

James Rogers

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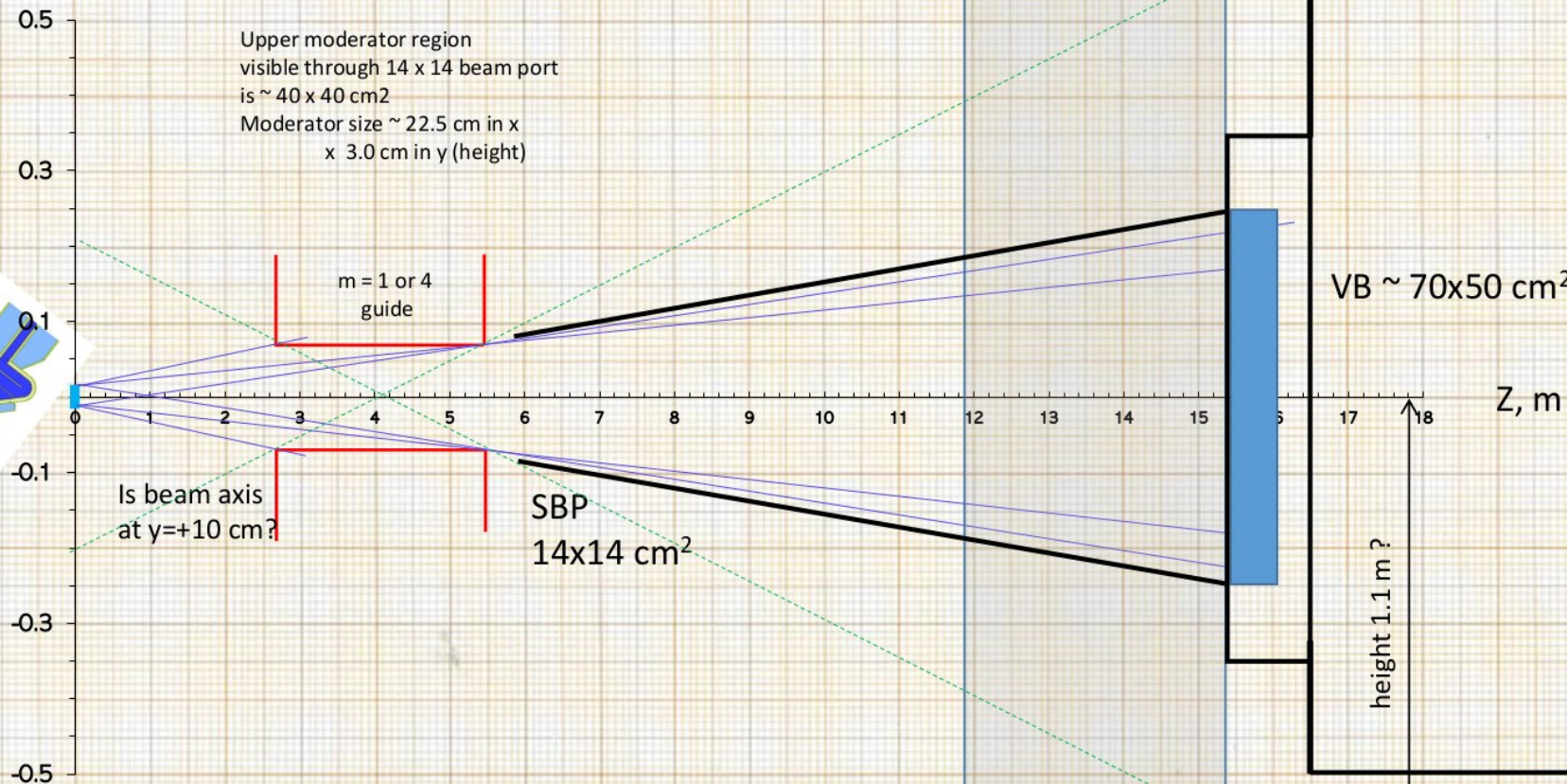
Venetian Blinds Simulation Progress and Optimization

Determining optimal parameters for VB array, optimizing for neutron
Time-of-Flight in HIBeam ESS beam design

Side View and Top View

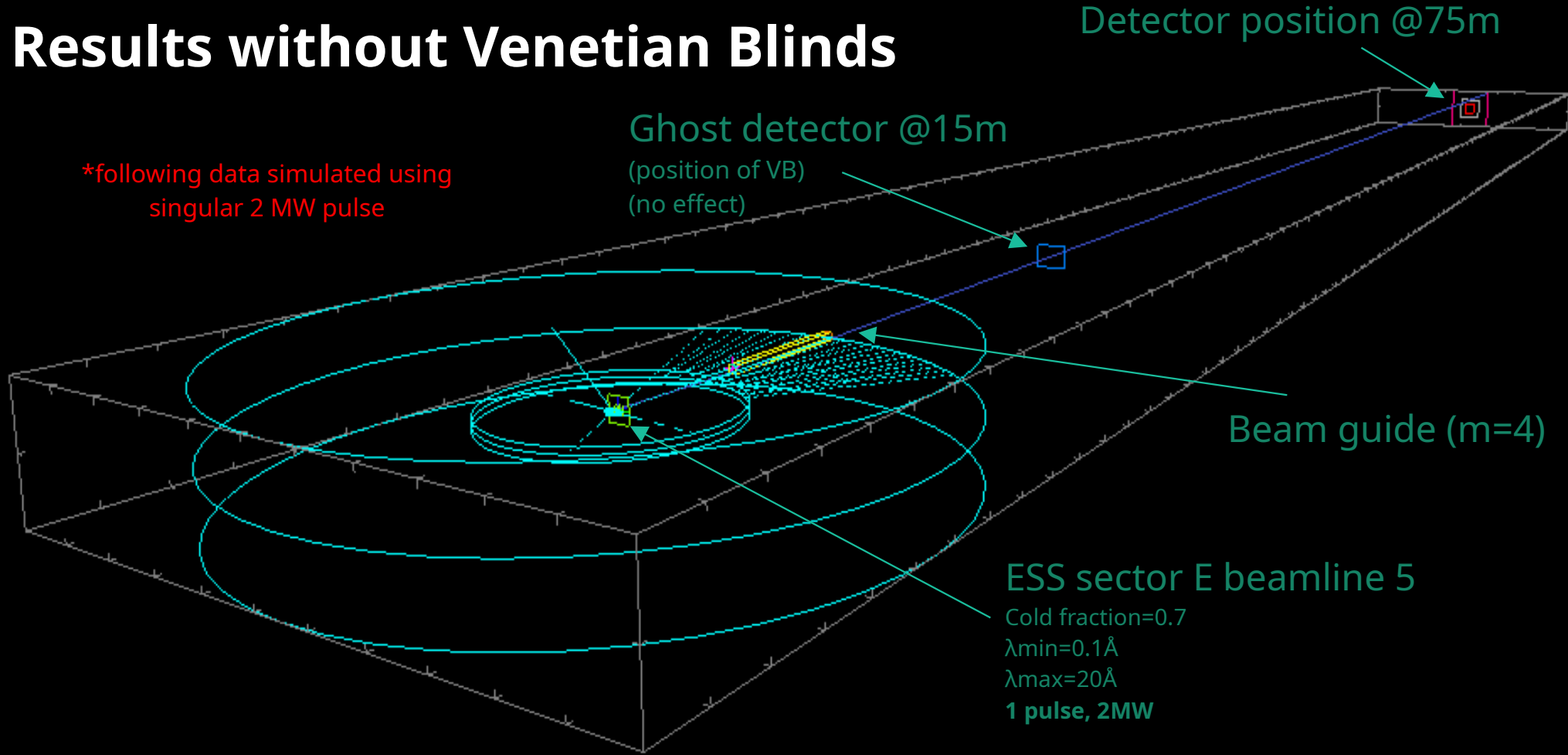
HIBEAM Current design (Kamyshkov's Drawing)

Y, X m



Results without Venetian Blinds

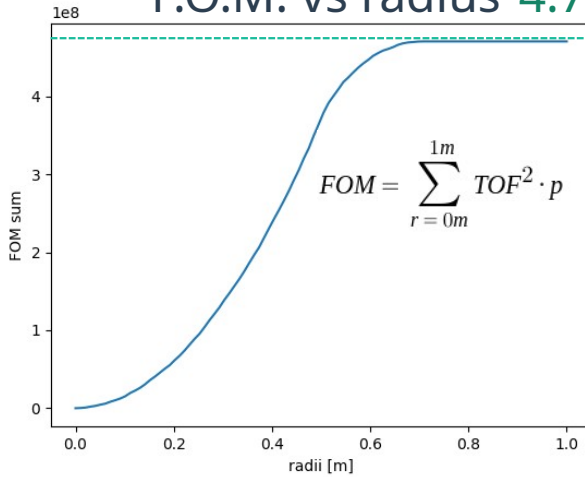
*following data simulated using
singular 2 MW pulse



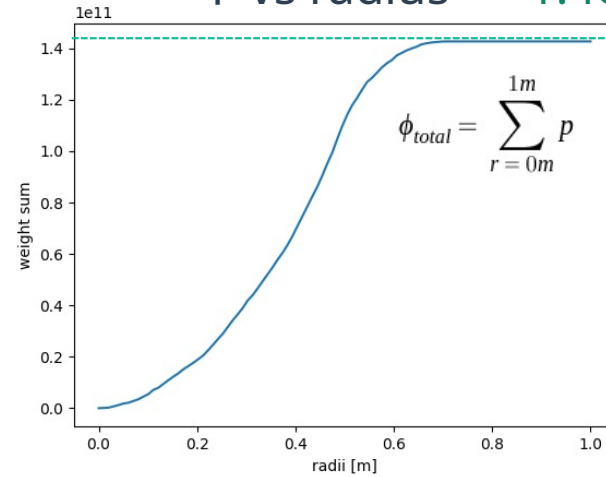
No VB

*No gravity

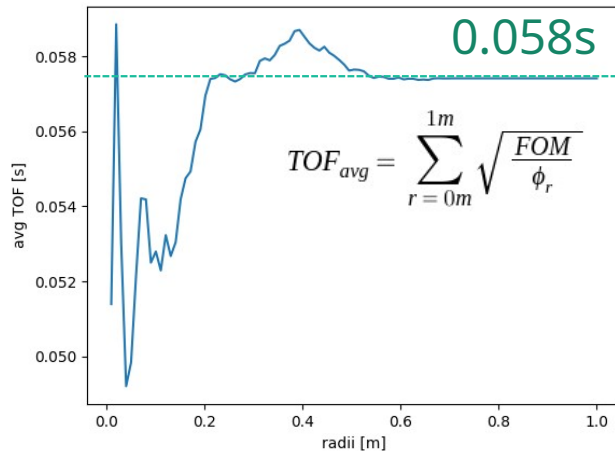
F.O.M. vs radius 4.7e8



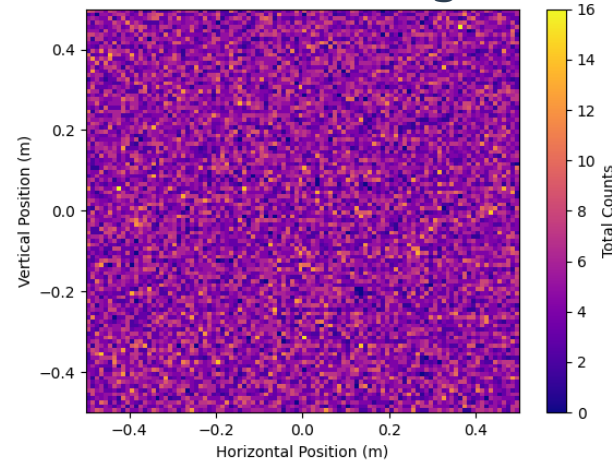
Φ vs radius 1.4e11



T.O.F. avg vs radius

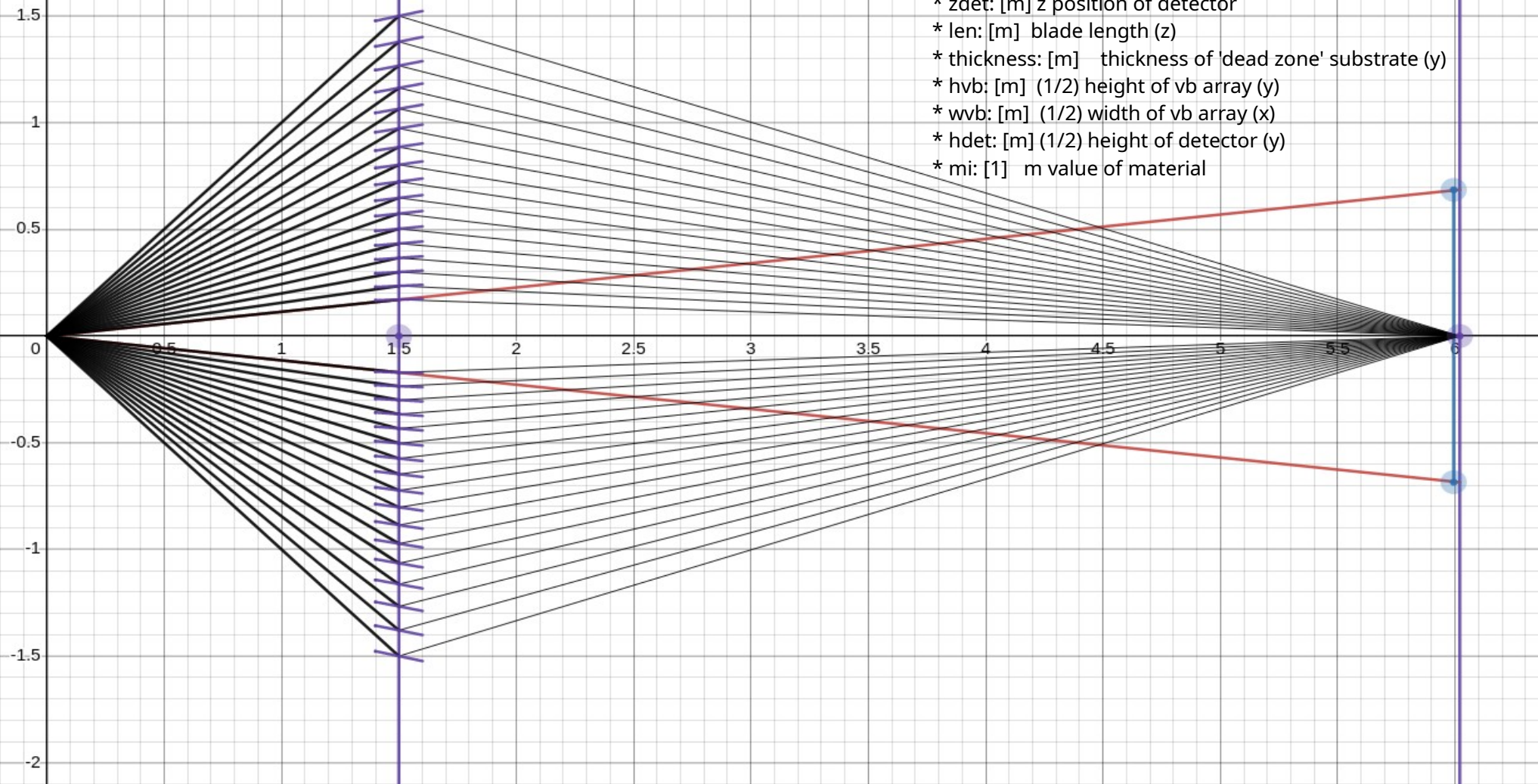


Detector Image



Max ~15 counts/cm²

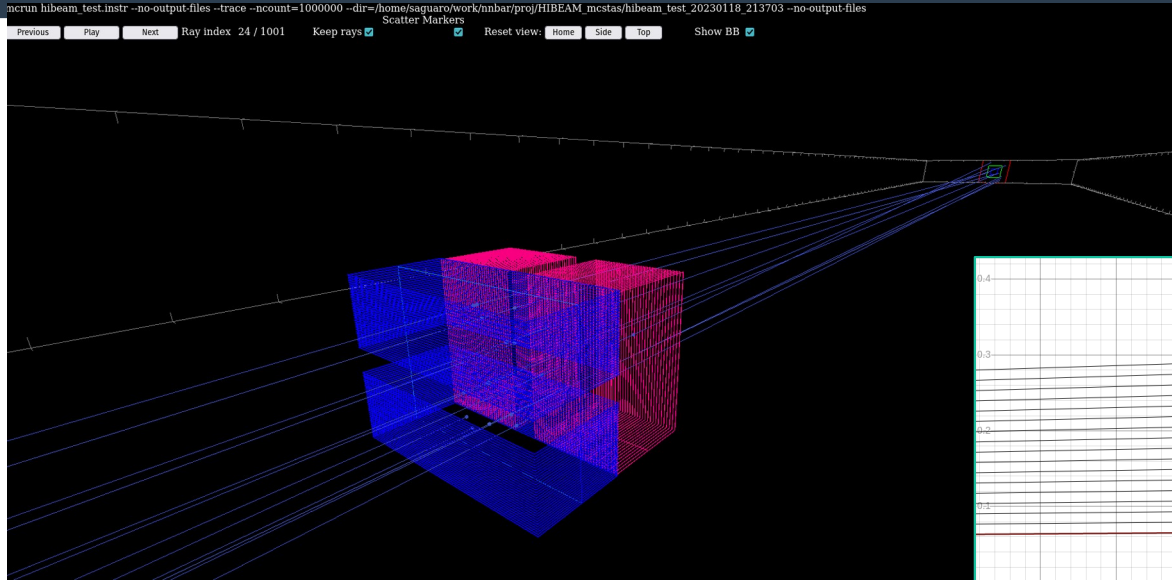
Example of Venetian Blinds (2d)



Params for Simulation:

- * N: [1] (1/2) number of blades
- * zvb: [m] z position of vb
- * zdet: [m] z position of detector
- * len: [m] blade length (z)
- * thickness: [m] thickness of 'dead zone' substrate (y)
- * hvb: [m] (1/2) height of vb array (y)
- * wvb: [m] (1/2) width of vb array (x)
- * hdet: [m] (1/2) height of detector (y)
- * mi: [1] m value of material

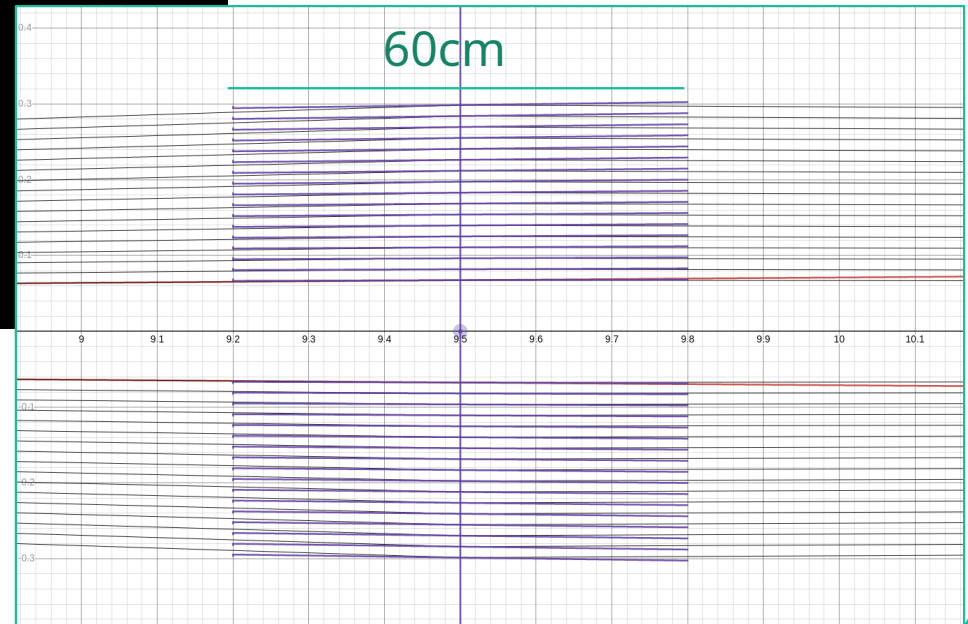
Results with length=60cm



3d visualization

*webGL rendering shows only
outline of plates

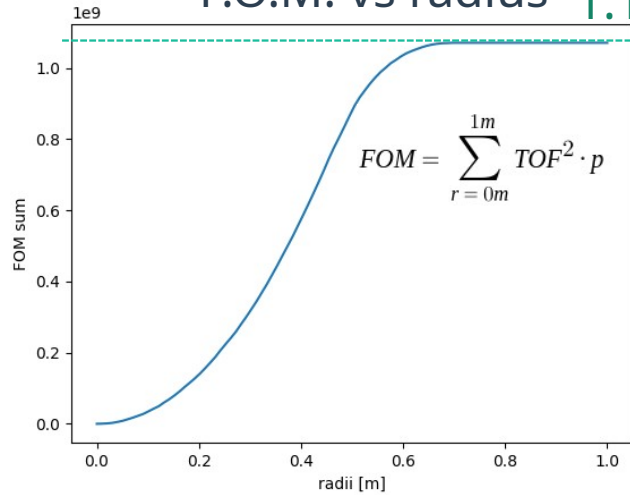
y-z projection
(only y deflectors shown)



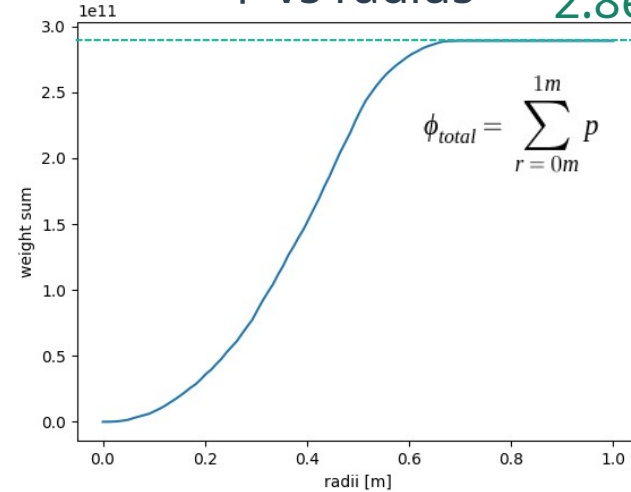
$l=60\text{cm}$

***No
gravity**

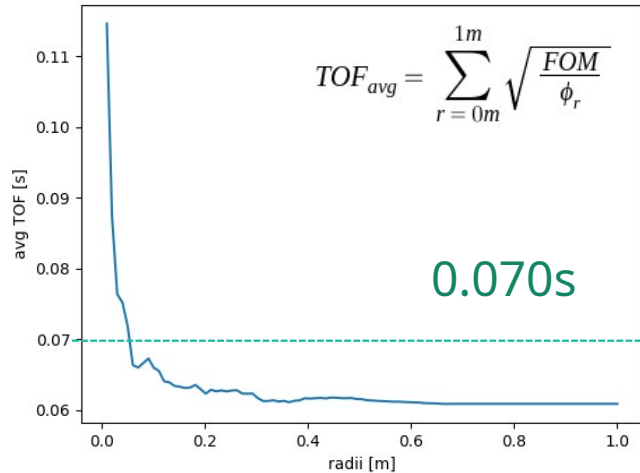
F.O.M. vs radius $1.1\text{e}9$



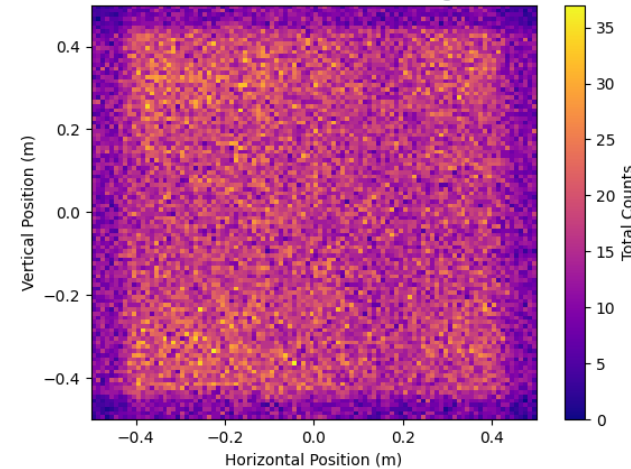
Φ vs radius $2.8\text{e}11$



T.O.F. avg vs radius

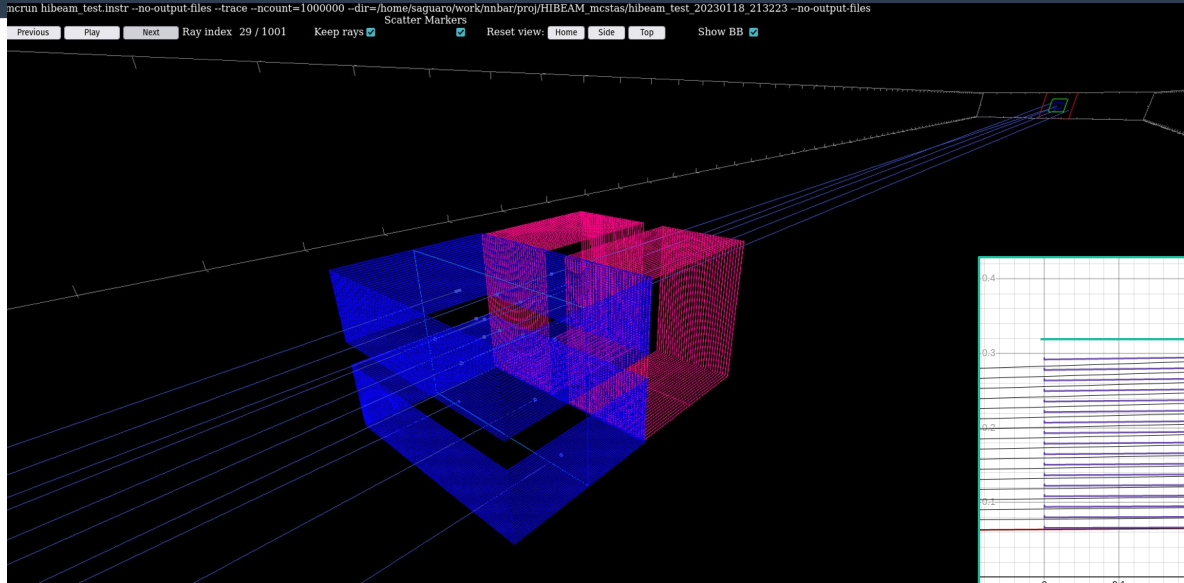


Detector Image



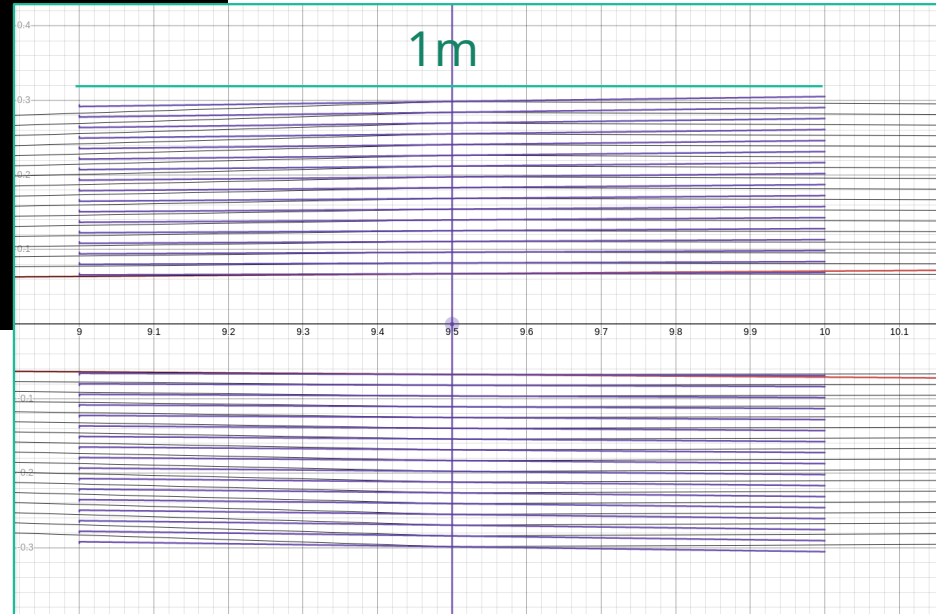
Max ~ 35
counts/cm²

Results with length=1m



3d visualization

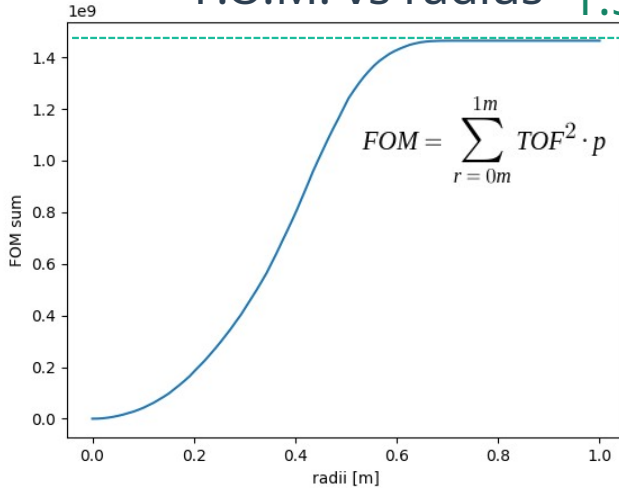
y-z projection
(only y deflectors shown)



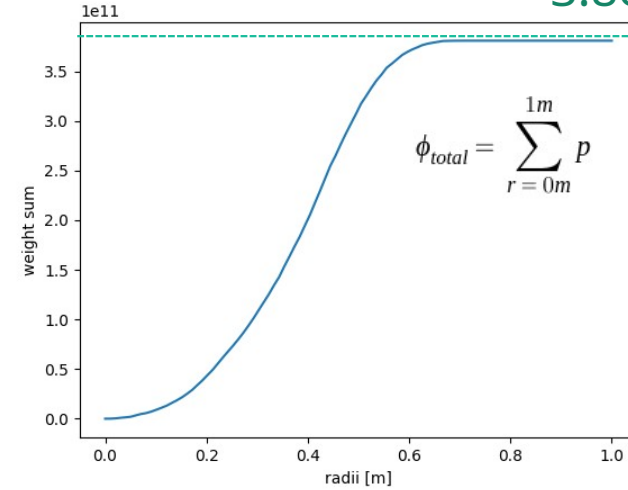
$l=1\text{m}$

*No
gravity

F.O.M. vs radius $1.5\text{e}9$

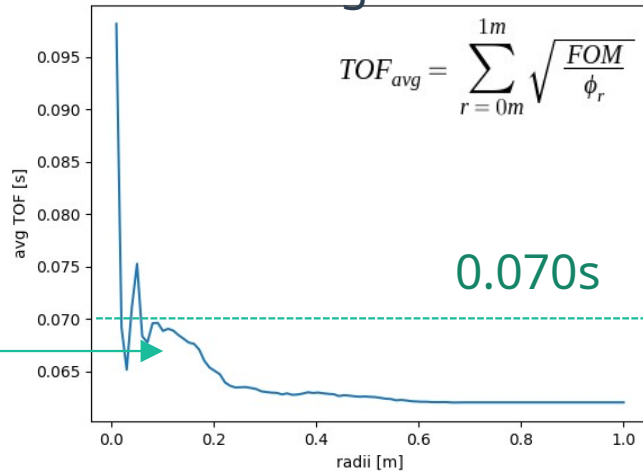


Φ vs radius $3.8\text{e}11$



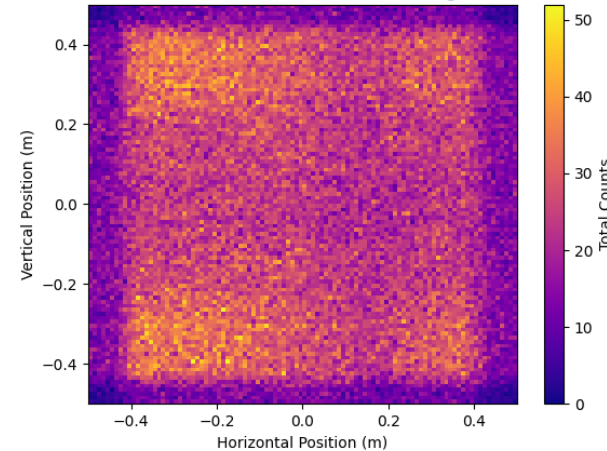
Greater neutron Φ

T.O.F. avg vs radius



0.070s

Detector Image



Max ~ 50
counts/cm²

Conclusions/ Continuation

- **Slightly higher flux at detector with longer blades**

- Φ (no vb): $1.4e11$
- Φ (60cm): $2.8e11$
- Φ (100cm): $3.8e11$

- **Slightly higher avg TOF for $r=(0.05,0.2)$**

- No vb: 0.05s
- 60 cm: 0.06s
- 100 cm: 0.07s

- **Higher FOM**

- No vb: $0.47e9$
- 60 cm: $1.1e9$
- 100 cm: $1.5e9$

Future Goals:

- Account for effect of gravity on slow neutrons
- Implement “Continuous Deflection” of VB blades
- Determine optimal configuration of VB, maximizing TOF for neutrons