KURRI scaling FFAG studies:

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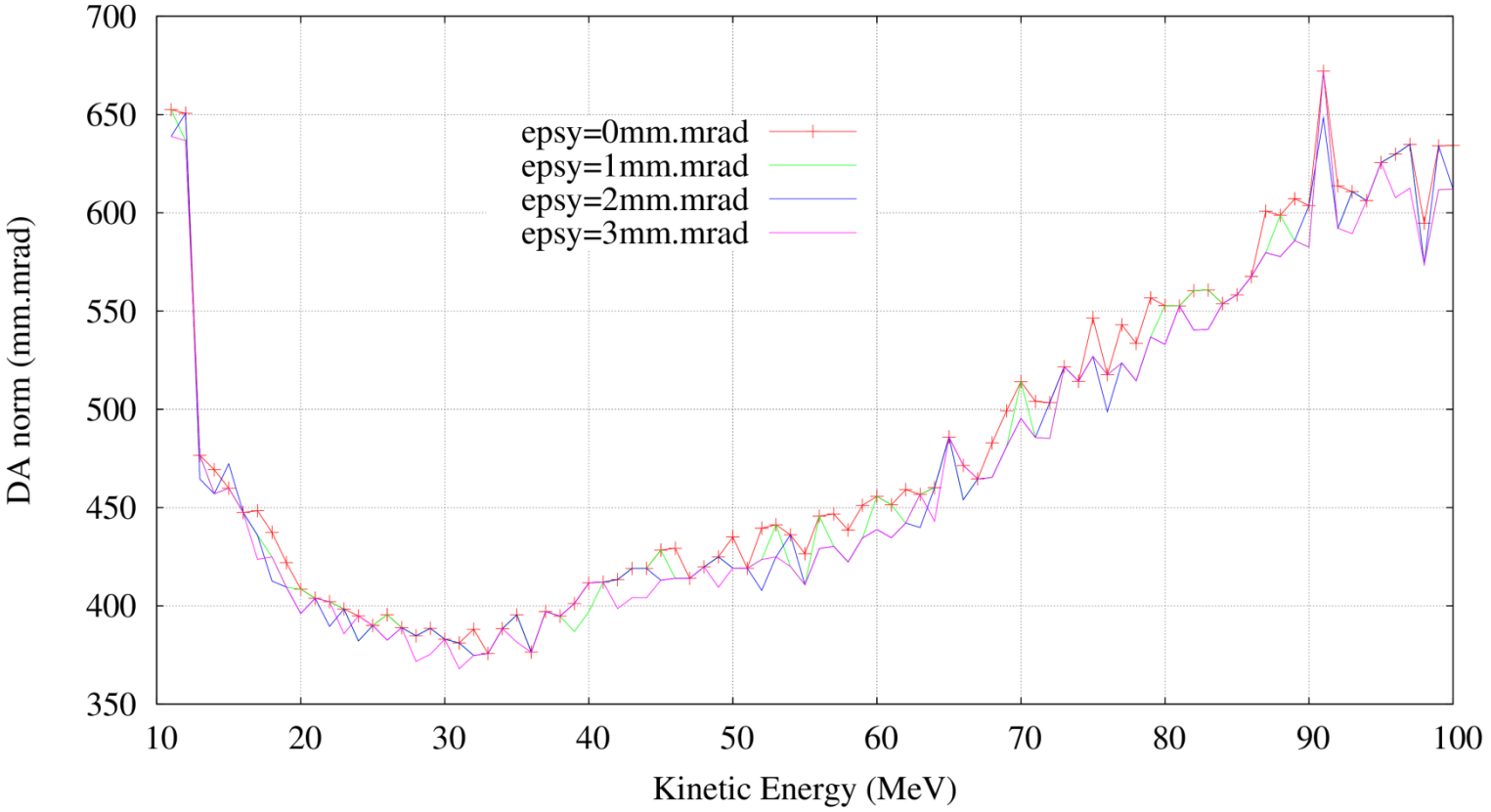
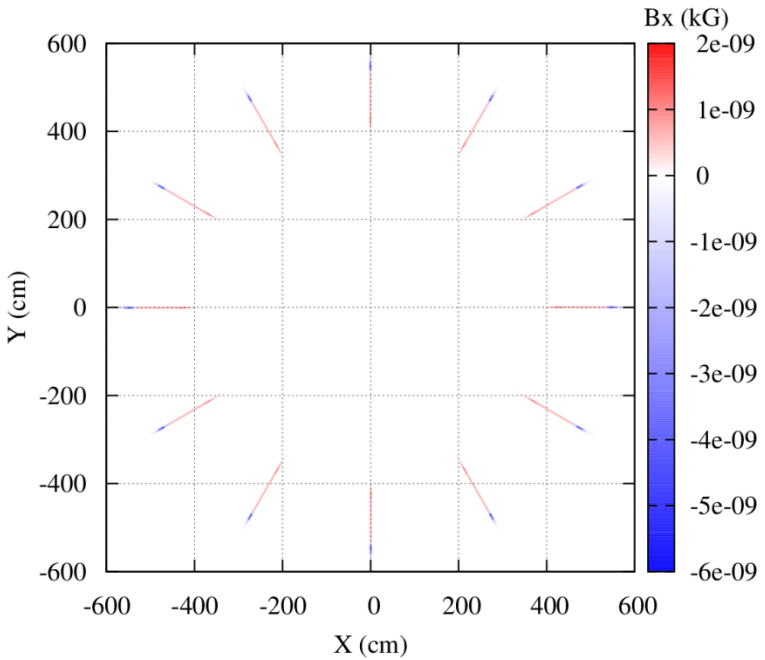
DA of the KURRI FFAG with 3D tosca map

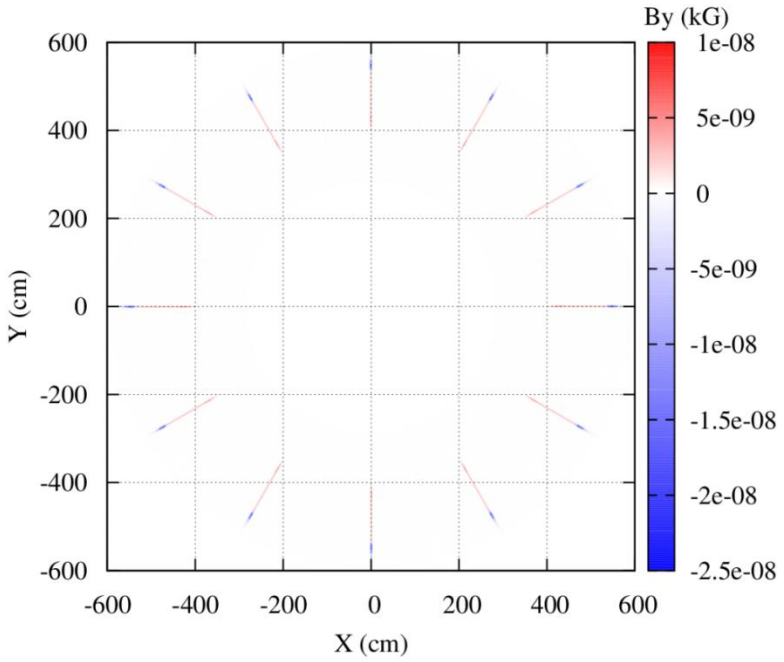


The Dynamic Acceptance is around 375 mm.mrad and seems insensitive to the vertical amplitude
Vertical amplitude limited to +-1cm, i.e. 3 mm.mrad

Median plane antisymmetry not ensured

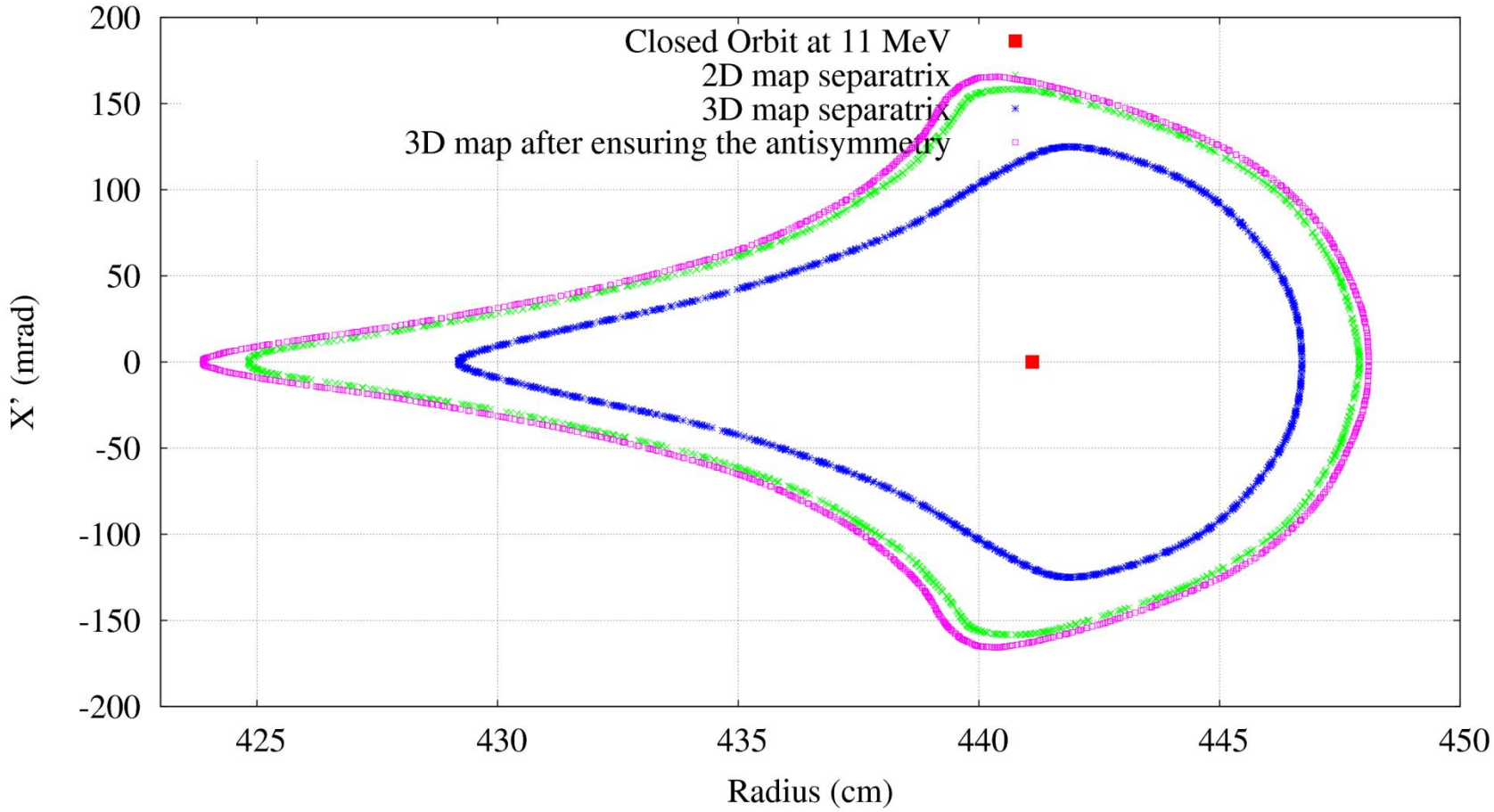
When calculating the DA in the mid-plane, important differences were observed when using 2D or 3D fieldmaps. Only possible explanation: antisymmetry not ensured with 3D fieldmap.





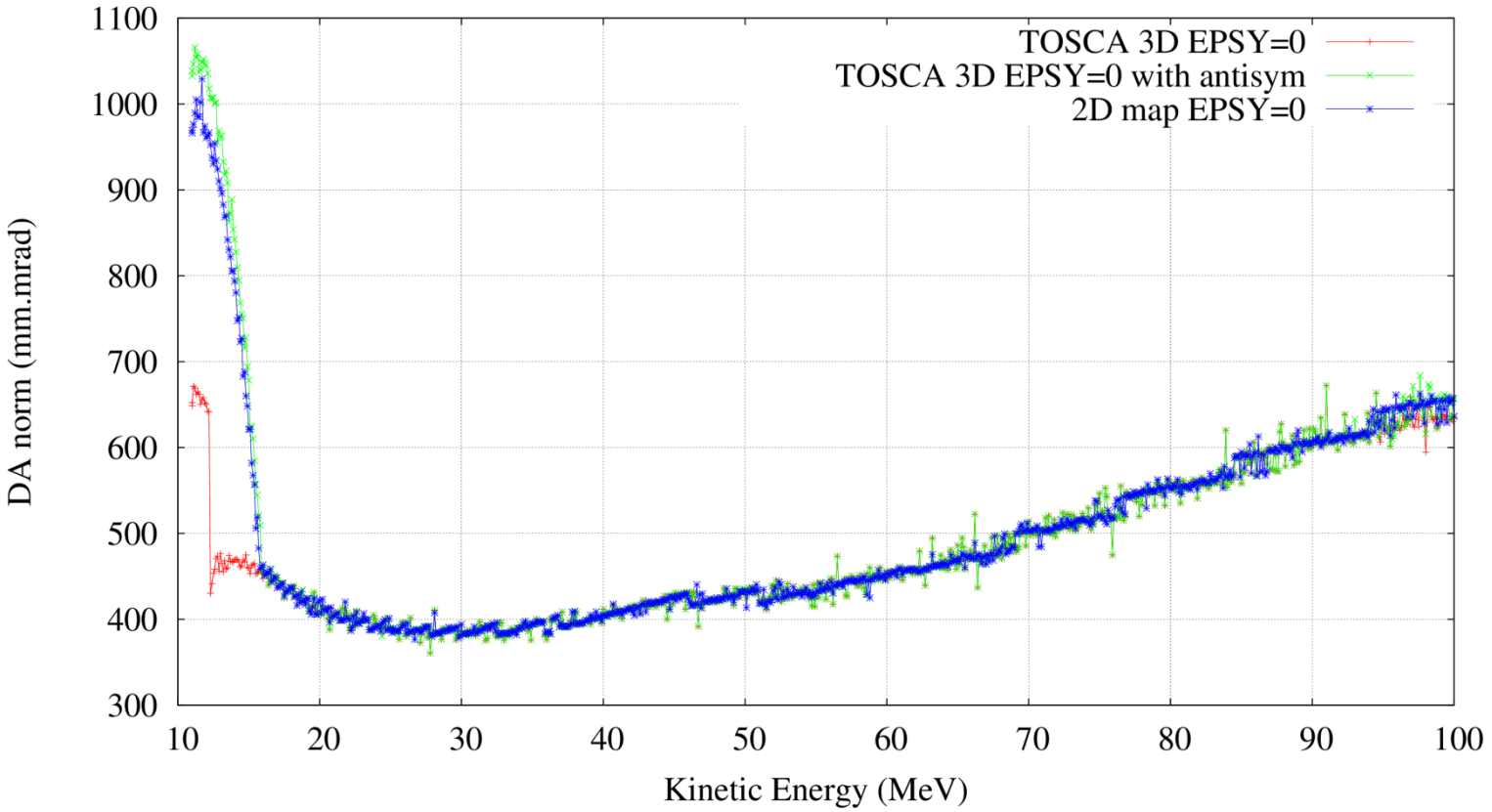
Field map plot of the Bx and By component in the median plane of the 150 MeV KURRI FFAG. If the median plane antisymmetry were ensured, one would ontain a blank map (zero everywhere). **Antisymmetry not ensured.**

3D map after ensuring the antisymmetry



The previous problem seem to arise from the Bx, By components that introduce some discontinuities in the calculation of the field and its derivatives in the median plane of the FFAG. Is the median plane antisymmetry guaranteed in real life?

Comparison of the different models



Mid-plane tracking with the 2D fieldmap and 3D fieldmap with antisymmetry yield similar results as expected.

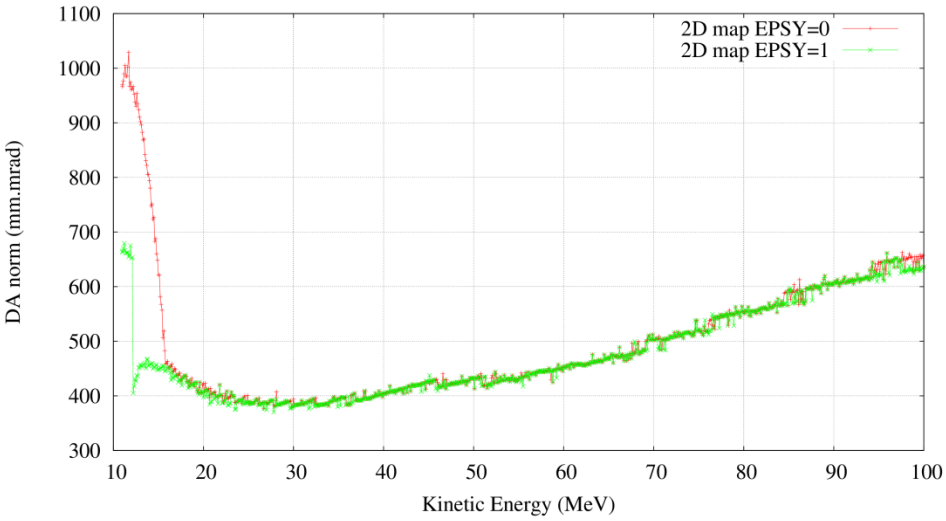
Difference with the 3D case is simply explained by the fact it is not antisymmetric.

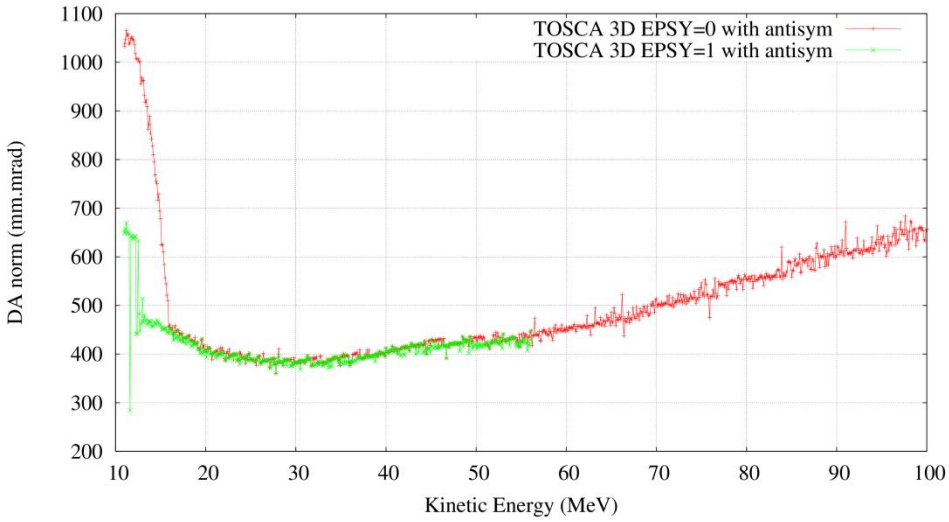
Summary

The DA calculation out of the mid-plane yield similar results between the 2D and 3D fieldmaps with and without antisymmetry.

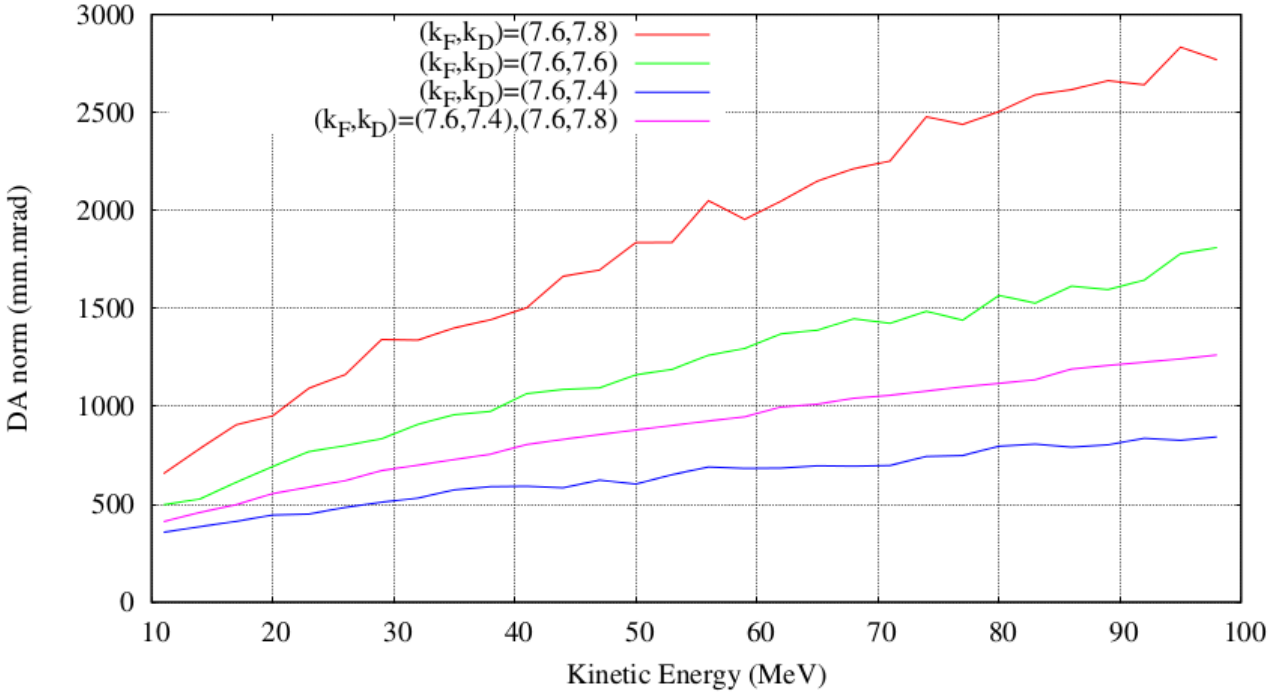
In all cases, the DA is thus 375 mm.mrad

However, the tunes may be different which explains some dips that can be observed in one case or the other.





DA vs kF kD

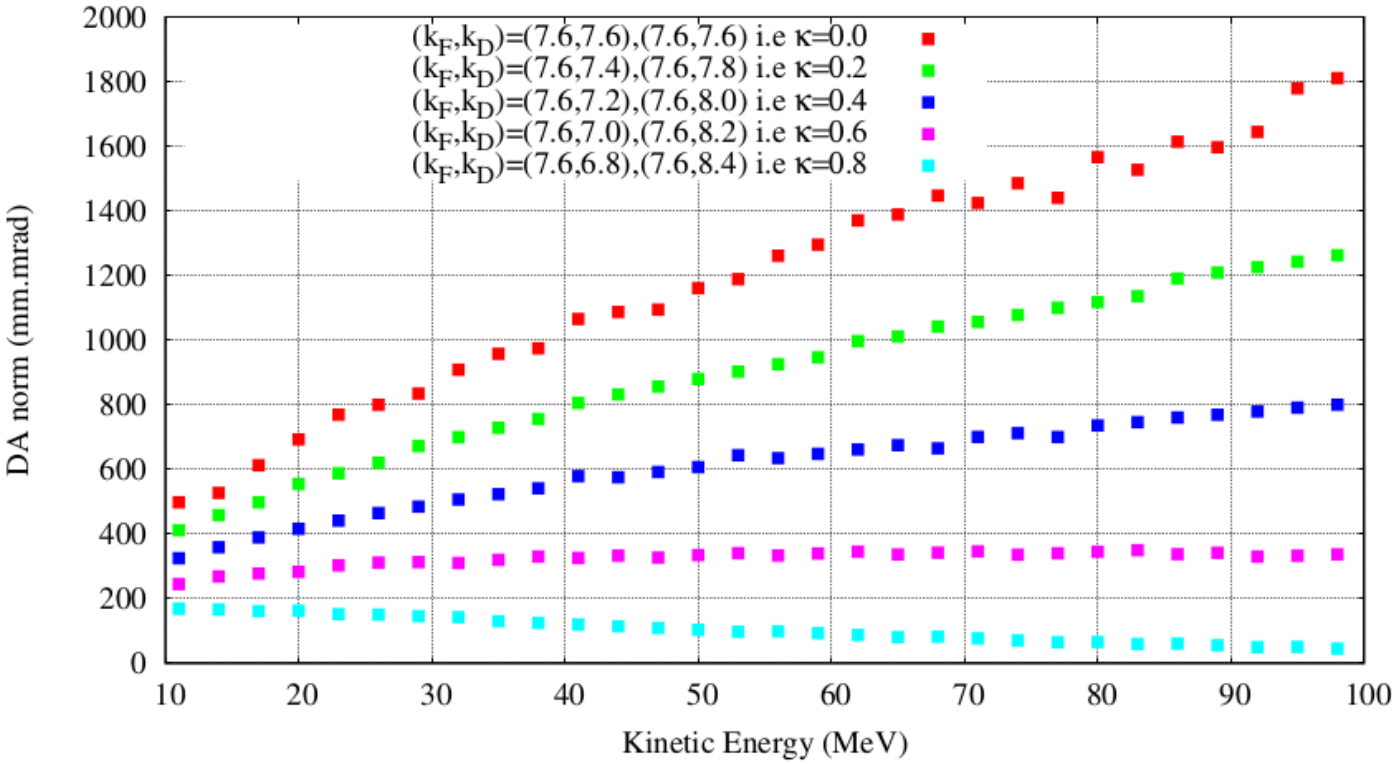


Increasing kD generally increeases the Dynamic Acceptance.
Therefore alternating the differences of kF,kD in order to fix the tune has a smaller DA than the equivalent scaling FFAG case.

This also shows that the DA is limited by any magnet which has kF>kD.

Generally speaking, kD>kF (~9>7.6) for the KURRI FFAG which explains the large DA simulated.

DA vs kF-kD



Increasing the differences of the scaling factors differences i.e. $\kappa = k_D - k_F$ decreases the DA of the machine.

As shown earlier, this is due to the magnets which have kF>kD.