Beam Deflection in the full FOOT Setup as a Function of Energy

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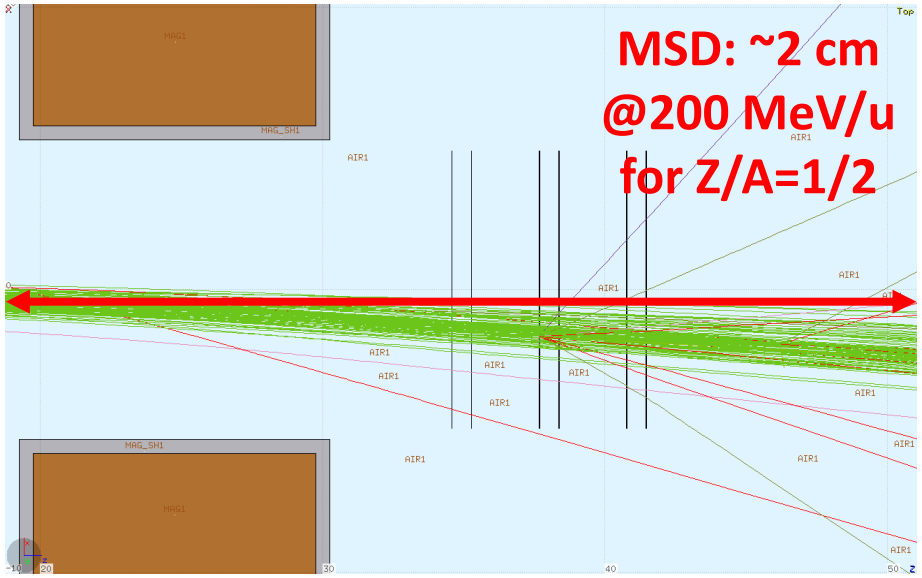
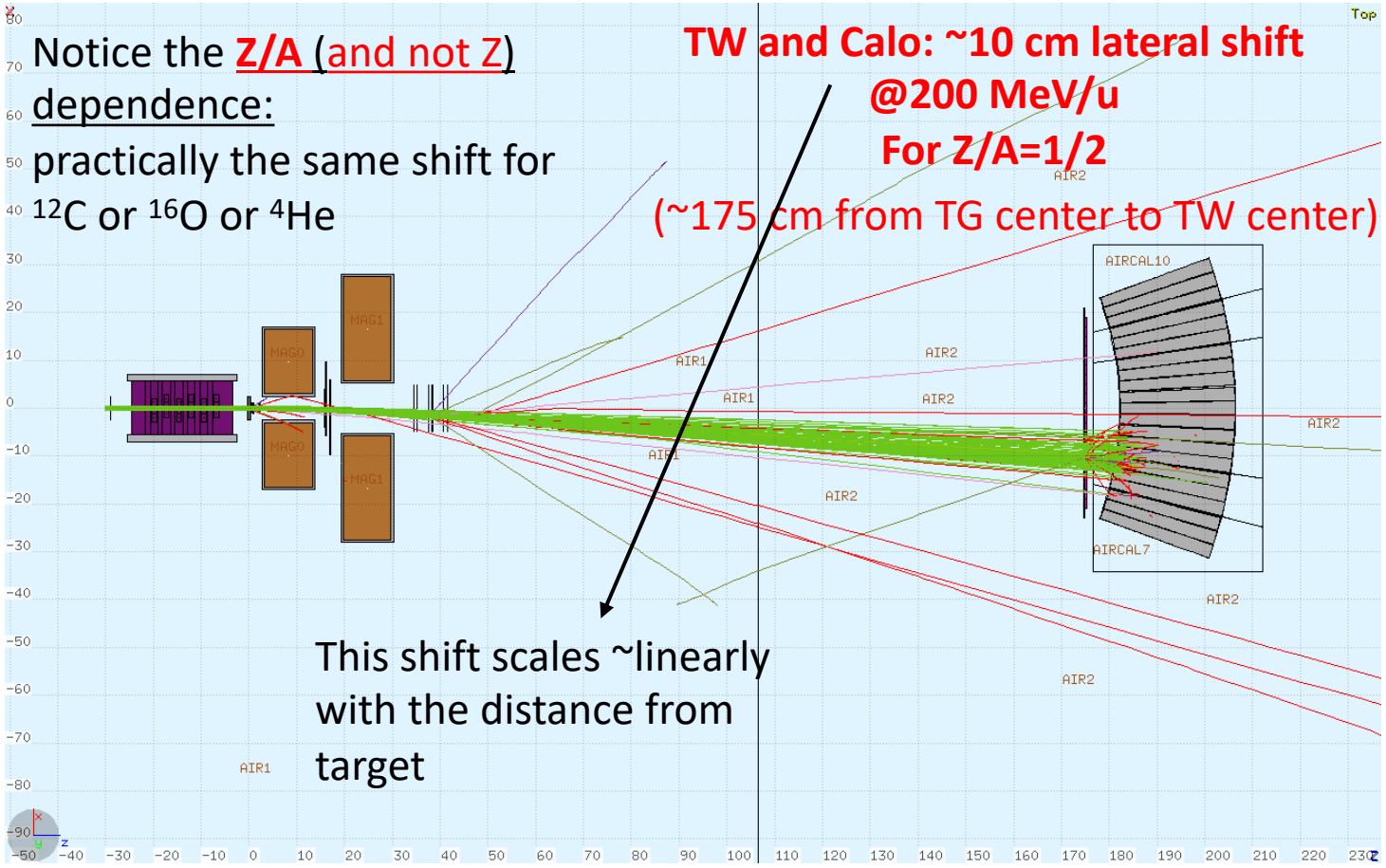
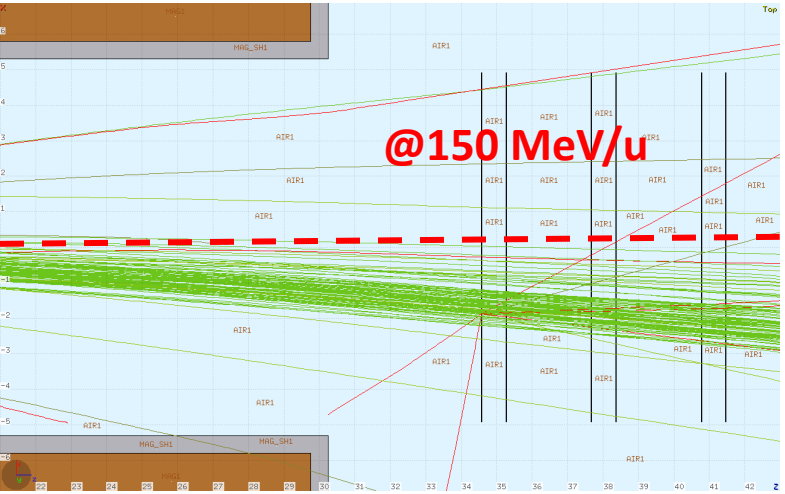
Introduction

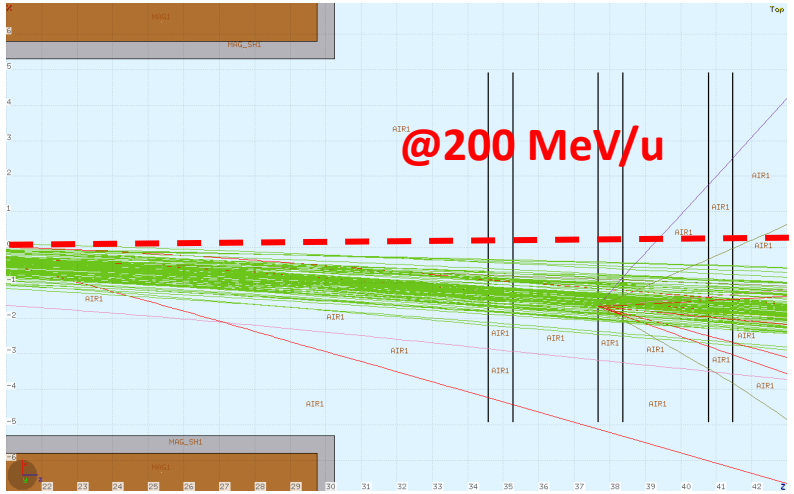
During the last physics meeting we introduced the issue of the average lateral shift of beam direction in the full FOOT setup, giving a number for the 200 MeV/u case

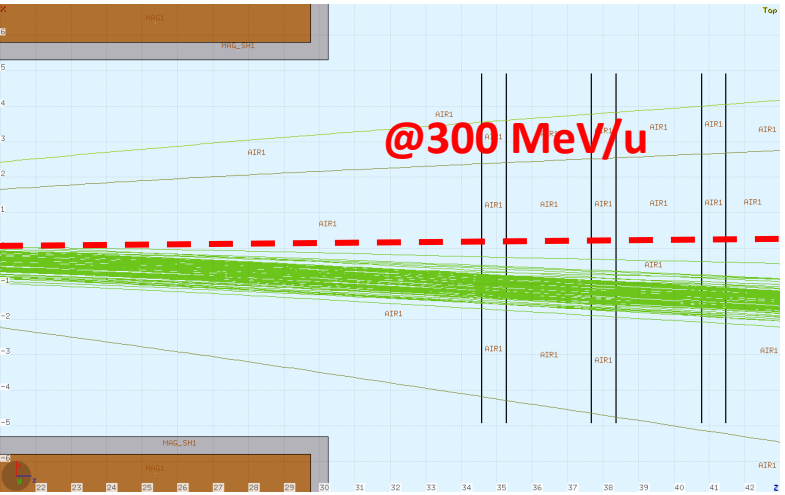


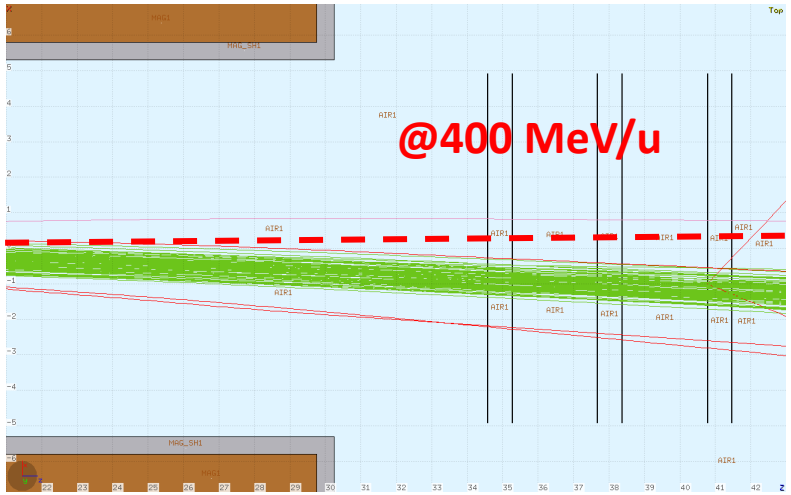
Let's investigate the energy dependence





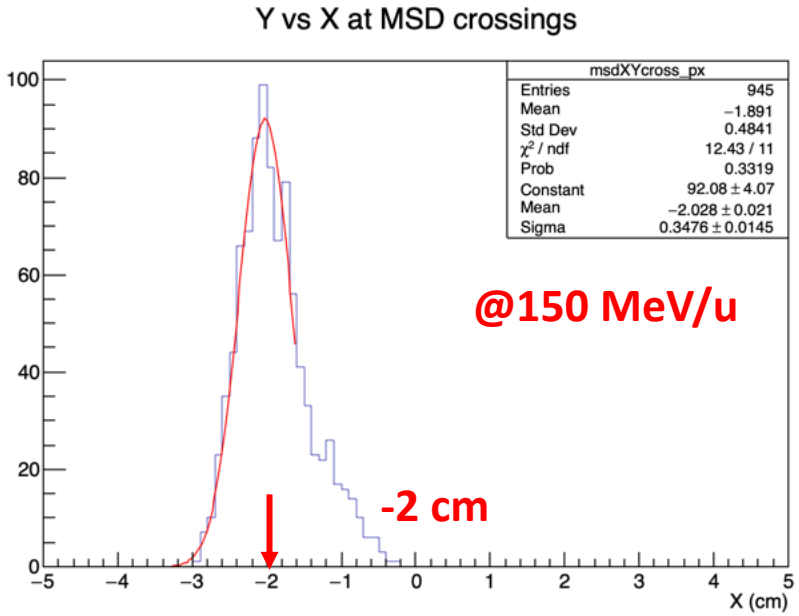


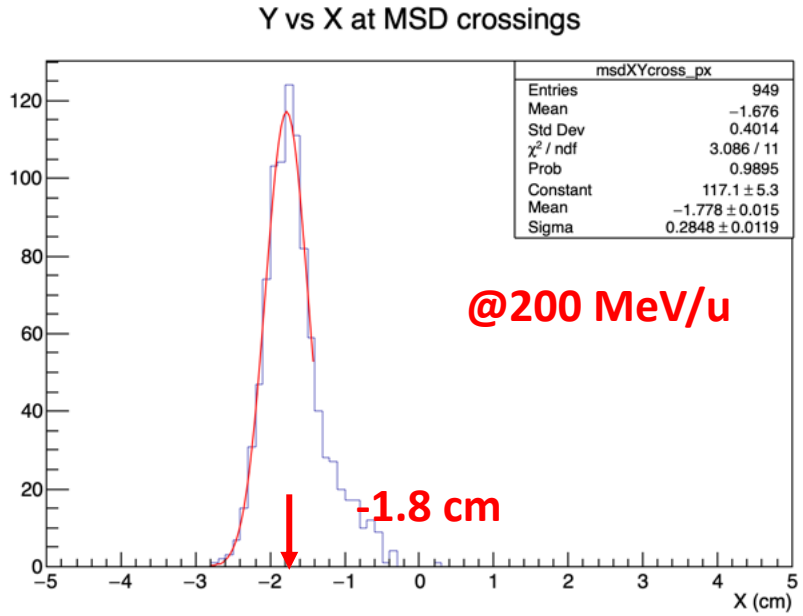


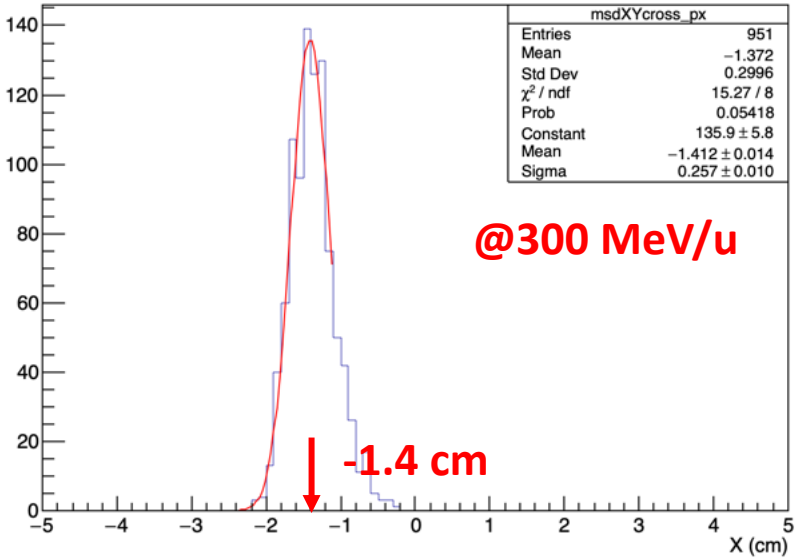


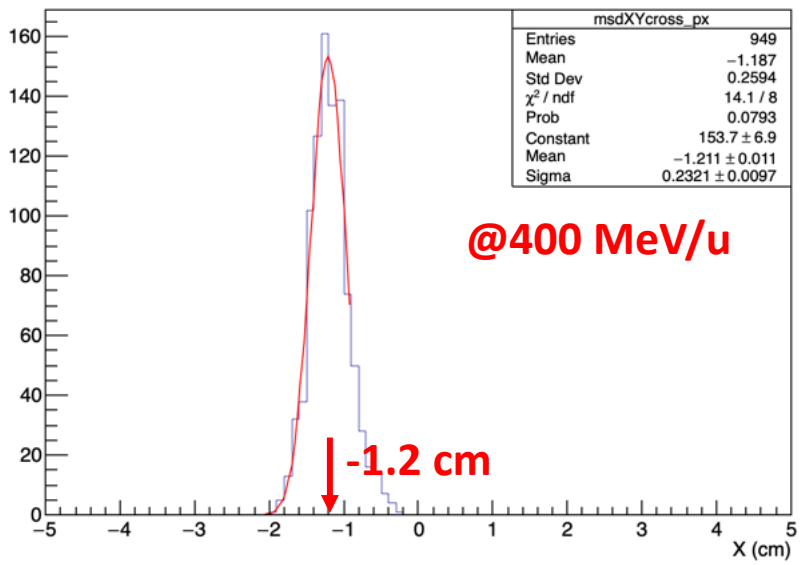
Difference < 1 cm when changing energy from 150 to 400 MeV/u

X coordinate @MSD center location

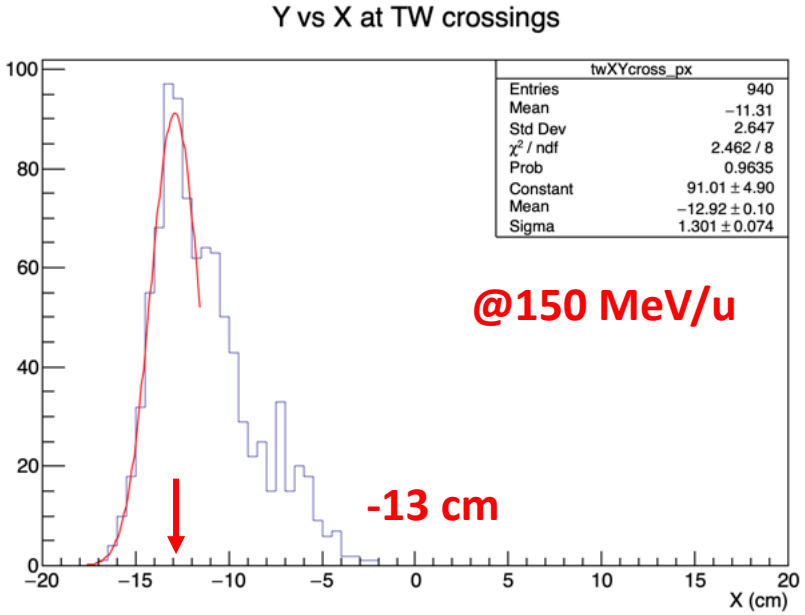


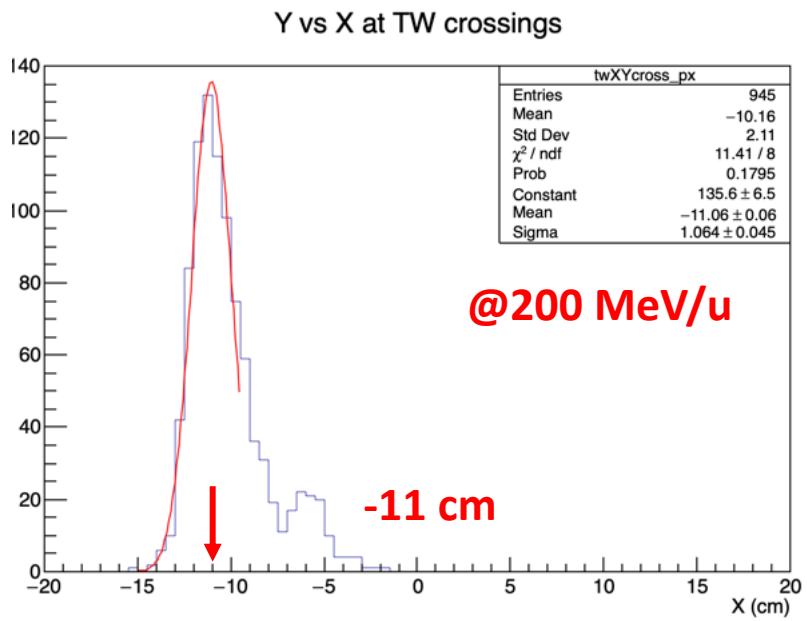


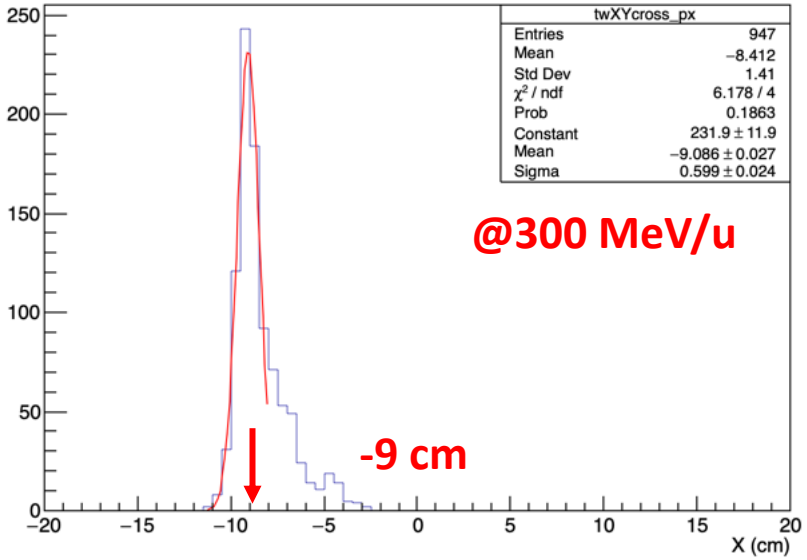


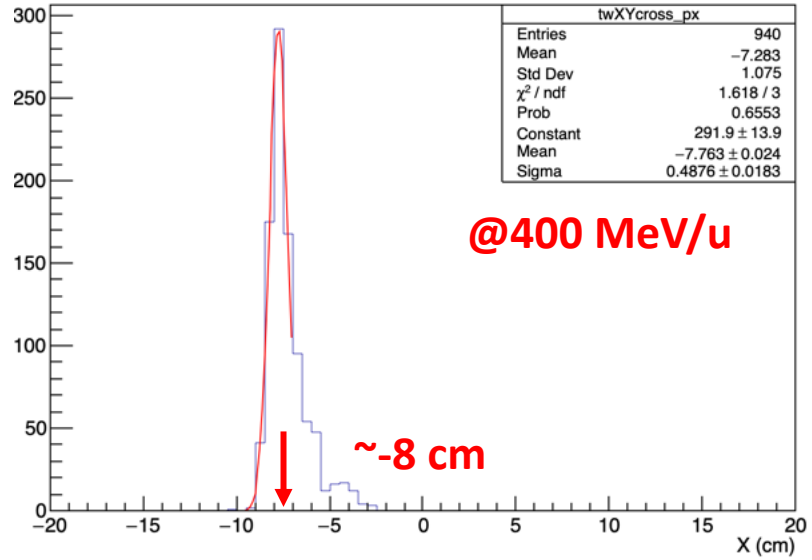


X coordinate @TW center(175 cm from target)







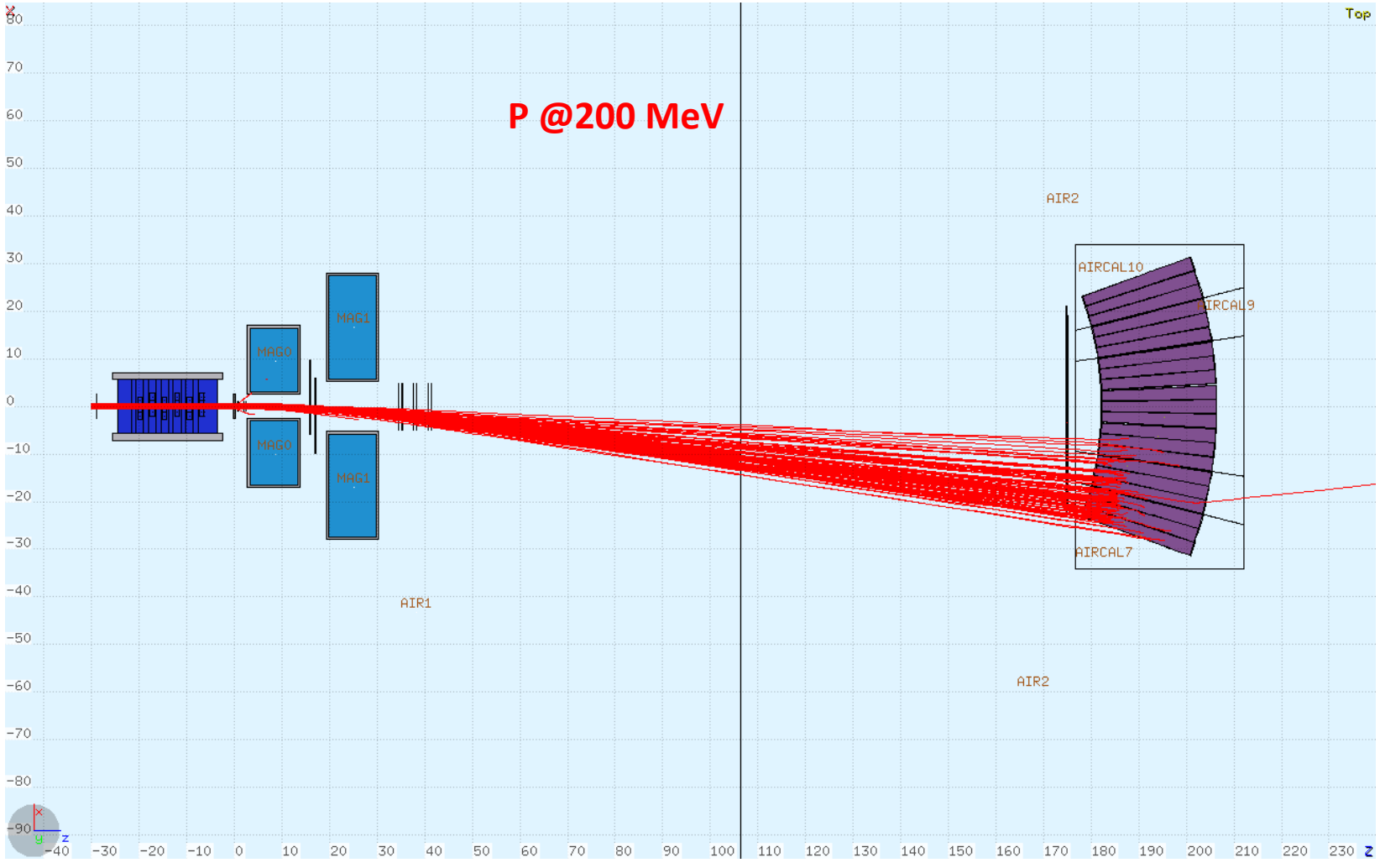


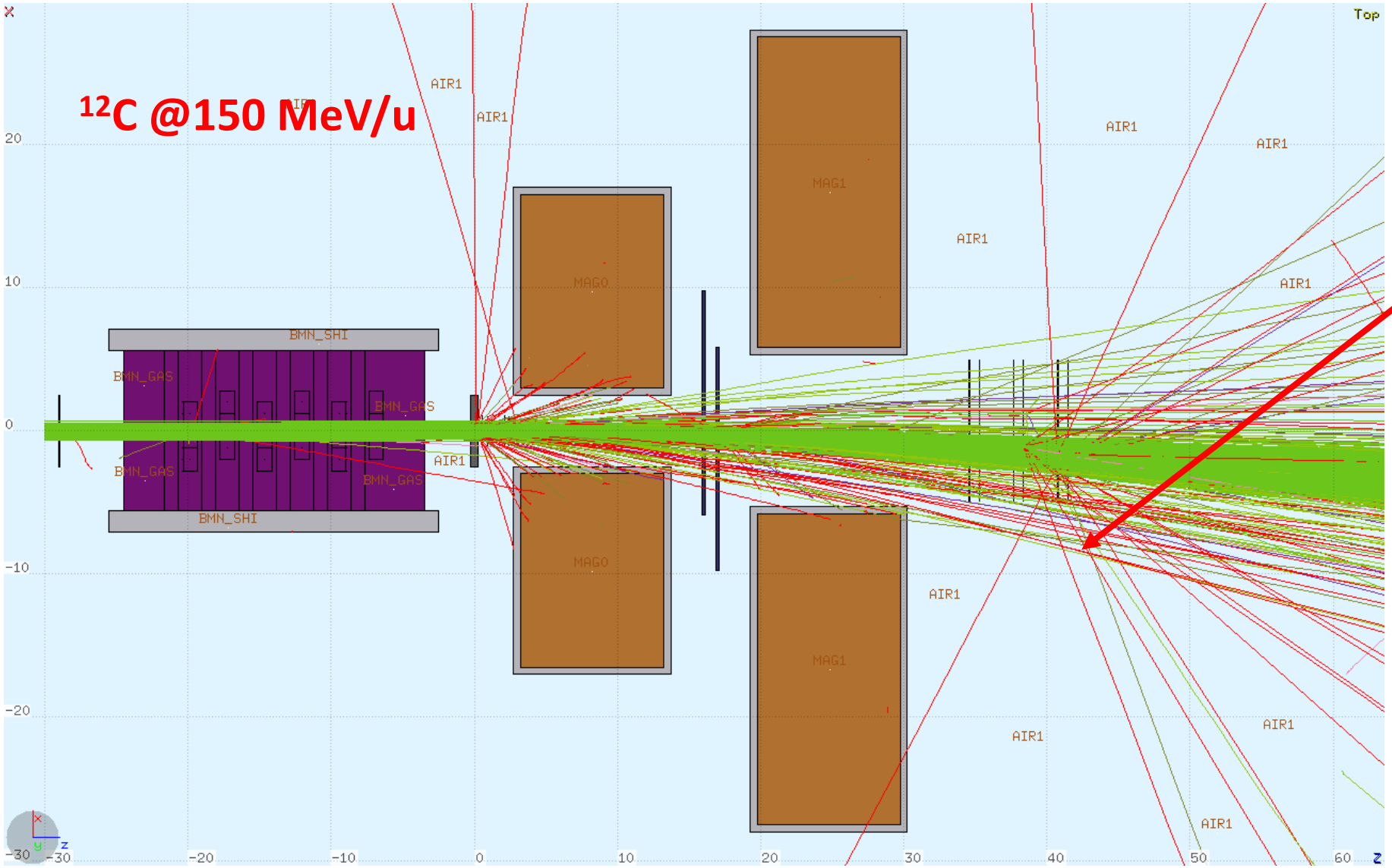
$R_{curv} \propto p/(Z\,B) \propto m\,\beta/(Z\,B) \propto A/Z\,(\beta/B)$

For the same E/A (i.e. same β): $R_{curv} \propto A/Z$

The case of protons

➔for the same E/A, protons (A/Z=1) are deflected more than ^{12}C (A/Z=2)

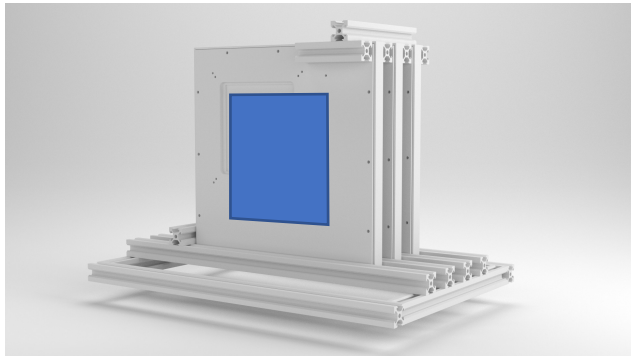




Notice the asymmetric distribution:

lower energy secondaries and protons have a larger angle deflection with respect to primaries:
<u>even if withjn the 10^{o} limit, in some conditions there is some risk to collide with the MSD boxes</u>

(here protons are the red tracks)



Neutron of course will go straight. Some of them will interact in any case in the external boxes

Comments and conclusions

In case of a multi-energy data taking campaign, a single average displacement of detectors can be envisaged for MSD, TW and CALO

However some attention has to paid to the issue of secondaries possibly impinging on the MSD box (mainly for lower energy primaries)

Everything should be checked in preliminary alignment runs