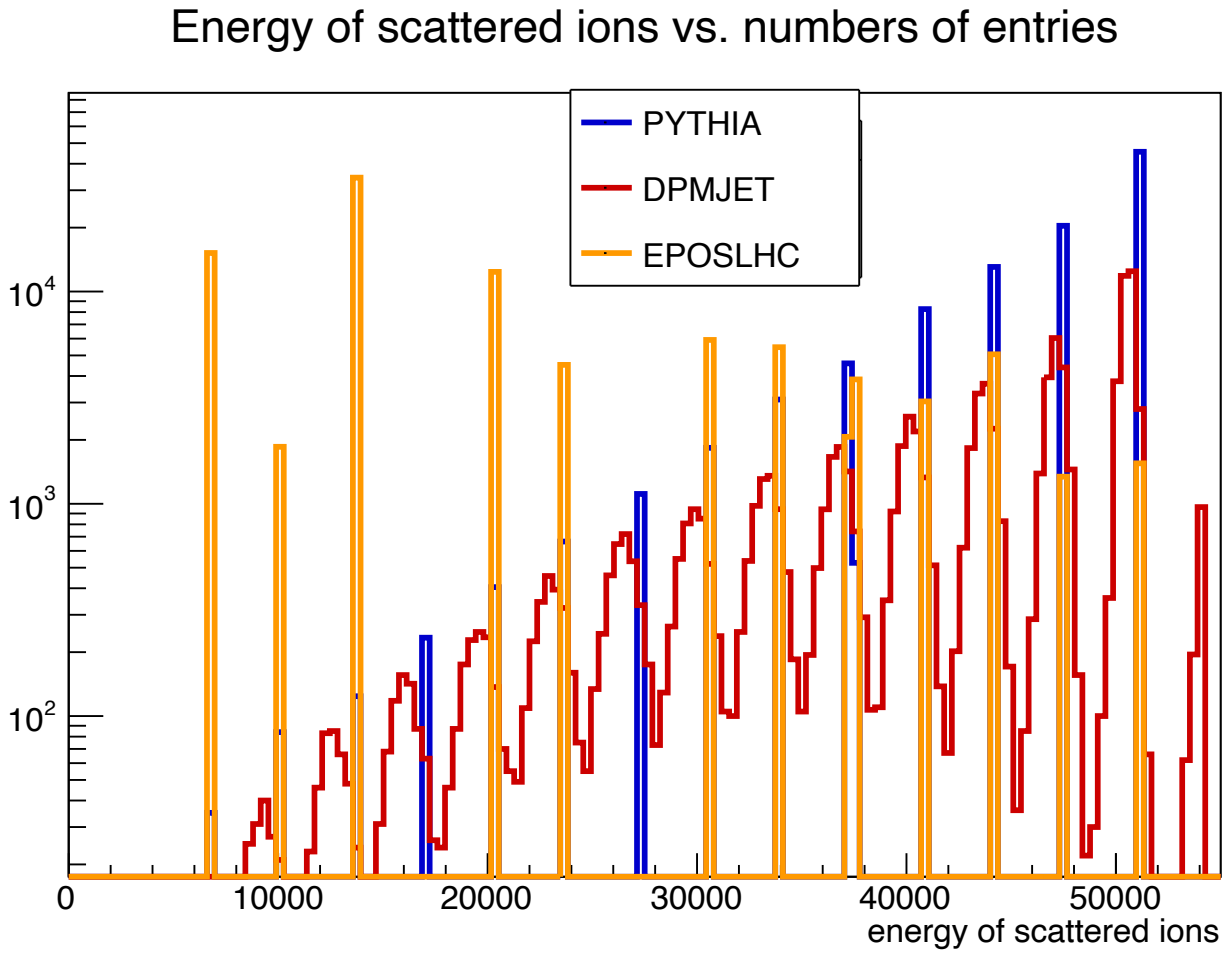
Acceptance for oxygen





Plotting with event generators

- Three different event generators that are designed to simulate particle collisions
- Difference between the predictions of the generators



Conclusion

First plots are generated, but there are still some things to fix

Next steps: plot different ions and compare them to oxygen