Agenda of ORNL-UTK-UKY-LU zoom meeting
March 17, 2026, at 3:30 PM EST

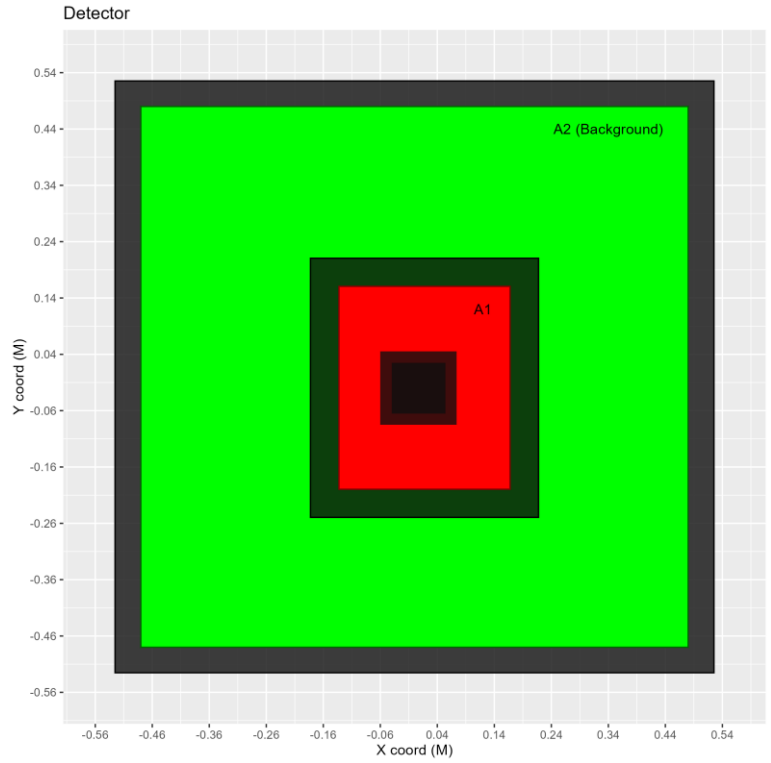
- Please, send your presented slides for INDICO posting
  https://indico.phy.ornl.gov/event/994

Agenda:

1. Alina (Yuri)	5' nTMM data set with background subtraction.
2. Nathan & Linus	10' update on calculations for PRD paper
3. Yuri	5' looking at other nn' experiments data
4. John	10' how to install borated poly in next nTMM run
5. Mubi	10' updates from UKY
6. Linus	10' updates from LU
7. AOB	

For Alina Moore

nn' zoom meeting • March 17, 2026 • YK



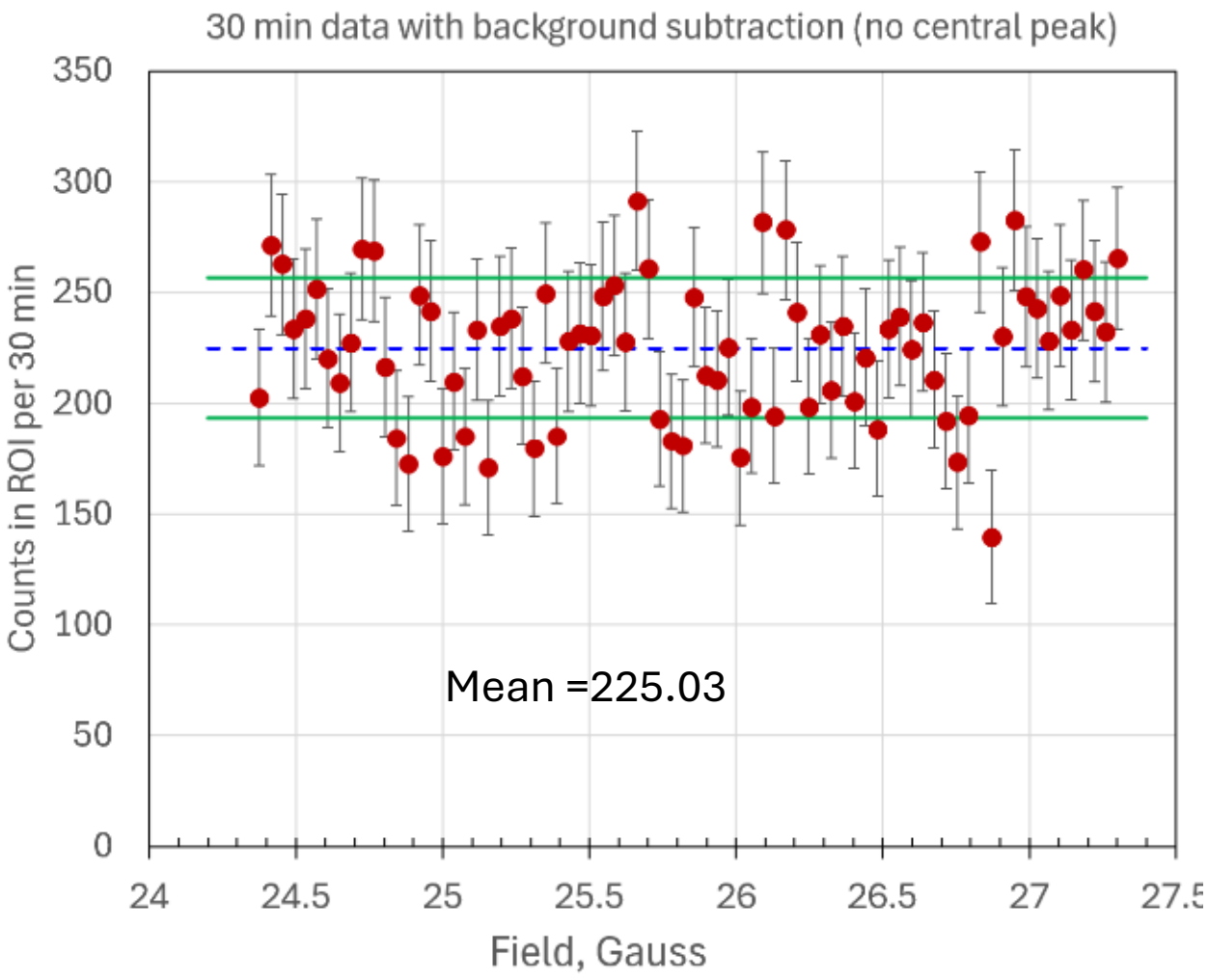
Area-rescaled background from green area subtracted from red area

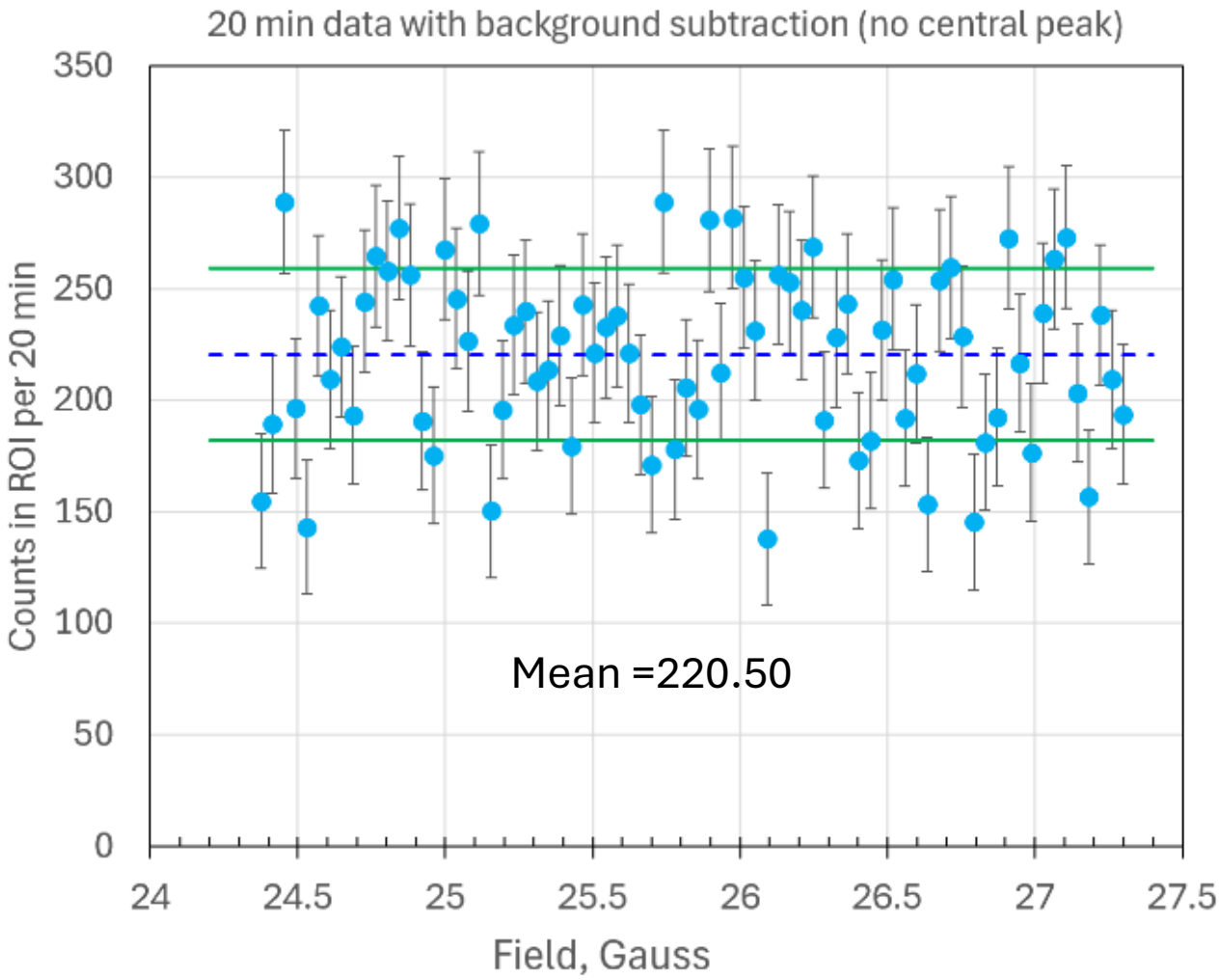
ROI 30 x 36 cm2

Eff = 90.15%

Central peak excluded

- Alina's EXCEL file is posted at UT One Drive: DATA-GP-SANS-2025 • DATA-FOR-FIT • ALINA
- Carolyn is preparing similar set without removal of central peak area





? Why average is not proportional to run time?

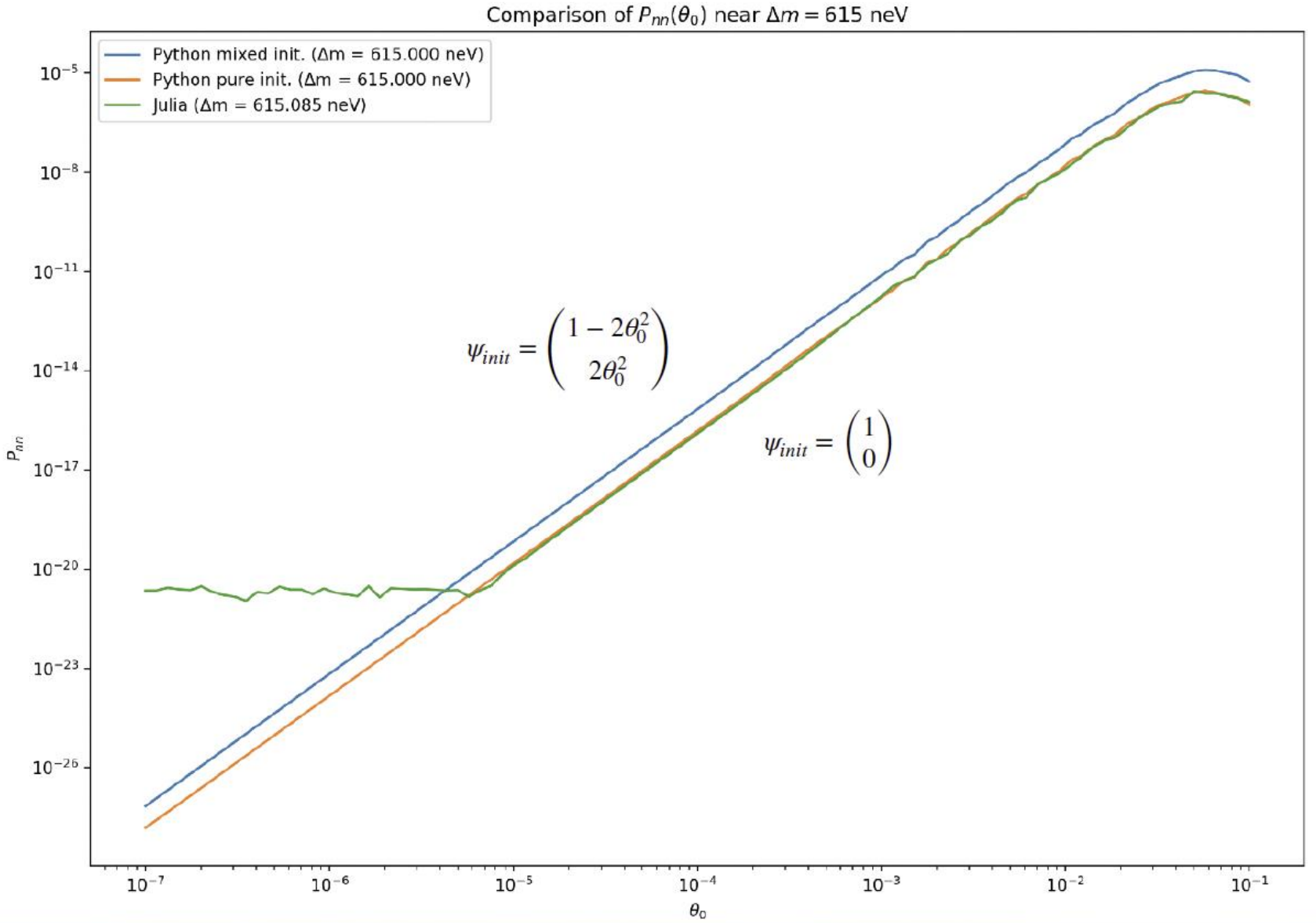
Comparison of Schrödinger evolution (Python) and density matrix (Julia) implementation

2026-03-17

Comparison between Python and Julia

	Python	Julia
Mixing angle	$\tan 2\theta = \frac{2\epsilon}{U + \varepsilon - iW}$	$\tan 2\theta = \frac{2\epsilon}{U - iW}$
Small angle approximation	$\varepsilon = \frac{\Delta m \tan 2\theta}{2}$	$\varepsilon = \theta \, \Delta m$
Initialisation:	$\psi_{init} = \begin{pmatrix} 1 - 2\theta_0^2 \\ 2\theta_0^2 \end{pmatrix}$ Mixed phase	$\rho_{\text{init}} = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$ Pure neutron state

Change of initialisation



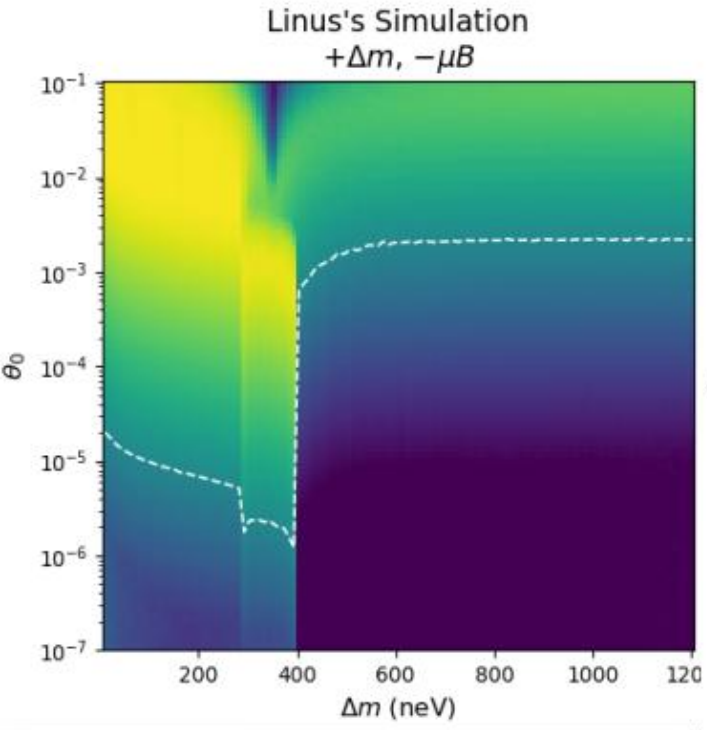
LUND UNIVERSITY

Way forward

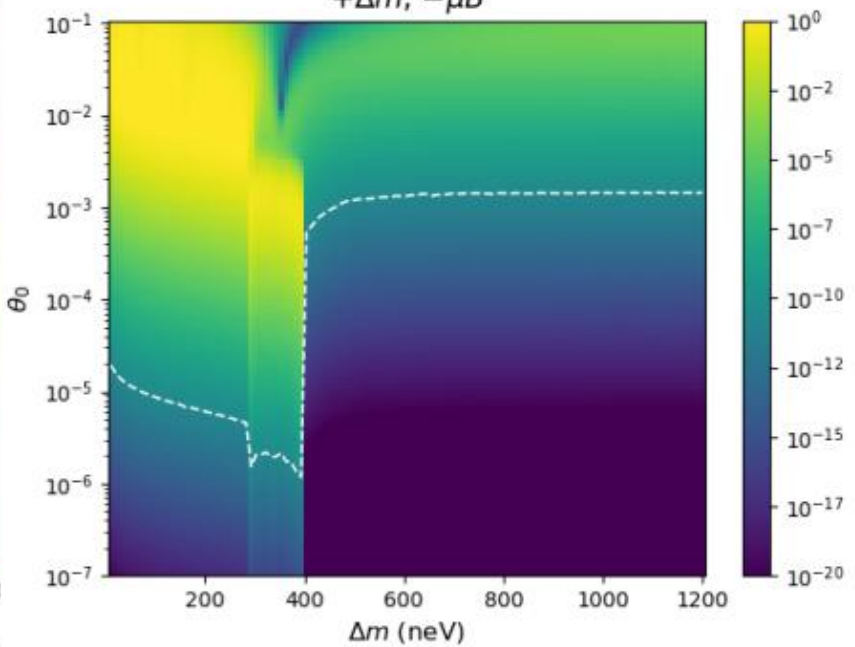
- If this is confirmed to be the reason for the discrepancy, I suggest we use the corrected Python code moving forward.
- I can run it on COSMOS, roughly 30x faster than on workstations.
- We should add description in paper of the new calculation and its agreement with the old one.
- Once available, shouldn't be more than 1 week of work to run the simulations.

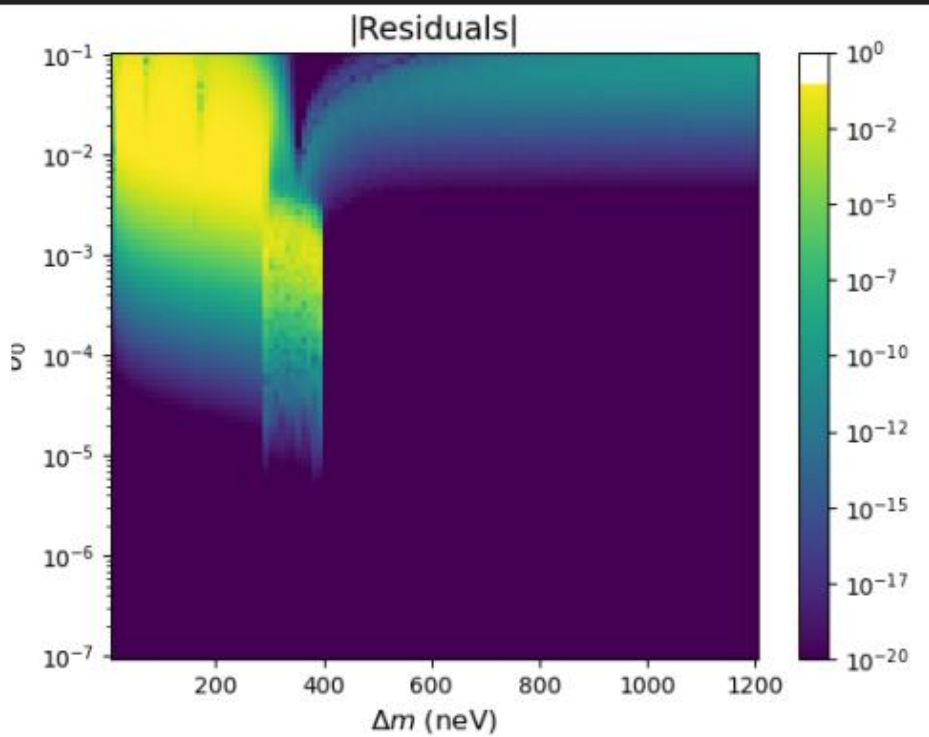
LUND UNIVERSITY

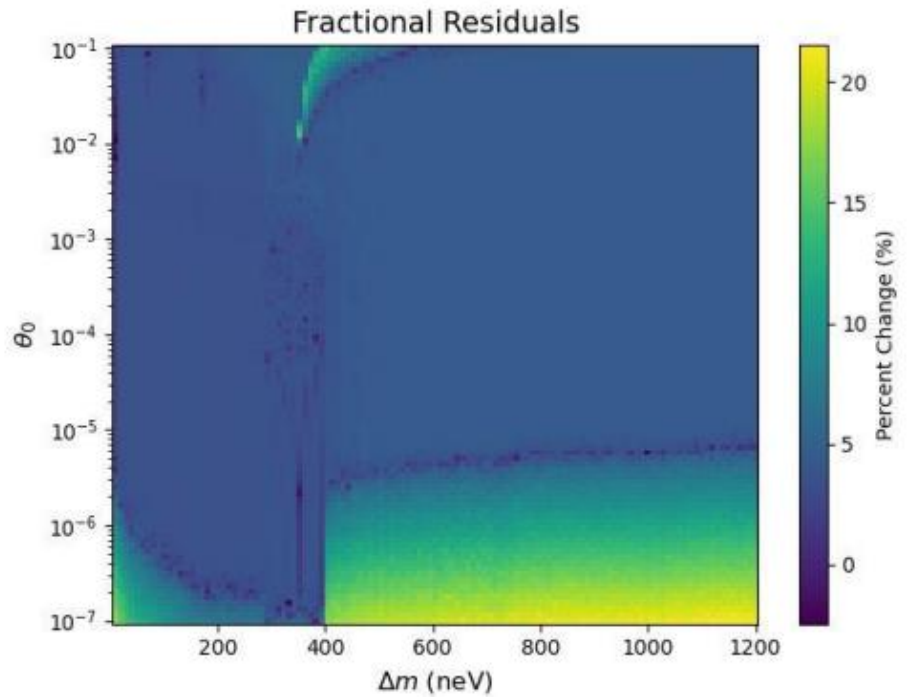
+Δm, +μB : Fractional residuals



0.02 mm stepsize





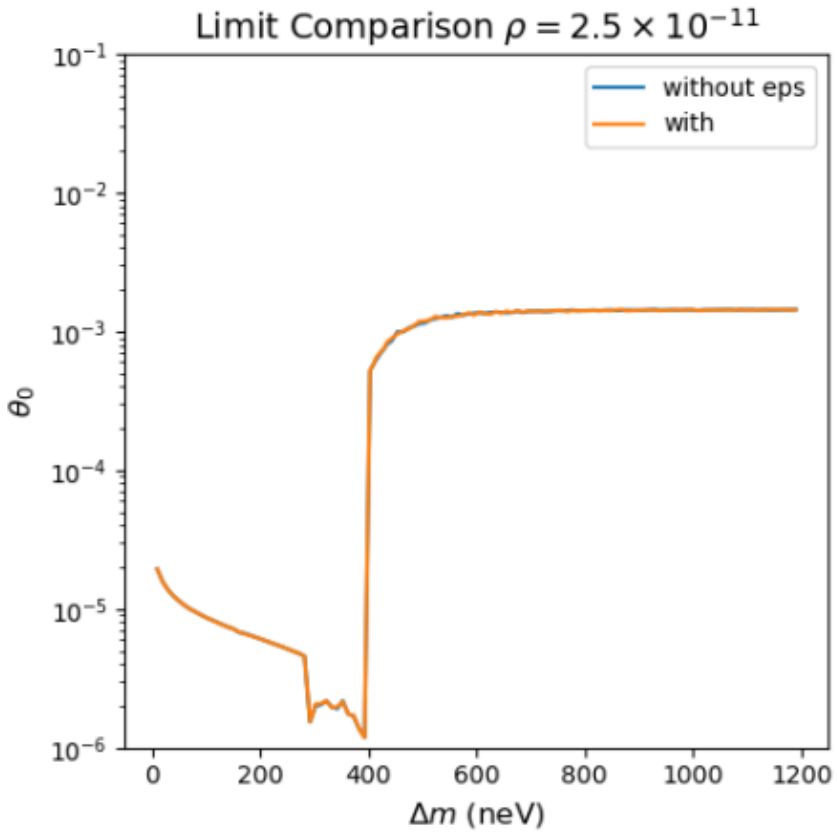


Calculation Error

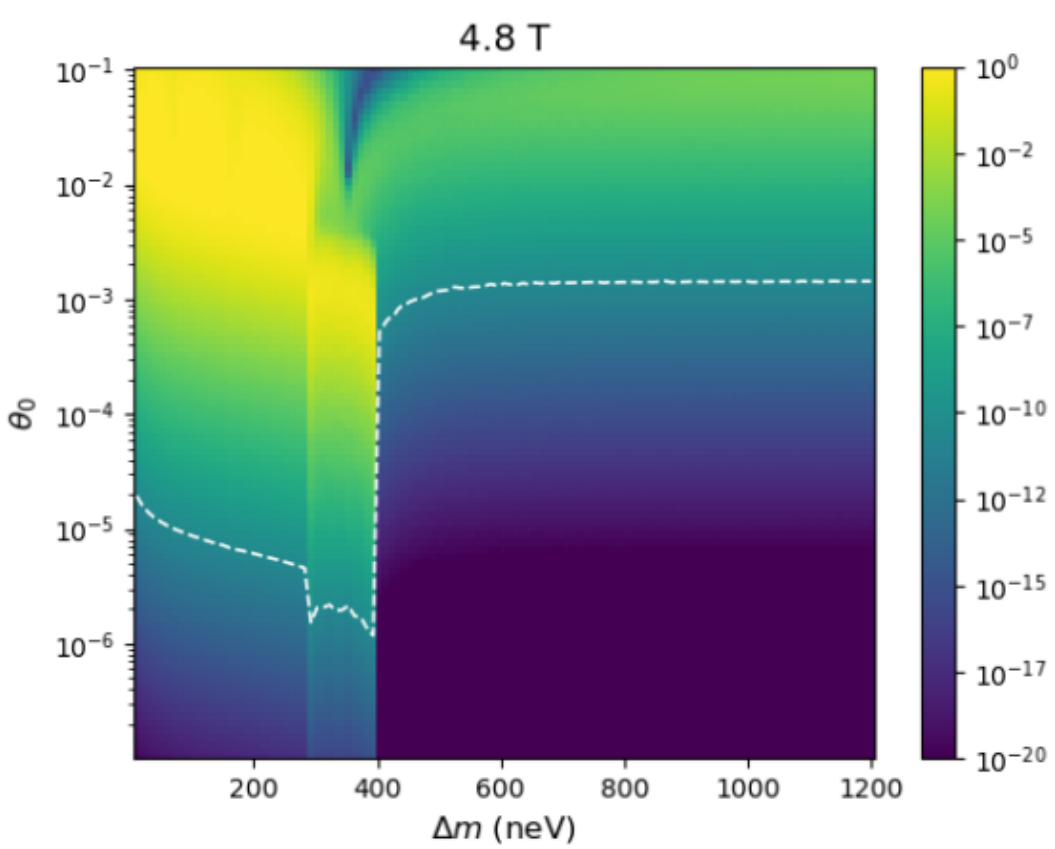
- Linus pointed out that opc = U + **eps** – iW may be incorrect

```
opc = (U + eps).astype(cp.complex128) - 1j*W
arg = 2.0 * eps / opc
zeta2 = cp.arctan(arg)
zeta = zeta2 / 2.0
```

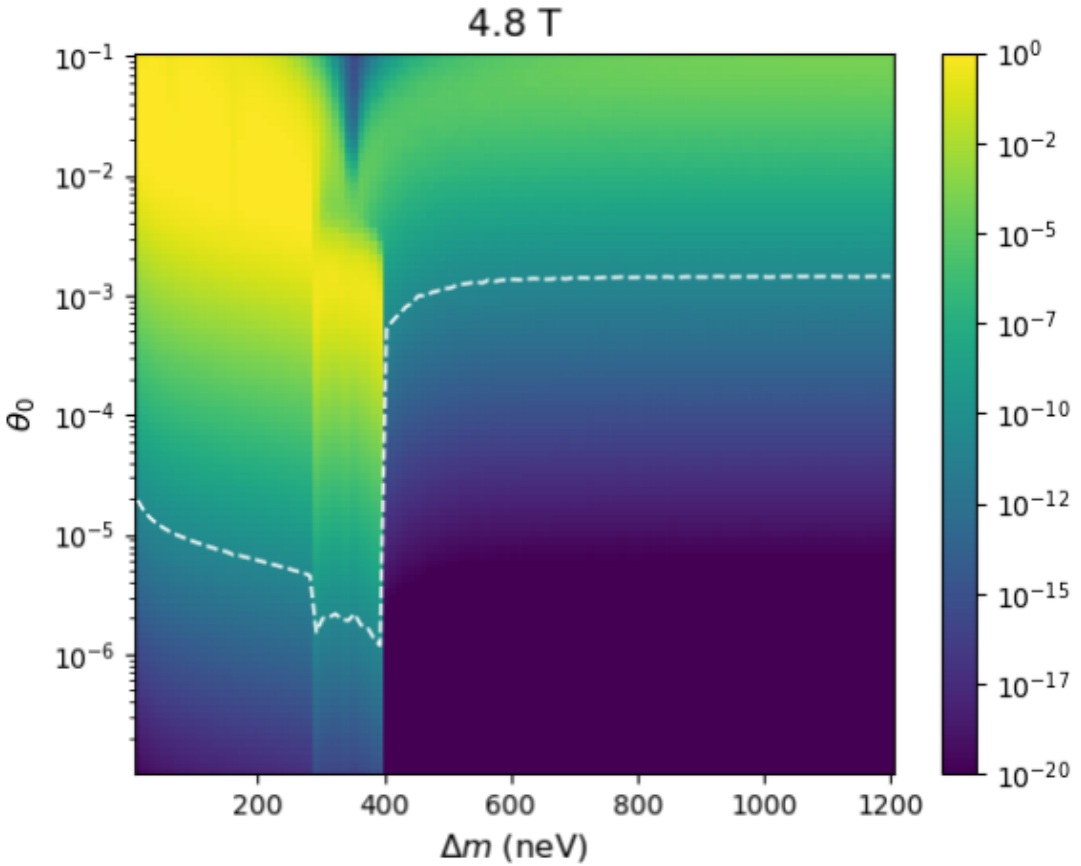
- Only resulted in a change at large theta and small dm
- Made absorption resonance look more like Linus's simulations (next slide)



With eps

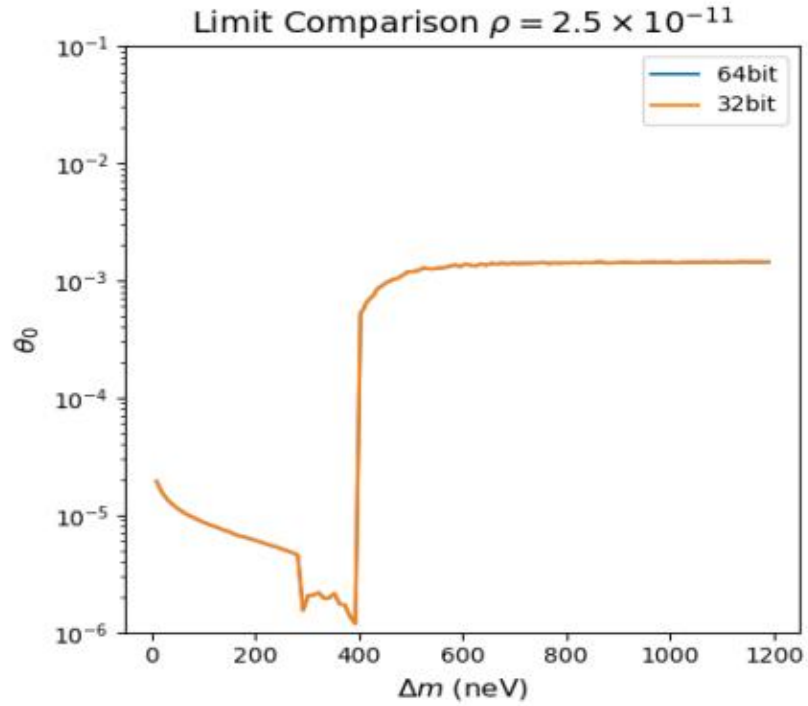


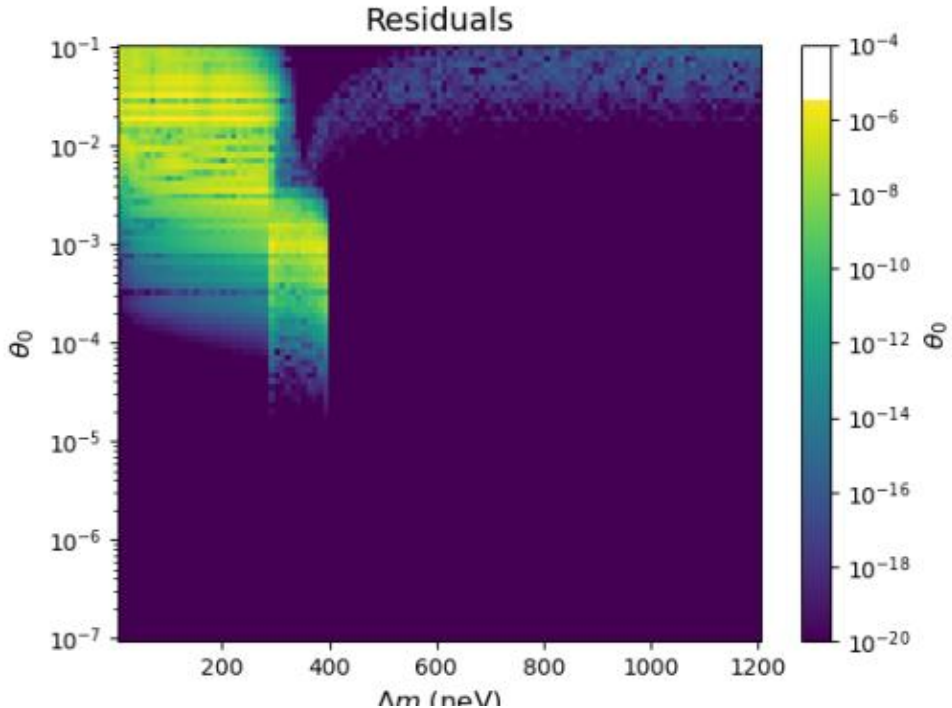
Without eps

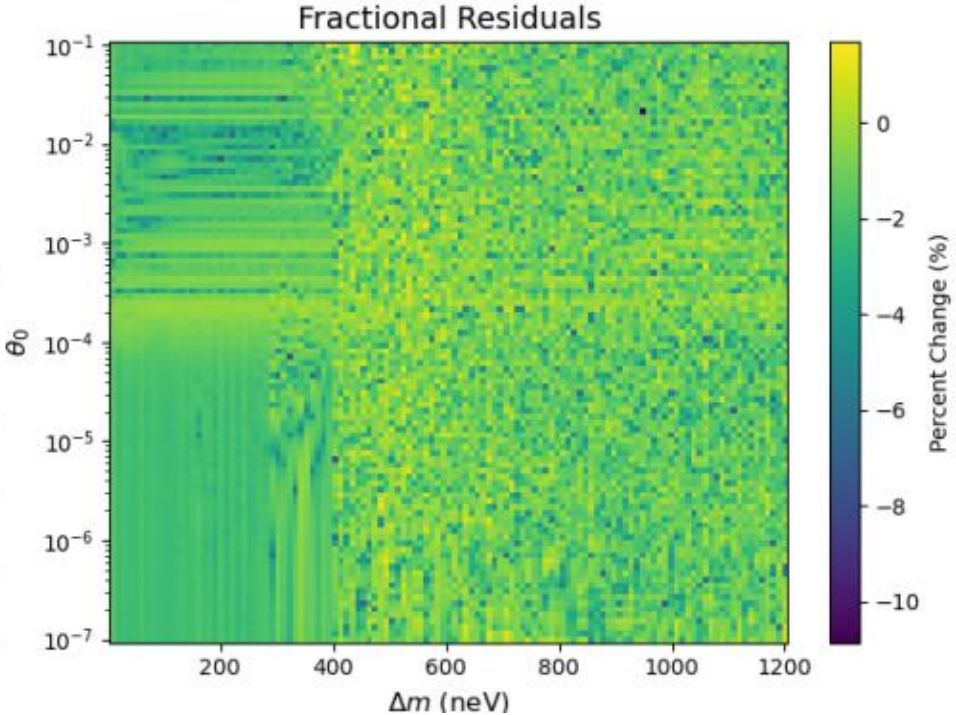


32 Bit

- Float64 -> Float32
- Complex128 -> Complex64







For the plot of comparison of nn' search with other experiments,
the other experiments limits exist in the form of .csv files
gathered by Frank, Cary, and now are in hands of Nathan

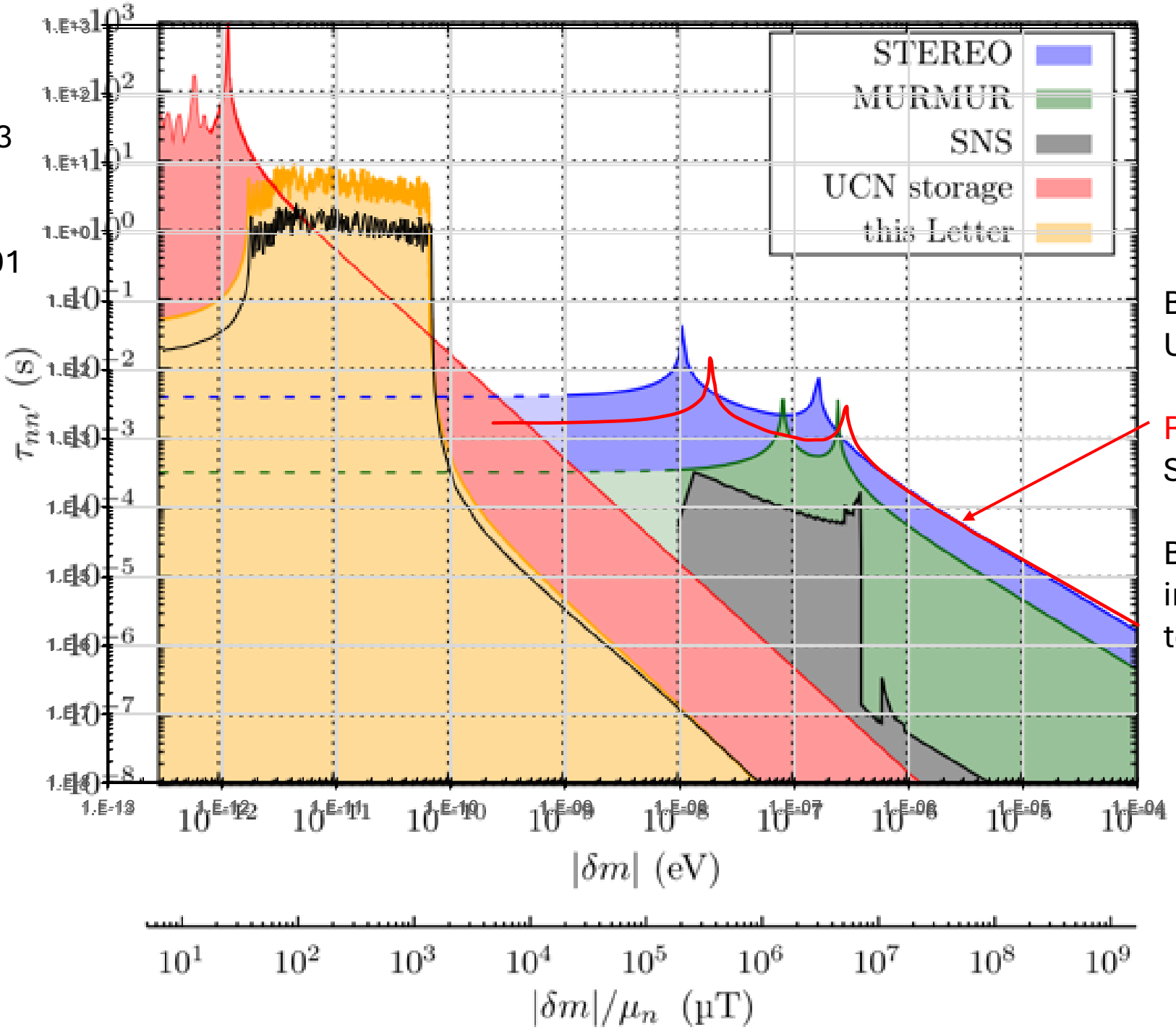
hostert_2023.csv
hostert_curve.csv
hostert_curve.xlsx
MURMUR_negative.csv
MURMUR_positive.csv
nEDM_Limits.csv
PSI_recast_1.csv
PSI_recast_2.csv
PSI_recast_3.csv
STEREO_negative.csv
STEREO_positive.csv
UCNBeam_Limits.csv

- New PSI UCN limits are promised next week.

New UCN PSI data
by N.J. Ayres et al., arXiv:2602.23487v1
(nucl-ex) 26 February 2026

UCN BEAM 2023

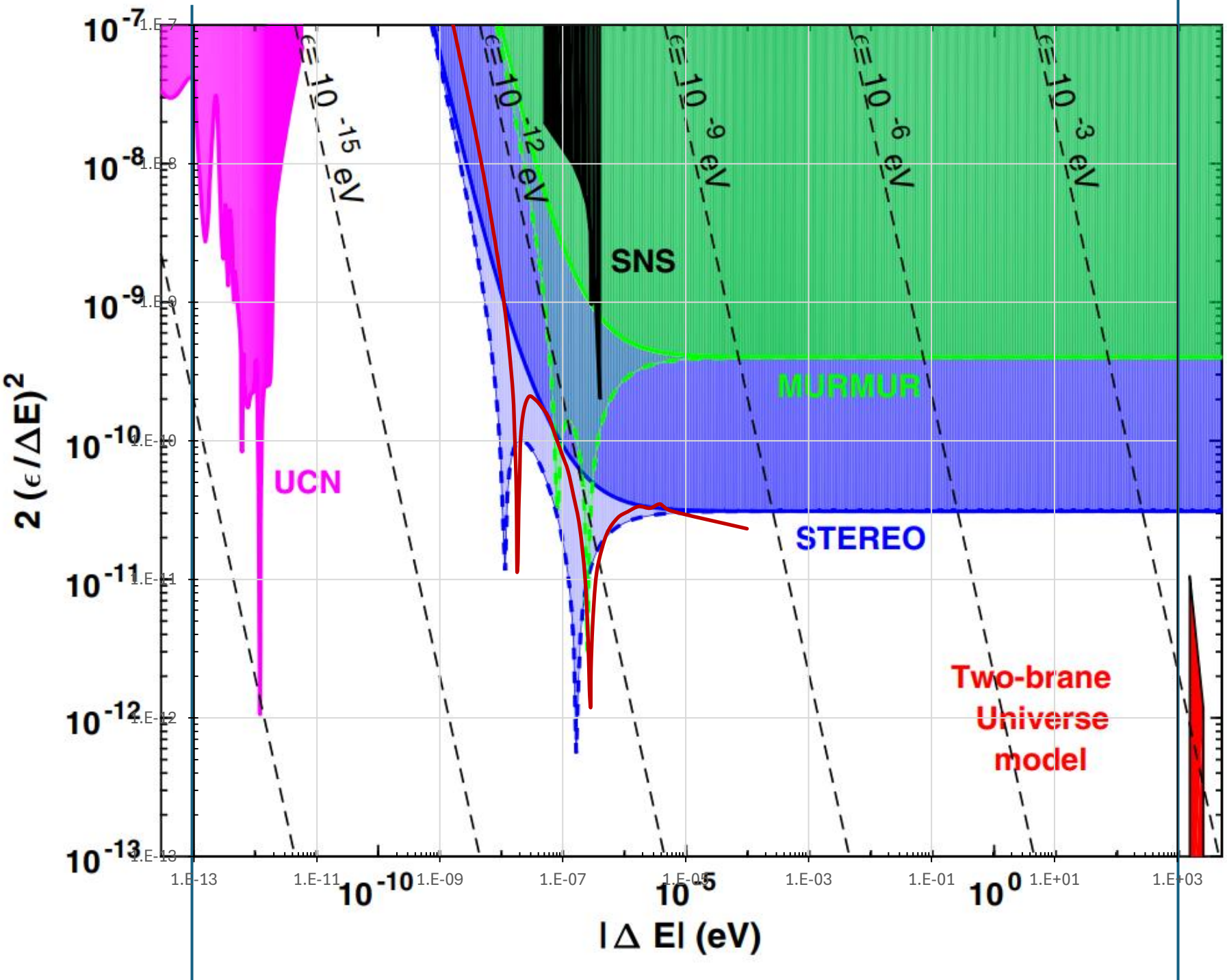
G. Ban et al.
PRL, 131, 191801



Black:
UCNBeam_Limits.csv

Red:
STEREO_negative.csv

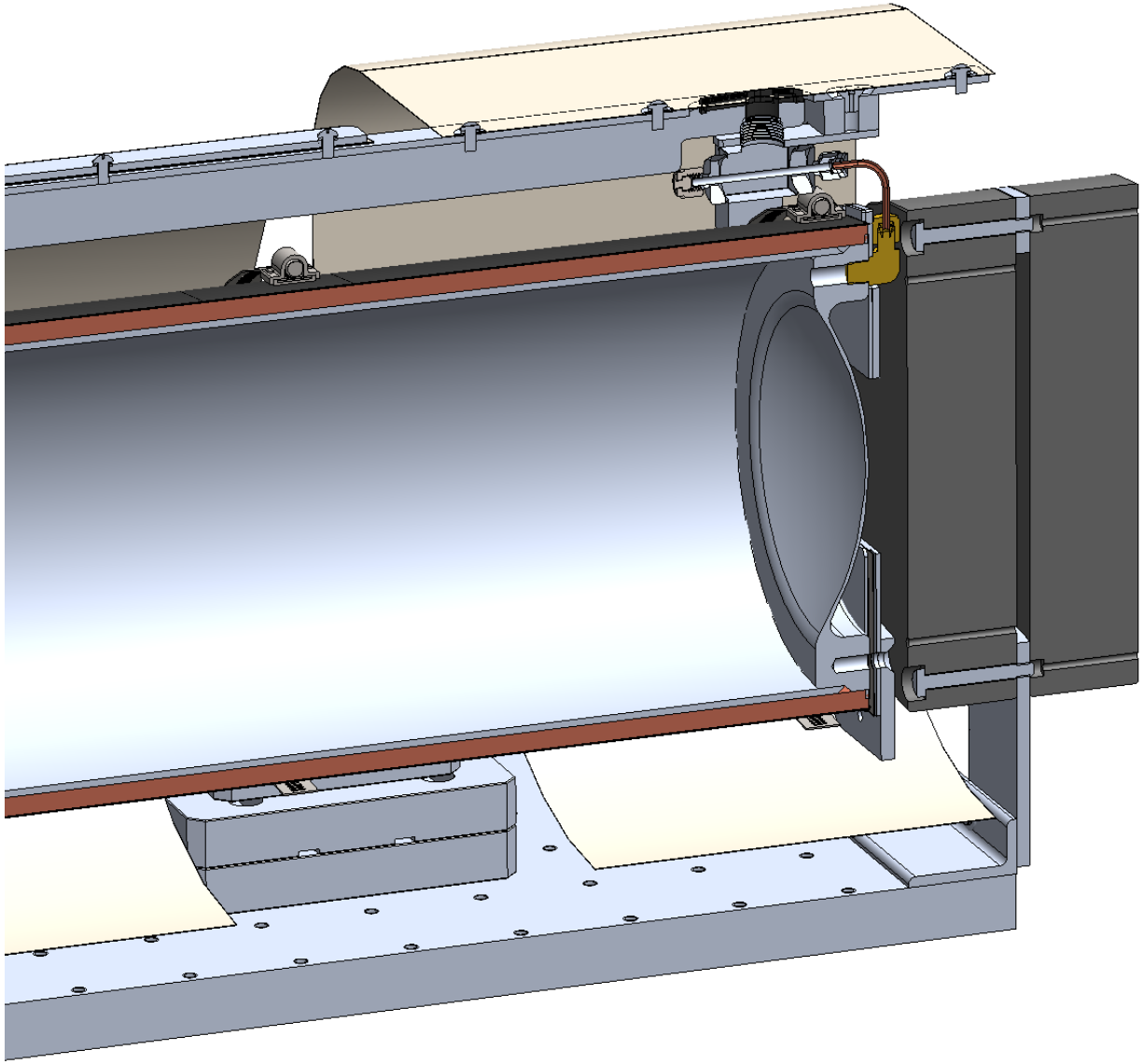
BTW: why negative ΔE in STEREO corresponding to our positive Δm?

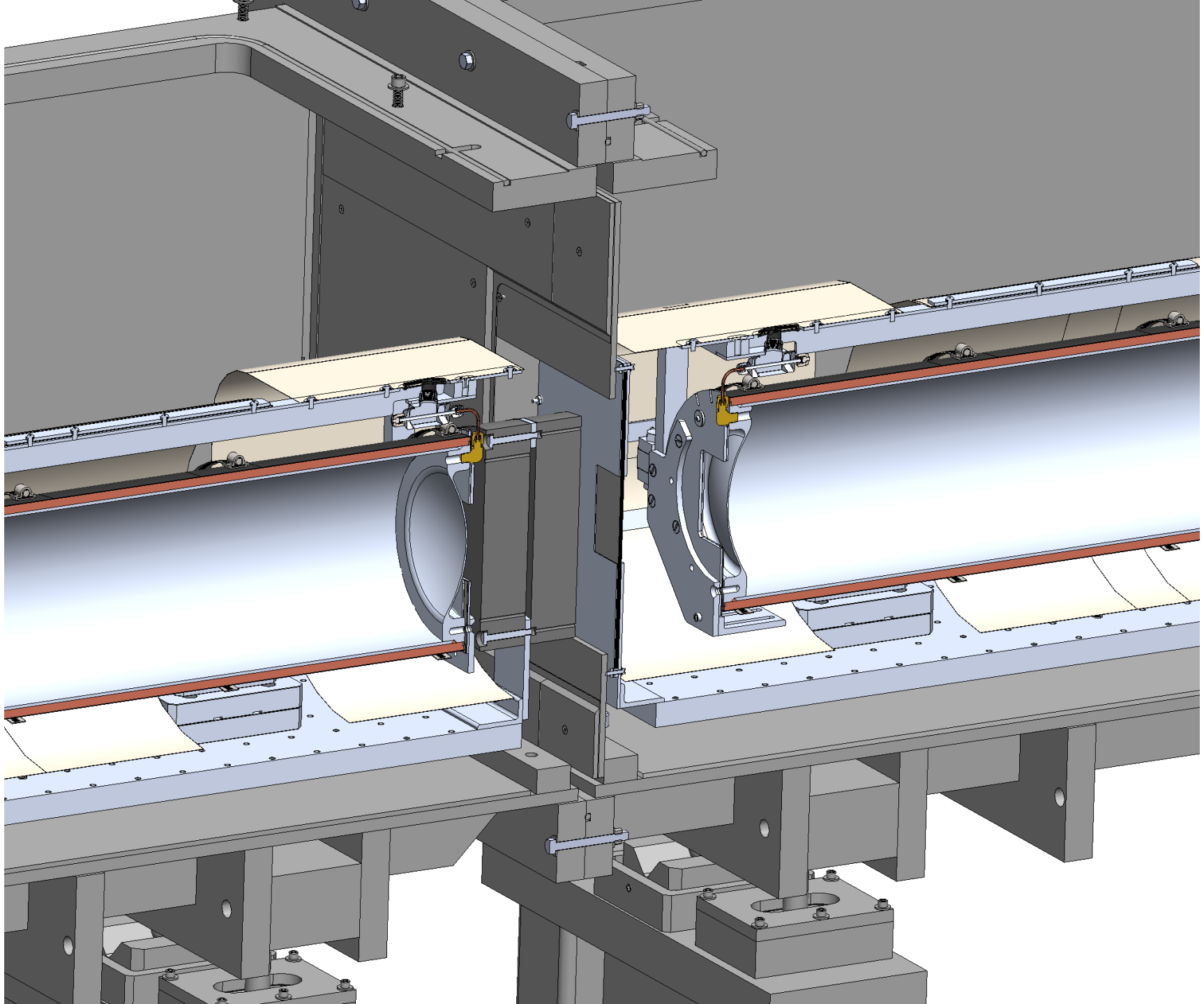

$2(\epsilon/\Delta E)^2$
$|\Delta E|$ (eV)
$\epsilon = 10^{-15}$ eV
$\epsilon = 10^{-12}$ eV
$\epsilon = 10^{-9}$ eV
$\epsilon = 10^{-6}$ eV
$\epsilon = 10^{-3}$ eV
SNS
MURMUR
STEREO
UCN
Two-brane Universe model

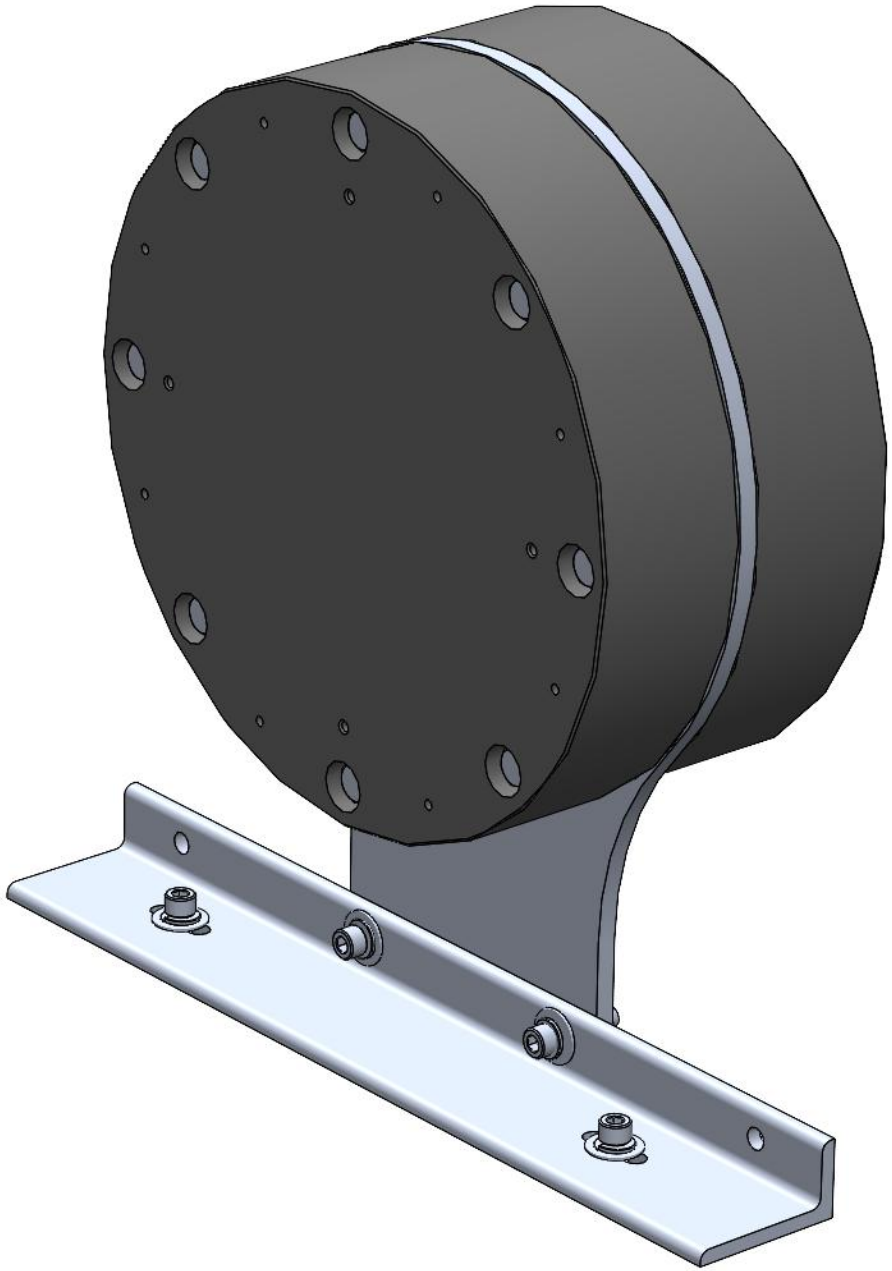
Online Digitizers

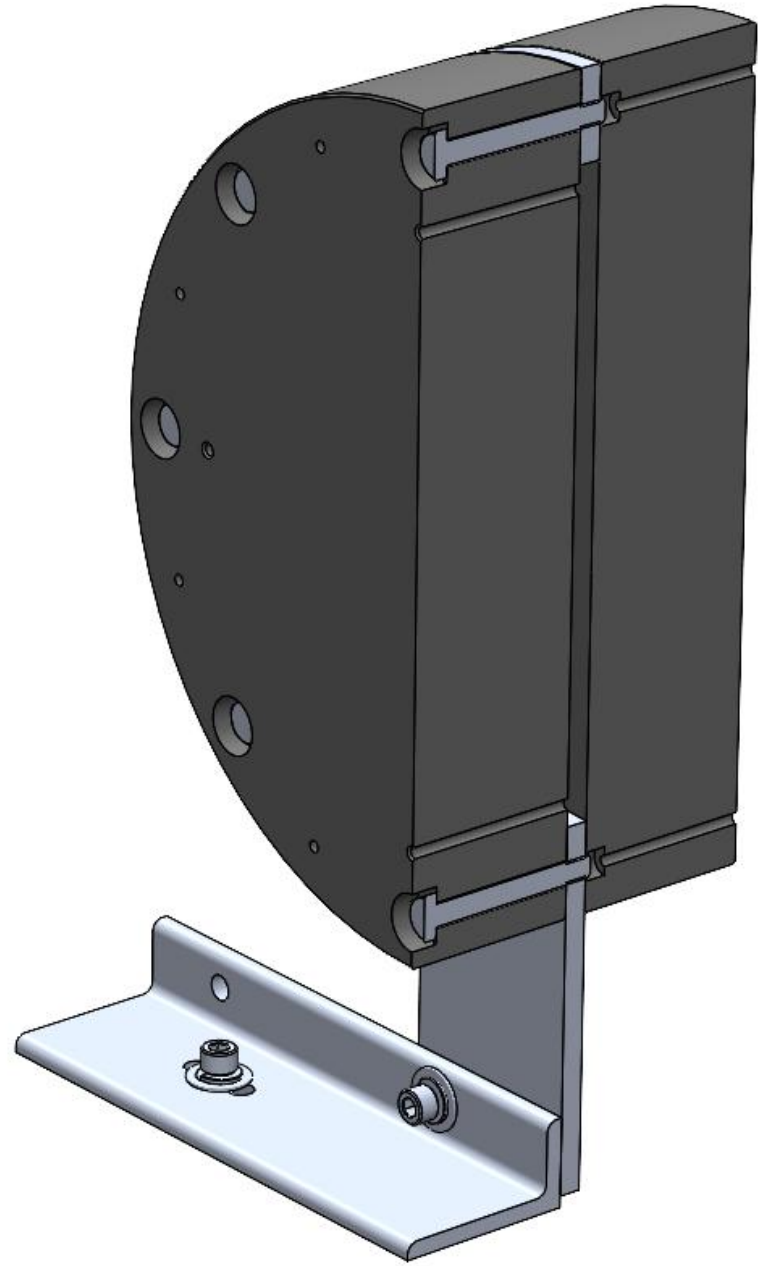
https://plotdigitizer.com/

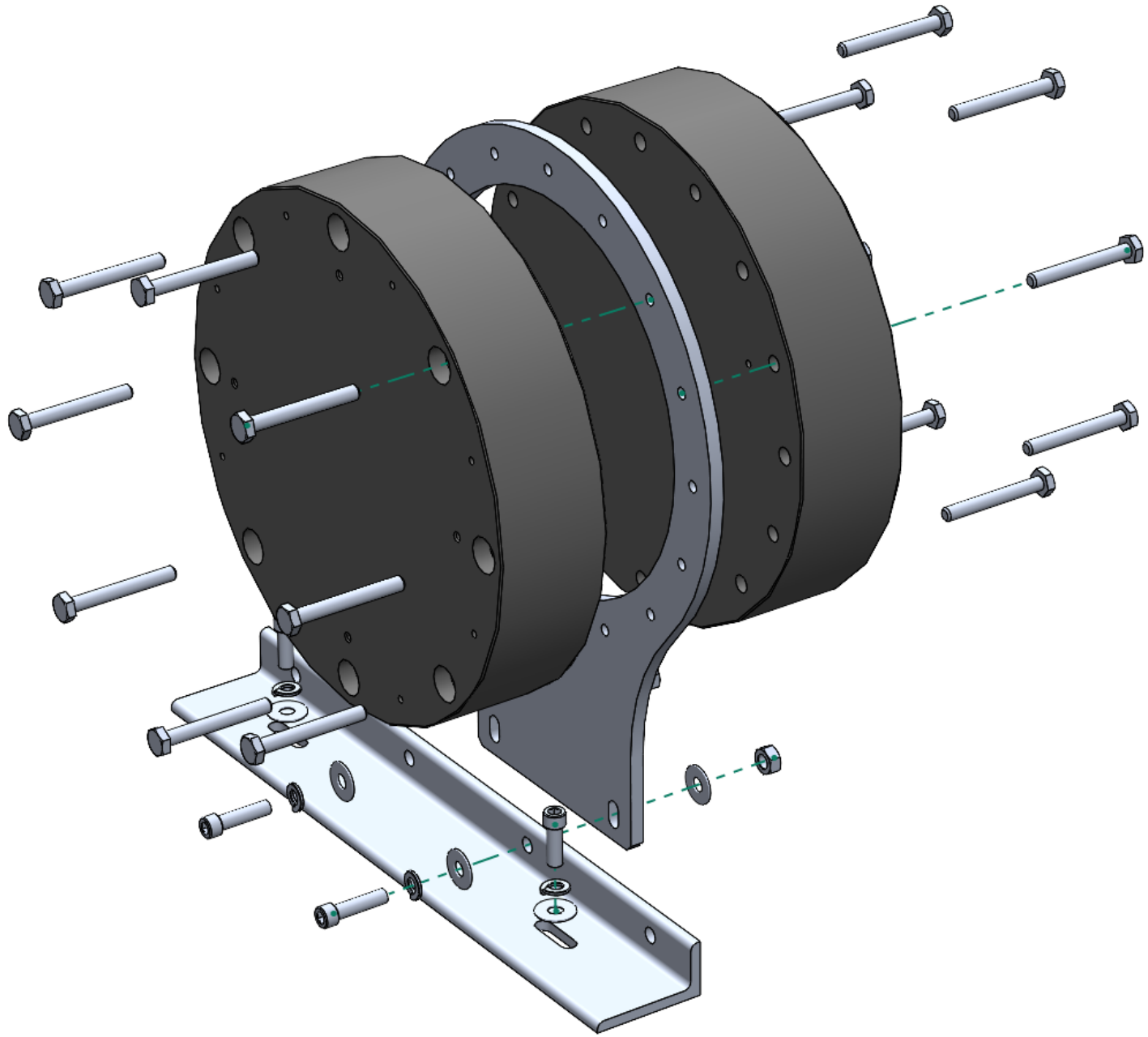
https://automeris.io/

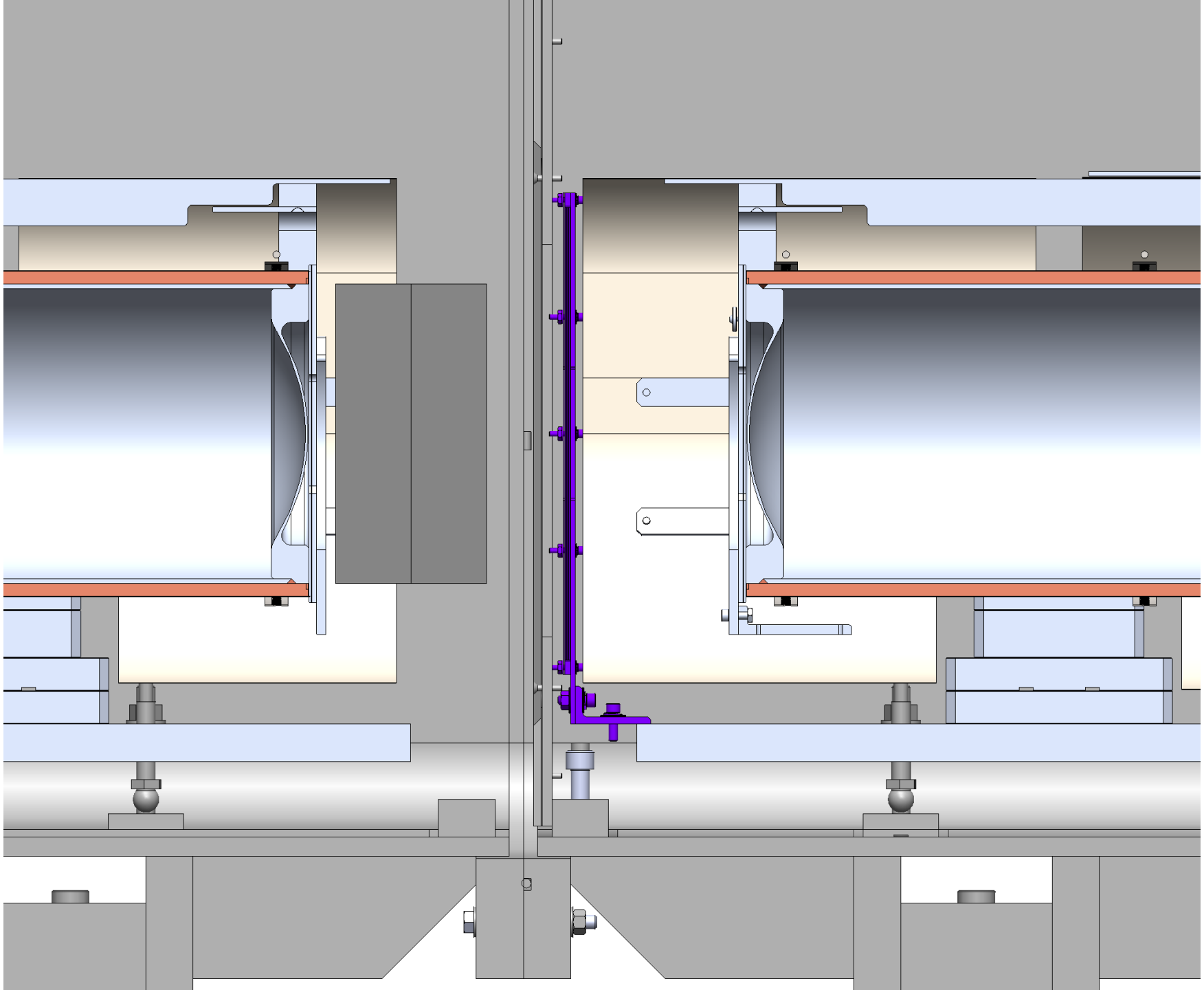


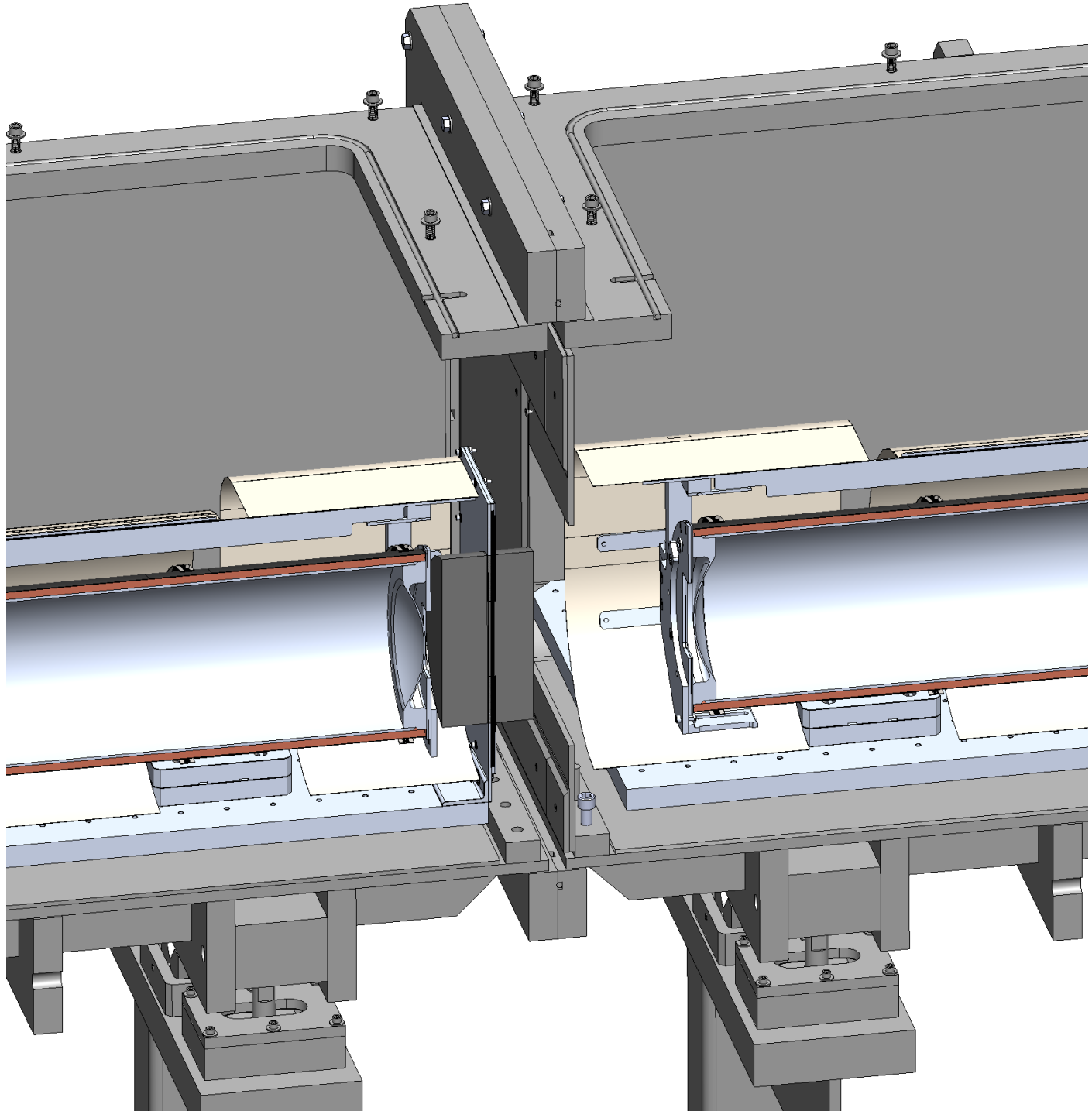












Hi Yuri,

I do expect to install this from the side before the outer magnetic shield is installed.

I also think that slitting the holes in the shielding near the cadmium package will be good. It is not necessarily required to make things clear but gives us some extra flexibility for when imperfect reality strikes.

I'd be happy to talk about this in tomorrow's meeting.

Shieldwerx carries 5% borated HDPE (density is 1.07 g/cm^3). They also carry a 5% borated self-extinguishing version (density is 1.60 g/cm^3). You can see those here:

- https://www.shieldwerx.com/poly-based-shielding
- https://www.shieldwerx.com/_files/ugd/fb24e8_7f15396dd82b4abf9a940052d8ee56af.pdf
- https://www.shieldwerx.com/_files/ugd/fb24e8_e625b2e7bc8e4d5fb1e7a8d61a10b97d.pdf

John