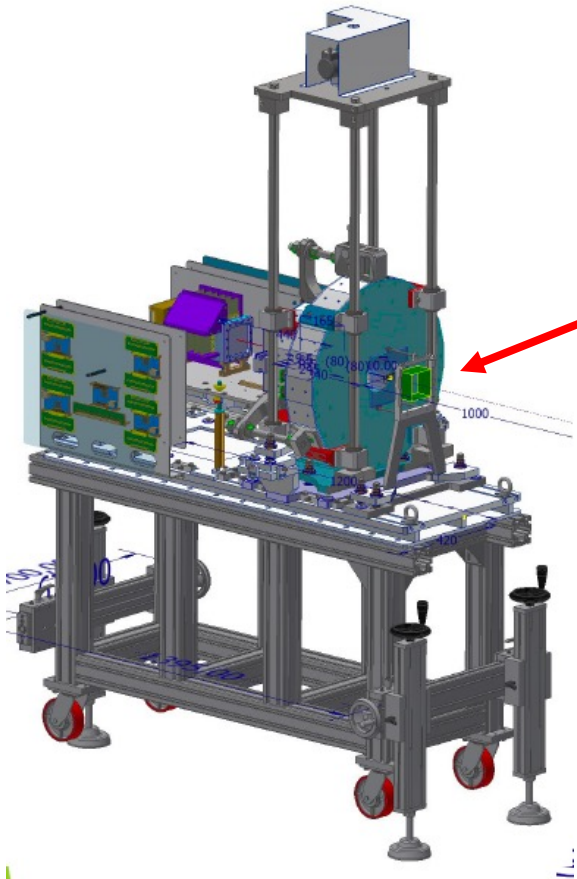


# The Full Detector Design: considerations from the last MC campaign

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# Introduction

The discussion going on at present on the final mechanical design of electronic spectrometer has triggered some considerations about the optimal detector layout



In particular the presence of magnets compels us to place the MSD at a distance from target which is larger with respect to what we were free to choose at recent data takings at HIT and CNAO



We made a preliminary investigation of these aspects using the new production with the 12C\_200\_2023 campaign

# Production

The required production for the **12C\_200\_2023** campaign has been completed.

Available in tier3 in [/gpfs\\_data/local/foot/Simulation/12C\\_200\\_2023](#)

1)  $10^7$  events “untriggered” (all events)

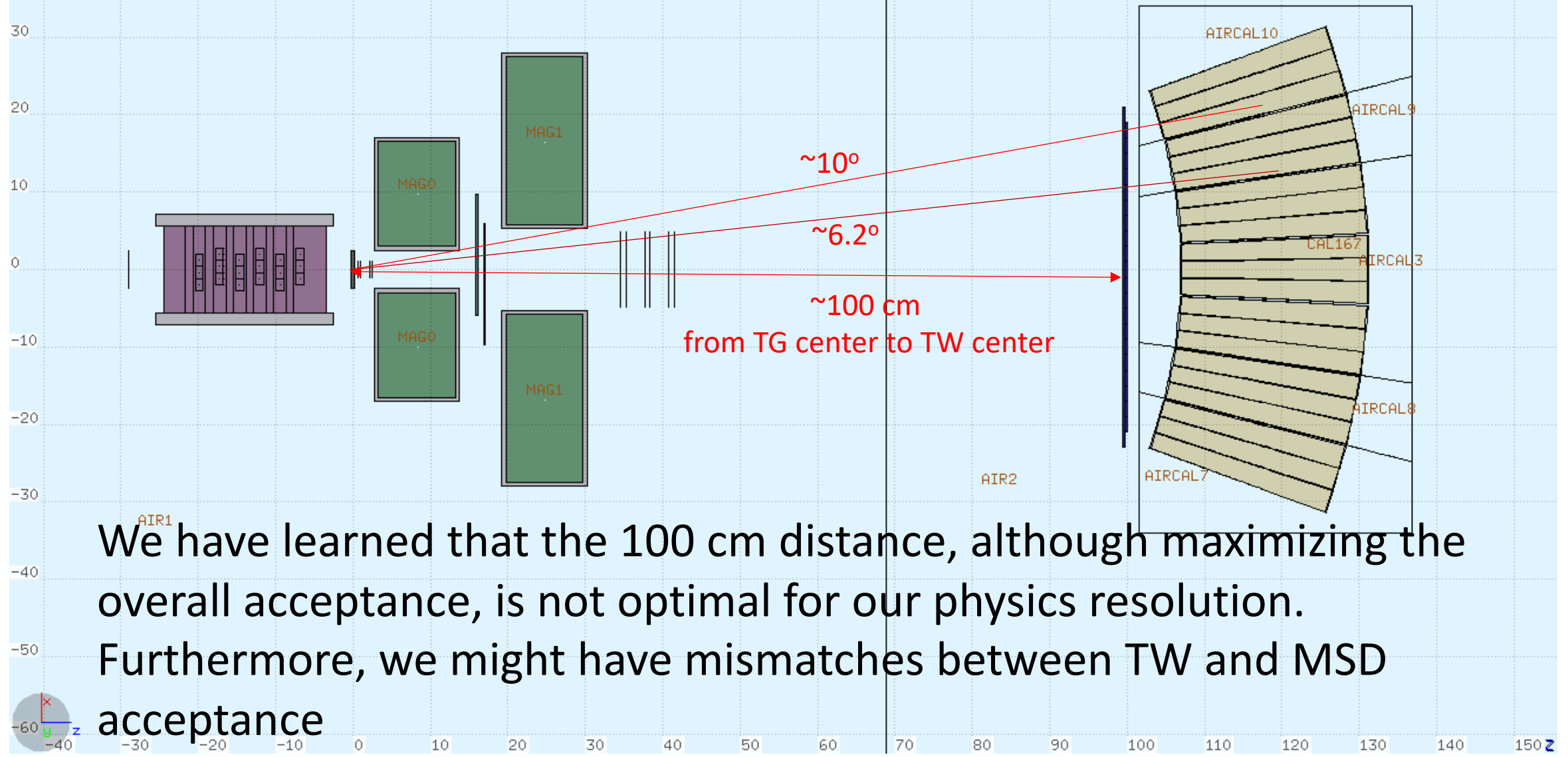
[12C\\_C\\_200\\_1\\_shoereg.root](#) ( $50 \cdot 10^6$  events)

[12C\\_C\\_200\\_2\\_shoereg.root](#) ( $50 \cdot 10^6$  events)

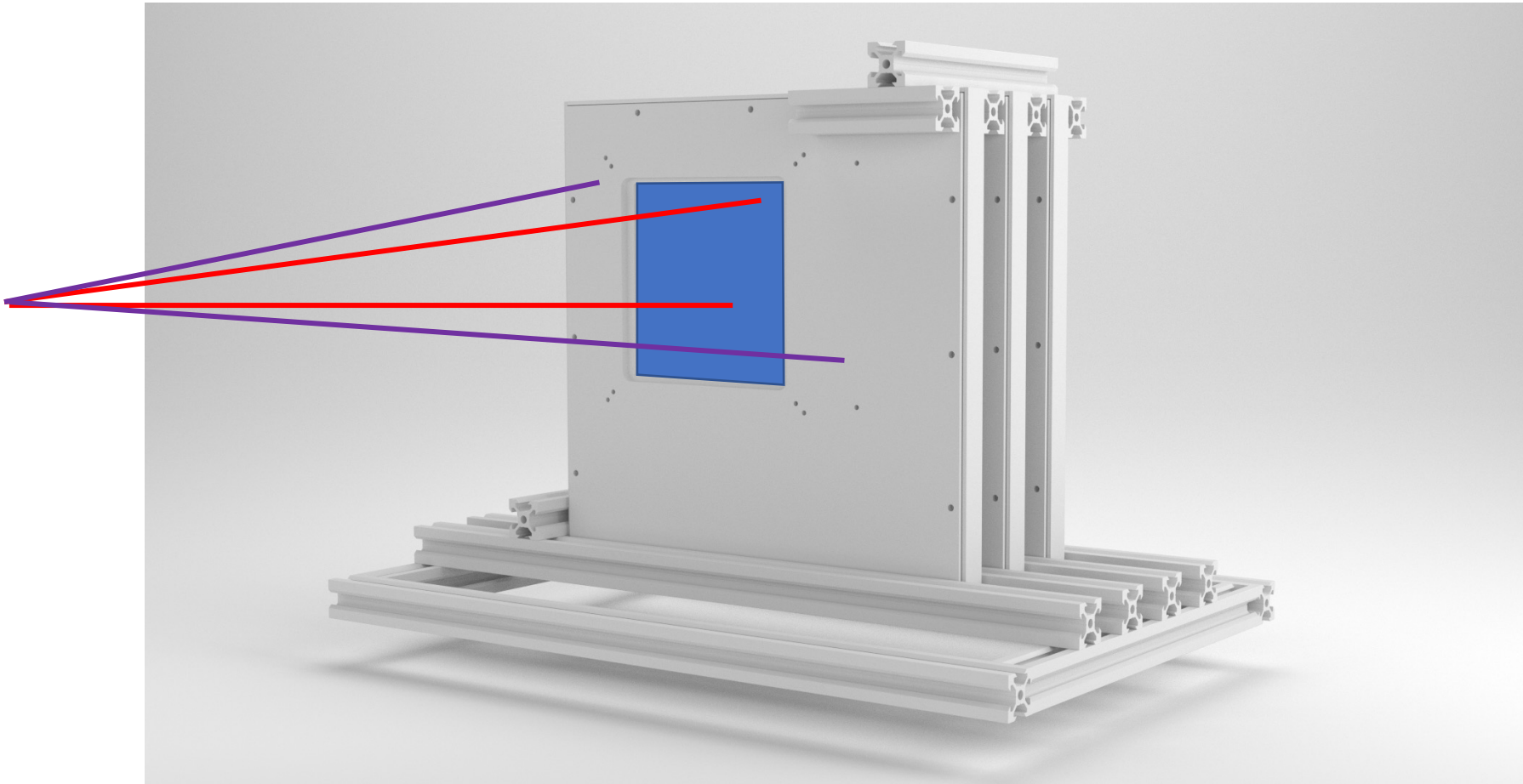
2) Additional  $10^6$  primary events in triggered mode (only fragmentation in target events)

[12C\\_C\\_200trig\\_shoereg.root](#) (it contains 33892 fragmentation events)

# Original design (motivated by historical considerations)

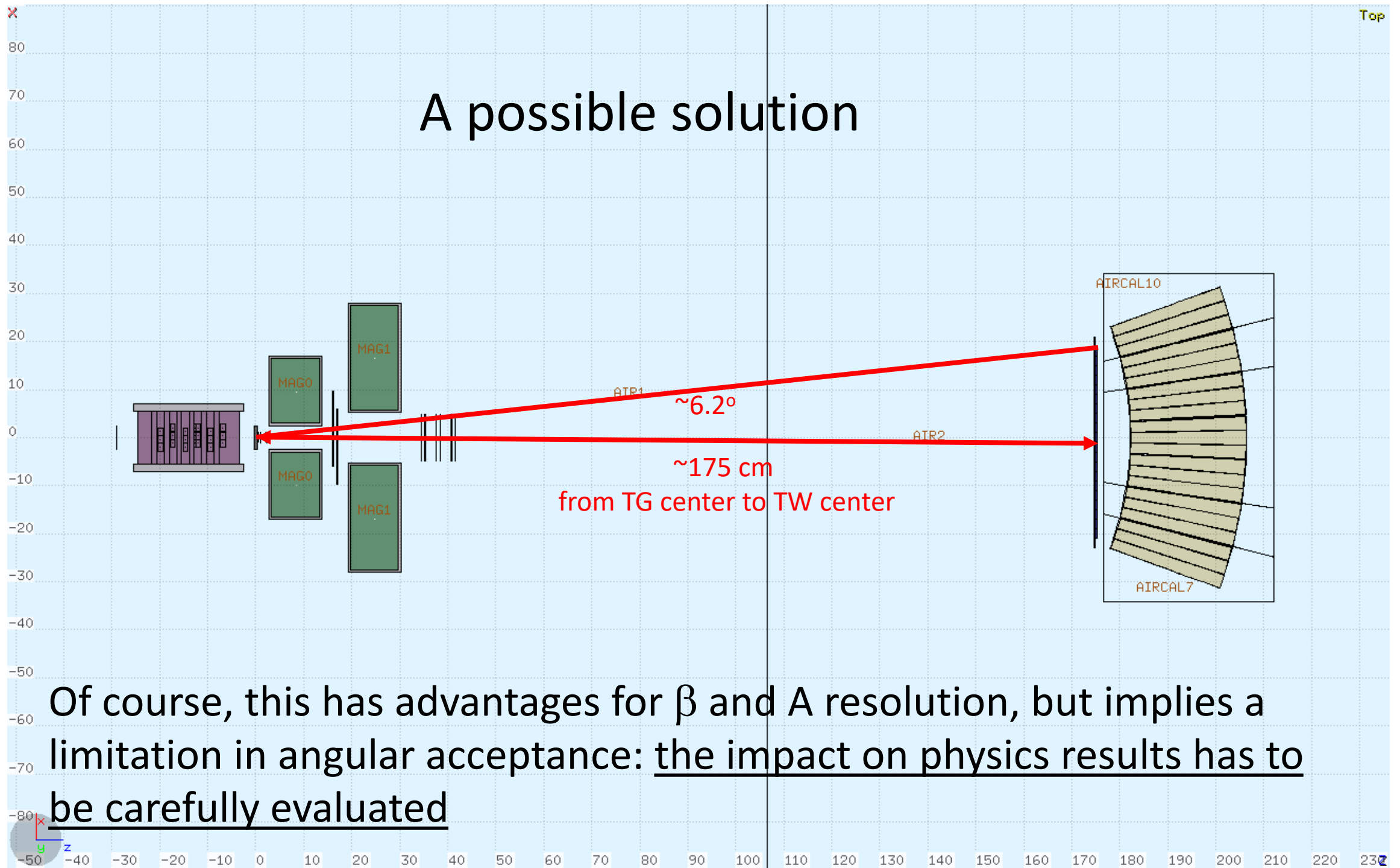


We have learned that the 100 cm distance, although maximizing the overall acceptance, is not optimal for our physics resolution. Furthermore, we might have mismatches between TW and MSD acceptance



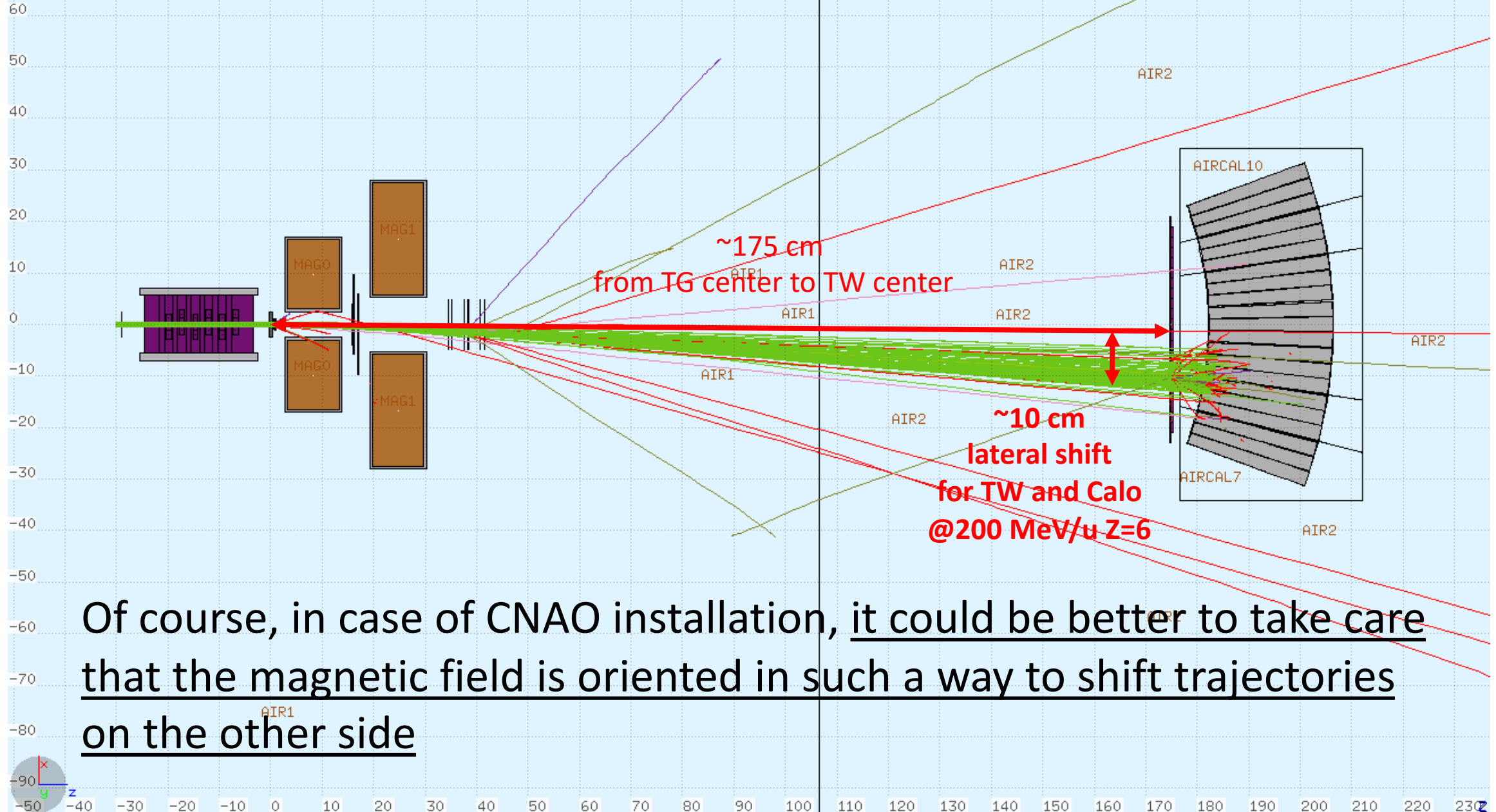
It can be very important that all the tracks pointing to TW are those which cross the active area of MSD, to minimize problems of interactions in passive materials

# A possible solution



Of course, this has advantages for  $\beta$  and A resolution, but implies a limitation in angular acceptance: the impact on physics results has to be carefully evaluated

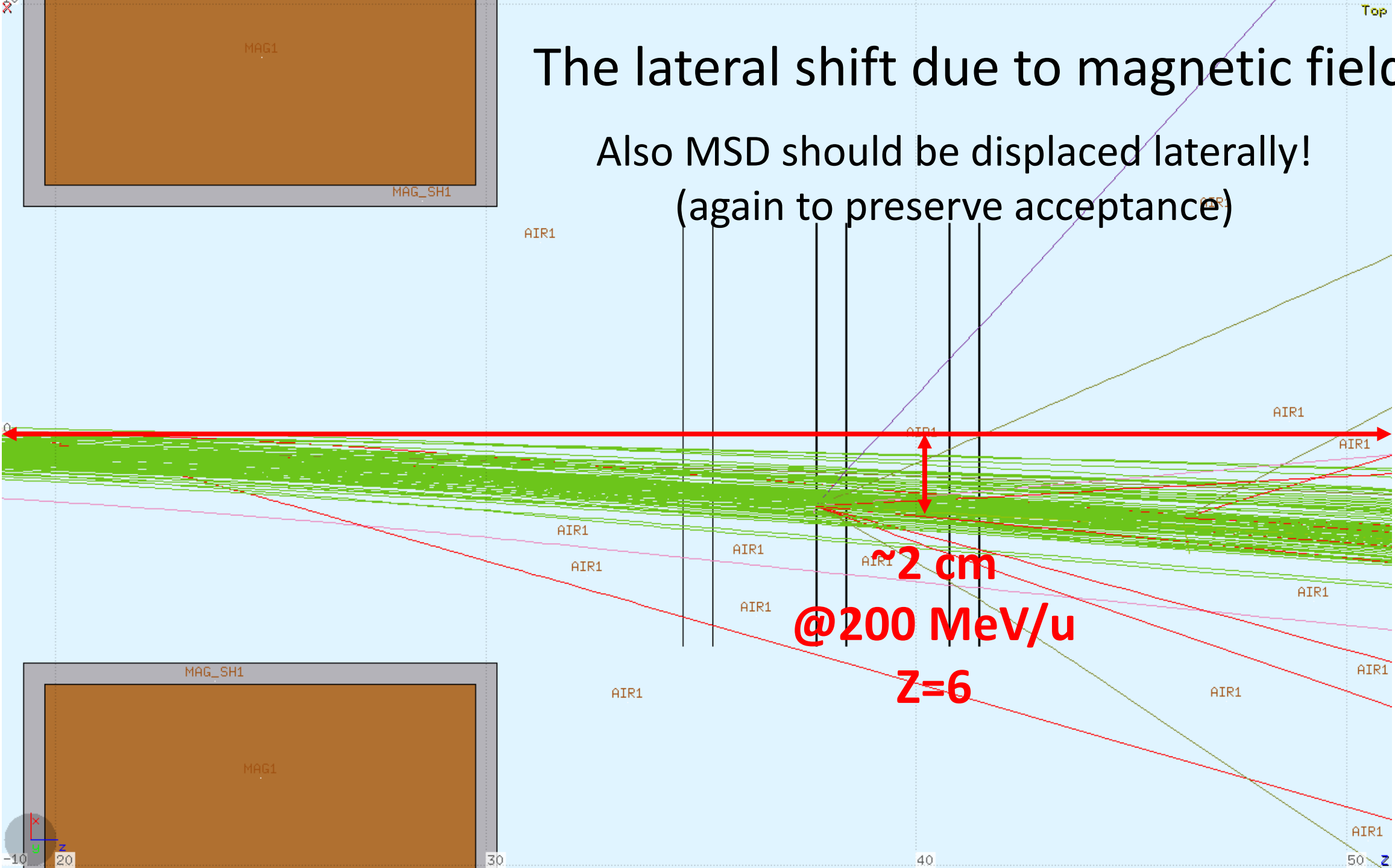
# The lateral shift due to magnetic field - 1





# The lateral shift due to magnetic field - 2

Also MSD should be displaced laterally!  
(again to preserve acceptance)

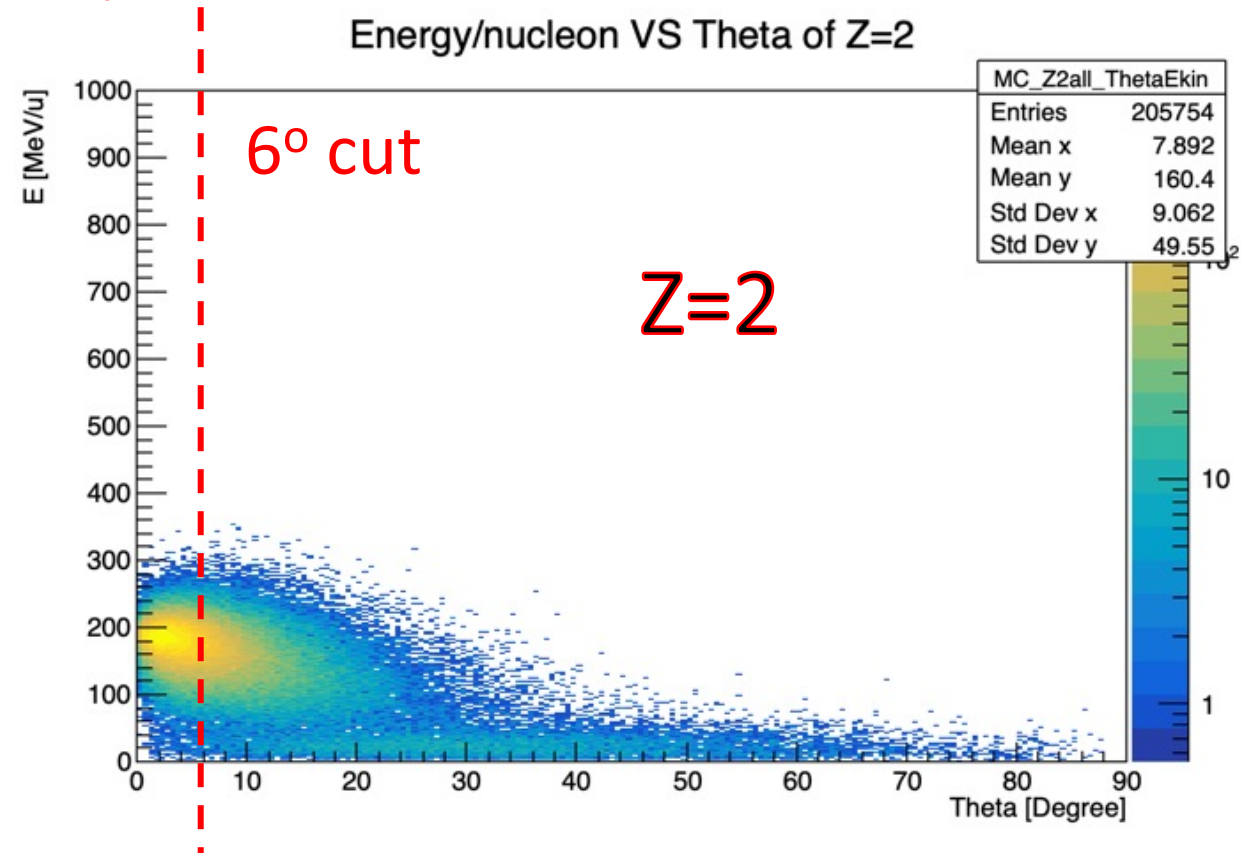
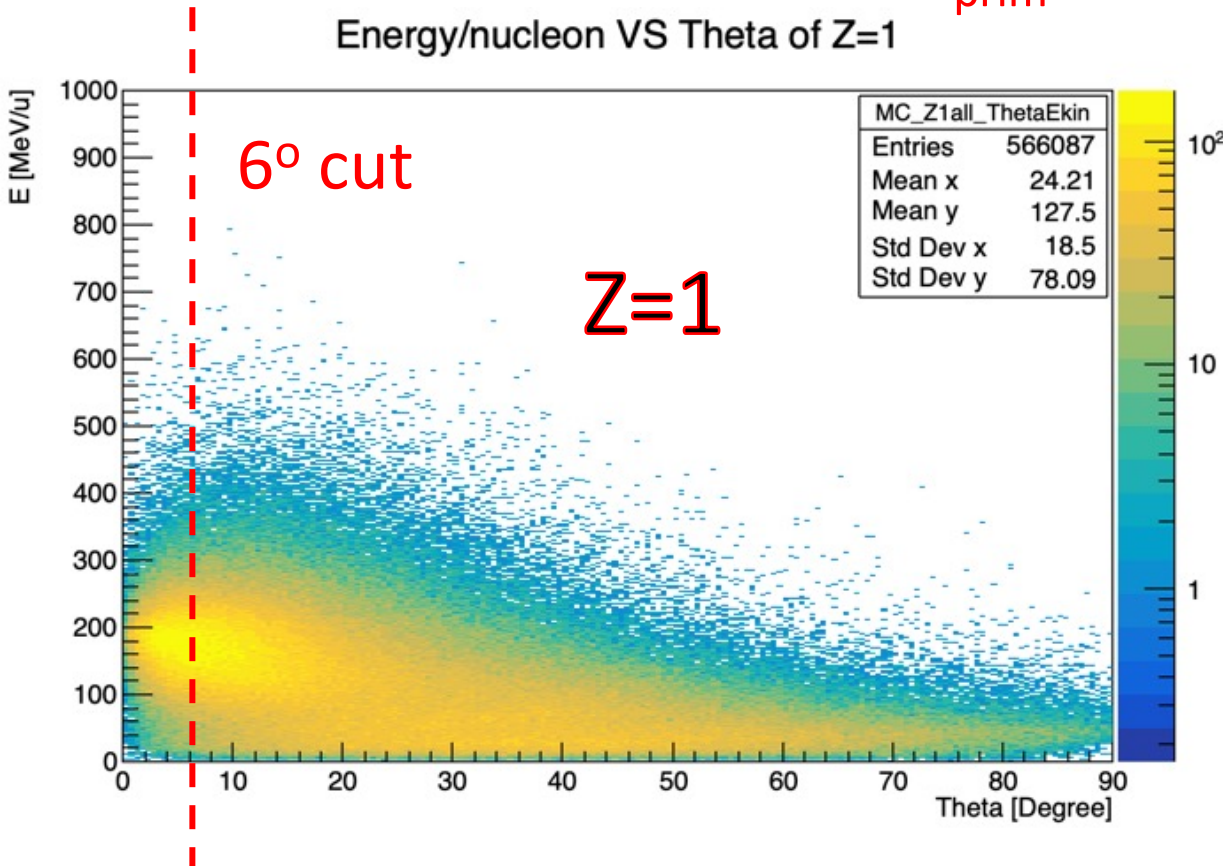


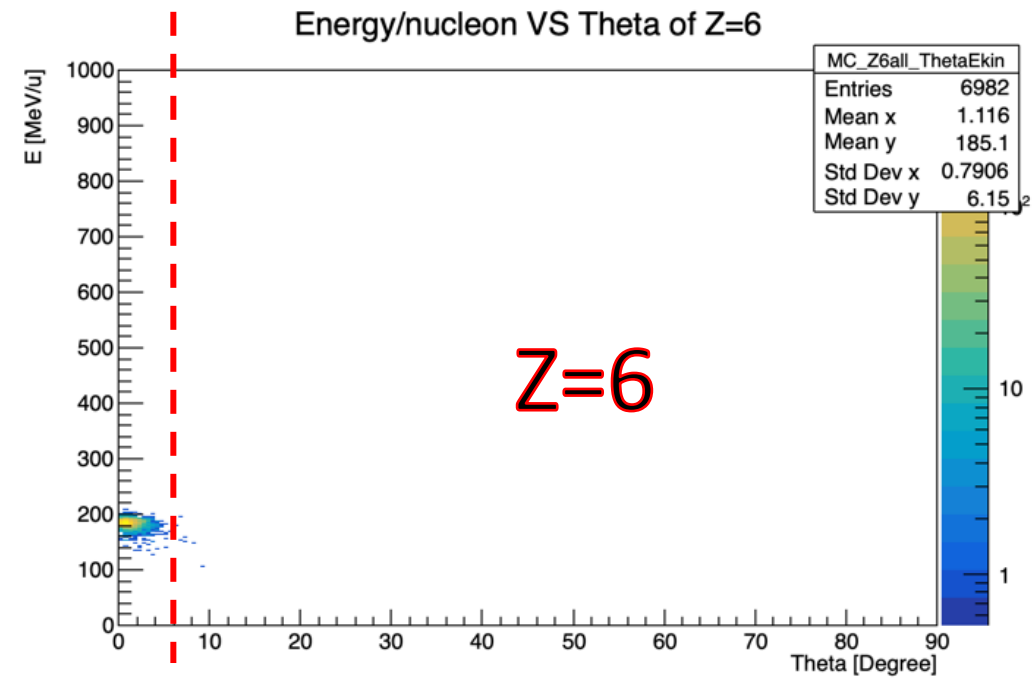
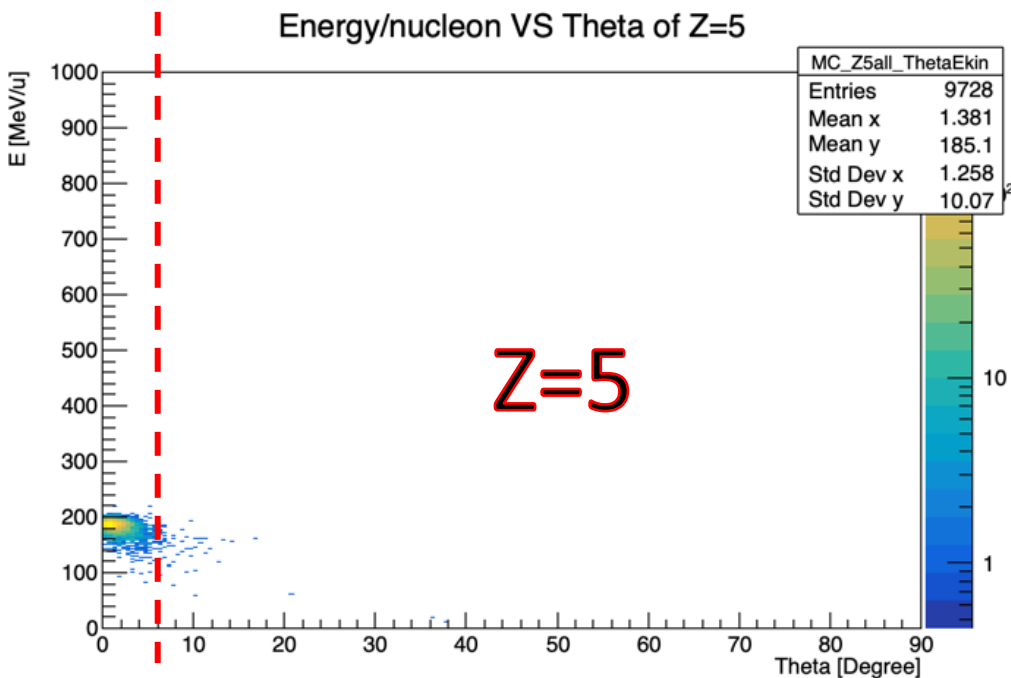
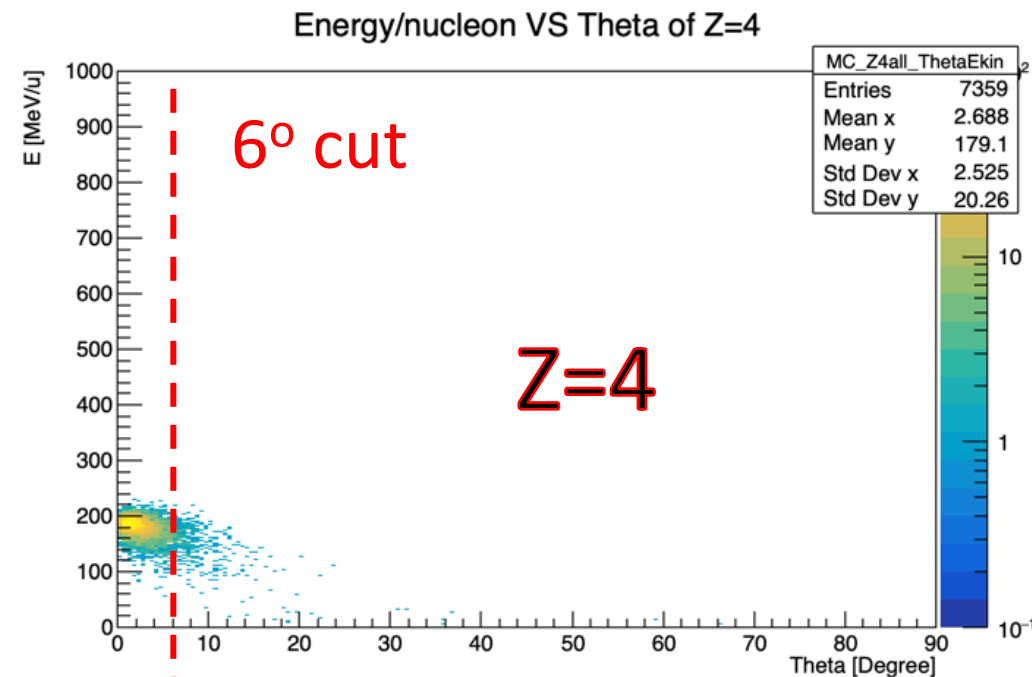
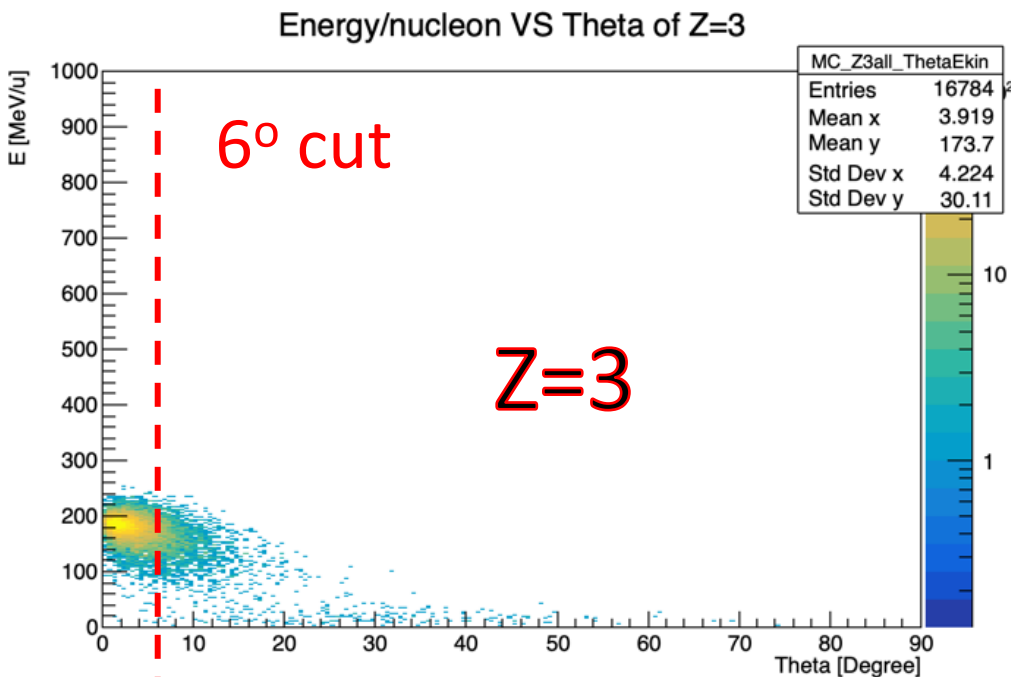


# What are we loosing with the angular cut in the acceptance?

E vs  $\theta$  of fragments exiting from target

$E_{\text{prim}} = 200 \text{ MeV/u}$





E vs  $\theta$  of  
fragments  
exiting from  
target

$E_{\text{prim}} = 200 \text{ MeV/u}$

# Comments and conclusions

In view of the final executive design of the mechanics for the full electronic setup the collaboration should:

- evaluate the general layout so to optimize and match the acceptances of TW and tracking system
- consider the proper shift for MSD support (it should be adjustable)
- evaluate the lateral shift for TW and Calo systems Also this shift should be made by means of an adjustable system
- decide if we need to include also a rotation: probably not necessary and risky
- be careful that the magnetic orientation is the proper one for the exp. room in which the apparatus will be installed.
- evaluate the impact on physics results due to the limited angular acceptance (actually energy-angle cuts). Apparently this affects almost only  $Z=1$  and  $Z=2$  (sigh...)

The final evaluation of lateral shift should be performed after the mapping of real magnets and after an alignment run

**Question:** should we modify the 12C\_200\_2023 campaign and repeat the simulation with a new geometry?