

# DL Model Updates

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## DarkLight updates

Location of target chamber had to change - initial motivation:

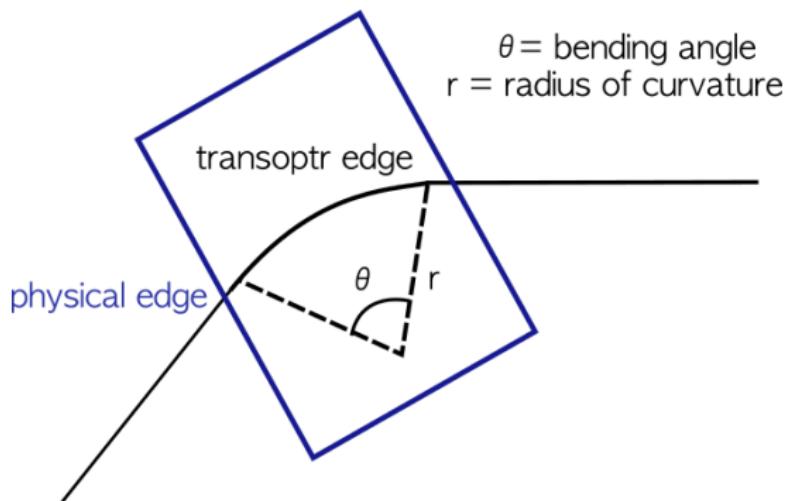
1. needed to insert bellows between last bending magnet (MB4) and scattering chamber (CAD side)
2. needed more space to integrate BPM and steerer upstream of target chamber (transoptr side)

Engineers resolved issue #1 resulting in a shift of .13in/3.302 mm towards the dump - no big deal.

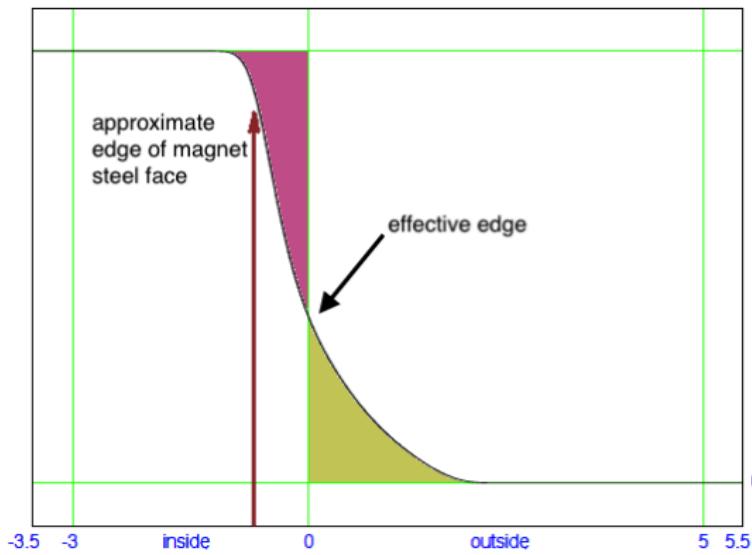
BUT deeper dive into transoptr side found discrepancy in definition of magnet "edge"...

## Transoptr magnet "edge" definition

- ▶ “Effective” edge of magnet - dependent on fringe field
- ▶ NOT same as physical magnet edge



# Transoptr magnet "edge" definition



Taken from COSY manual - default dipole with no Enge function specified

x-axis: units of magnet gap  
y-axis: units of peak field

Pink area = Green area

Idealized behaviour of ptcl in bend:

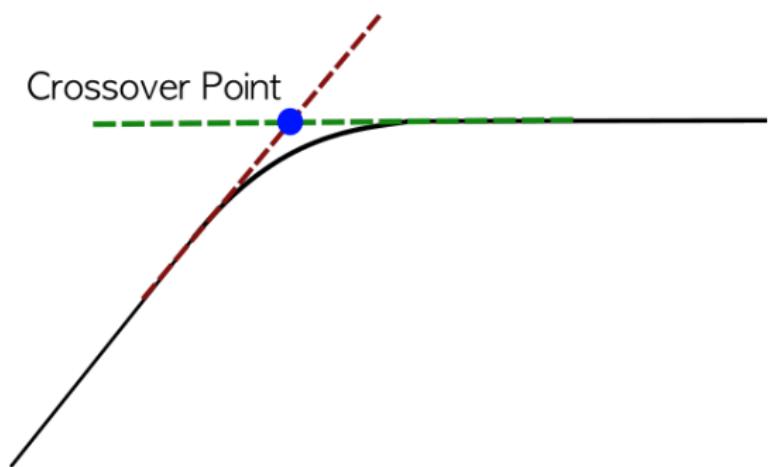
- ▶ Hard edge approximation
- ▶ ptcl starts turning suddenly at  $s=0$

BUT very good approx.

Whether inside or outside of magnet steel depends on pole shape.

## Crossover Point

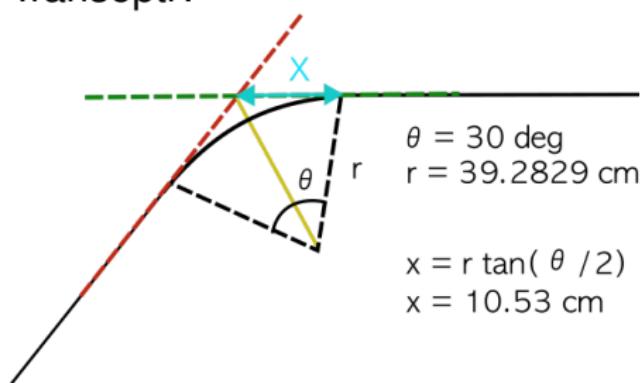
- ▶ Better to define distances wrt crossover point of magnet.
- ▶ Will be the same no matter the edge definition.



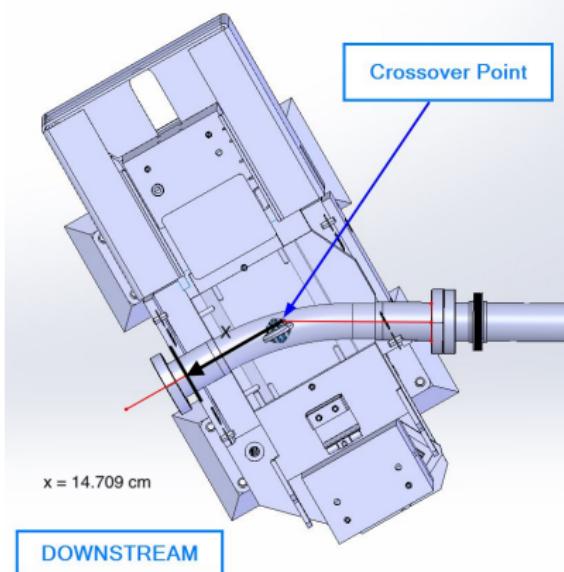
# Transoptr vs SolidWorks

Discrepancy in edges based on crossover point: **4.18 cm**

Transoptr:



SolidWorks:



When taking distances to the target, total discrepancy becomes **5.3 cm**  
( $45.053 \text{ cm} - 39.74 \text{ cm}$ )

## Dump distance discrepancy

While comparing key distances between models, noticed a discrepancy in distance between crossover point and face of dump shielding.

- ▶ Transoptr: 222.75 cm
- ▶ SolidWorks: 227.92 cm

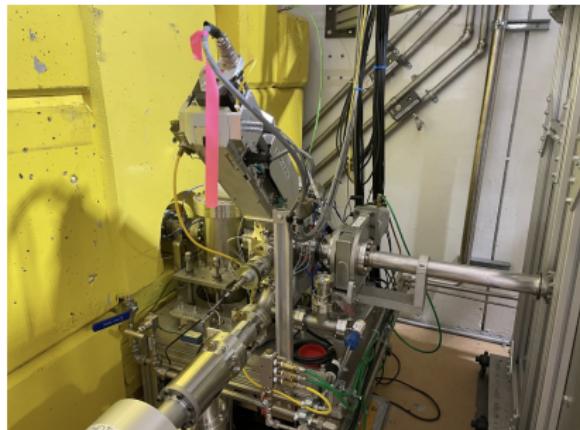
Where does this  $\approx$  5 cm come from??

Closer look  $\rightarrow$  SolidWorks number lines up with centre of dump BPM in transoptr code (227.87 cm)

# Dump distance discrepancy

Kate & co. went into e-hall to measure distances:

- ▶ Front face of shielding to flat blue surface of dipole:  
212.19 cm
- ▶ Adding SolidWorks distance to crossover point (14.709):  
 $226.9 \text{ cm} \pm \approx 1 \text{ cm}$

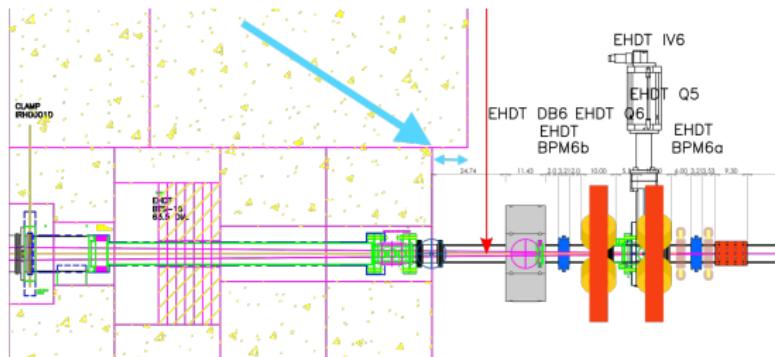


Agrees with SolidWorks, so transoptr is likely the cause of discrepancy.

# Dump distance discrepancy

Believe it comes from part of shielding that sticks out by  $\approx 5\text{ cm}$ !

Previously may have looked at side view drawing rather than top down and seen this as extending beyond the actual entrance.



## Dump distance discrepancy

From photos Kate & co took:

- ▶ Dump BPM appears flush with shielding
- ▶ NOT 5 cm embedded as transoptr code previously had



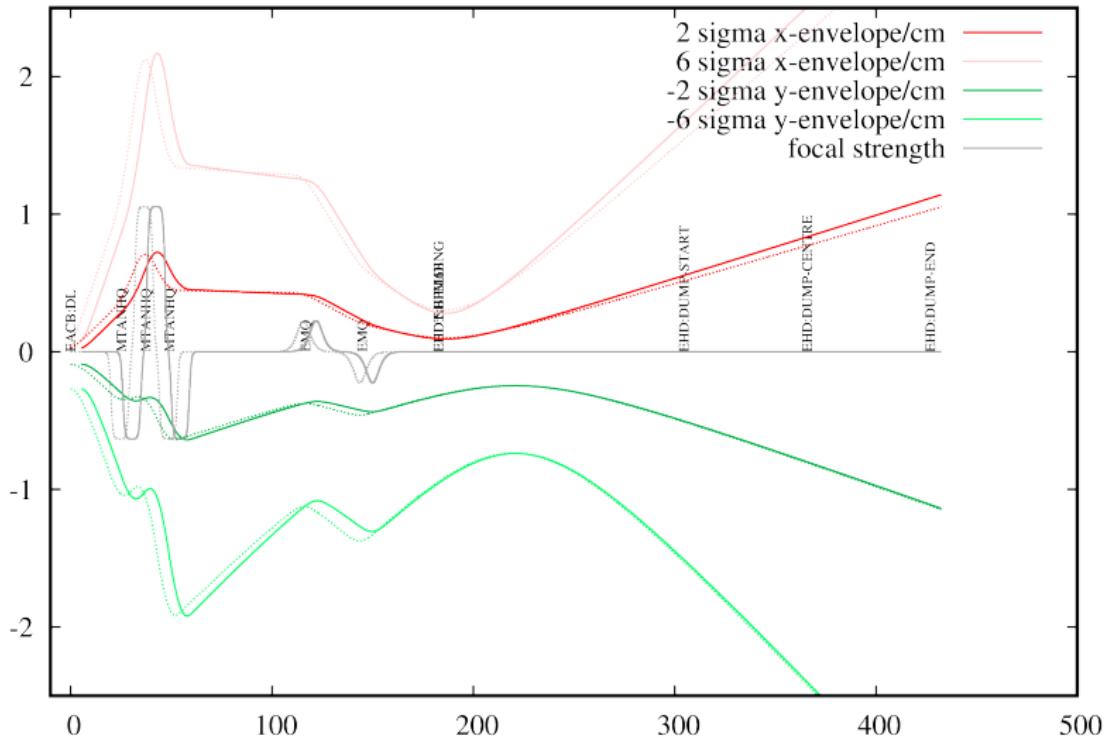
## Conclusions:

Changes to model:

- ▶ Shift target by 5.3 cm downstream
- ▶ BUT gained  $\approx 5$  cm back in the model from dump shielding correction

Still leads to new spacing but not as severe as could have been.

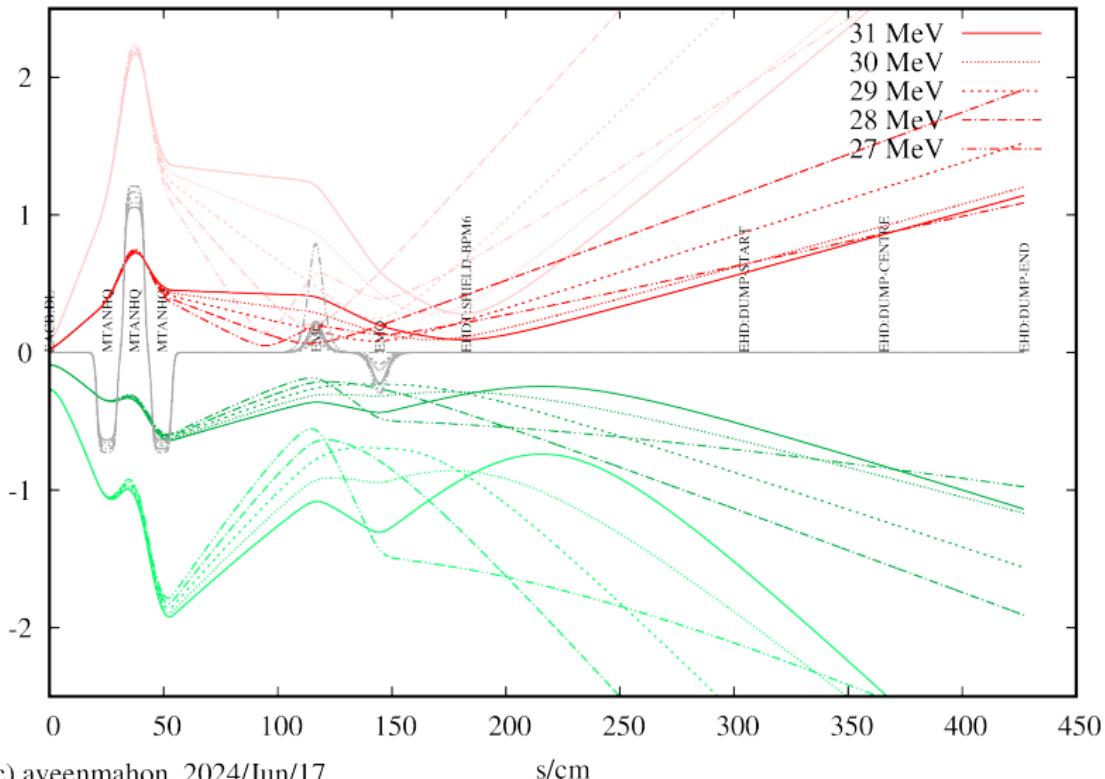
# "New" Beam Optics Model: 1um target 31 MeV



(c) aveenmahon, 2024/Jun/12

Dotted lines show previous model to demonstrate shift.

# 1um tantalum target: 27-31 MeV



# No target: 27-31 MeV

