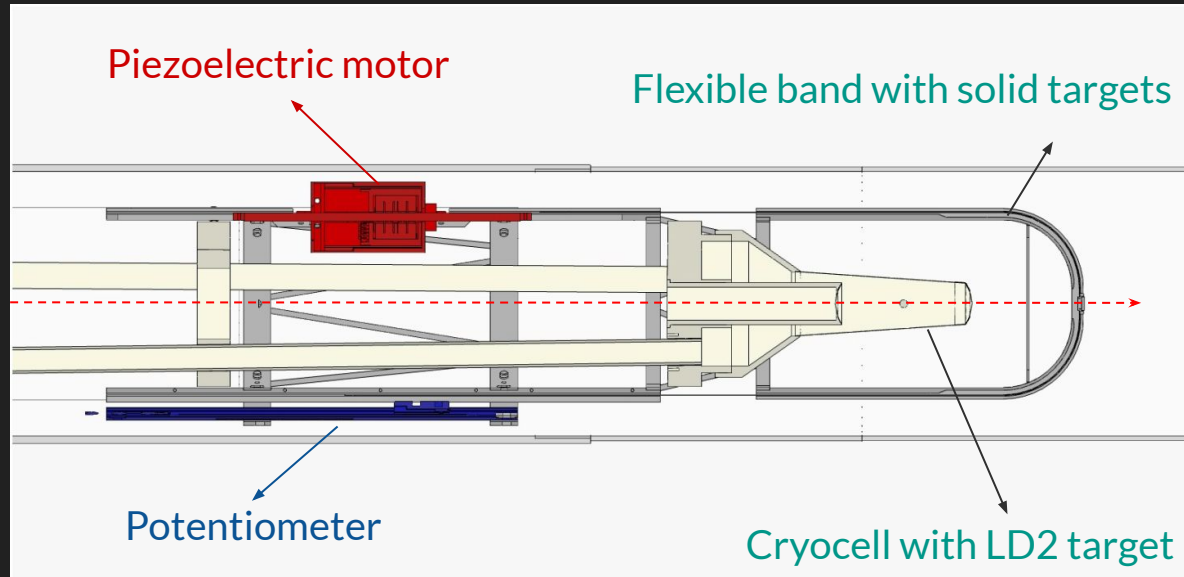


RG-E Experiment Update

Antonio Radic

CLAS collaboration meeting
November 12 - 15 2024

RG-E Double-target system



Solid target

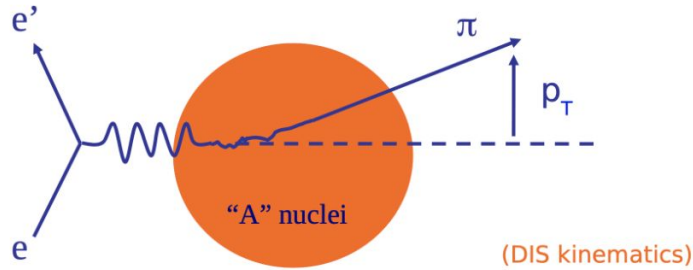
- Carbon
- Aluminum
- Copper
- Tin
- Lead

Liquid target

- Deuterium

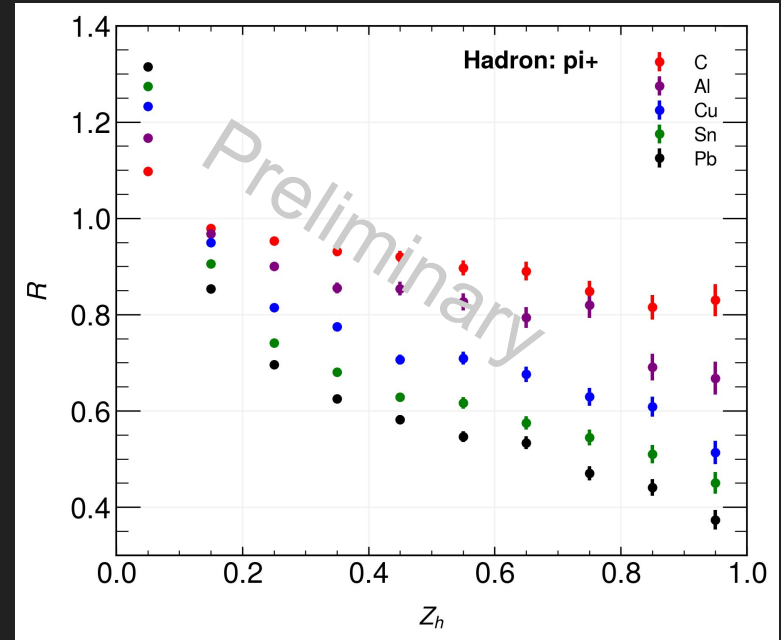
Physics and observables

Transverse momentum broadening: $\Delta p_T^2 = p_T^2(A) - p_T^2(^2H)$



Hadronic multiplicity ratio:

$$R_M^h(z, \nu, p_T^2, Q^2, \phi) = \frac{\left\{ \frac{N_h^{DIS}(z, \nu, p_T^2, Q^2, \phi)}{N_e^{DIS}(\nu, Q^2)} \right\}_A}{\left\{ \frac{N_h^{DIS}(z, \nu, p_T^2, Q^2, \phi)}{N_e^{DIS}(\nu, Q^2)} \right\}_D}$$



Run summary and data collected

- Data taken in Spring 2024 from March 15th to May 19th
- 10.547 GeV electron beam
- >95% of data has inbending torus polarity

Data taken

Target	Current (nA)	Days	PAC Days	Accumulated charge (mC)	Integrated luminosity (1/fb)
LD2 + C	85	6.3	3.2	23.17	24.38
LD2 + Al	70	6.8	3.4	20.53	24.23
LD2 + Cu	75	6.6	3.3	21.46	22.42
LD2 + Sn	65	9.8	4.9	27.60	21.58
LD2 + Pb	70	14.4	7.2	43.63	26.76
Pb (only)	160	0.7	0.4	4.98	2.84
C (only)	85	0.6	0.3	2.29	3.79
Total		44.7	22.3	143.66	126.00

Calibration status

- Last cooked version: pass0.3 (online calibration)
- In progress: DC alignment
- DC alignment is a validation of RG-K alignment.
- Next steps: Run pass-0/timelines after DC alignment, schedule “ready for calibration” review

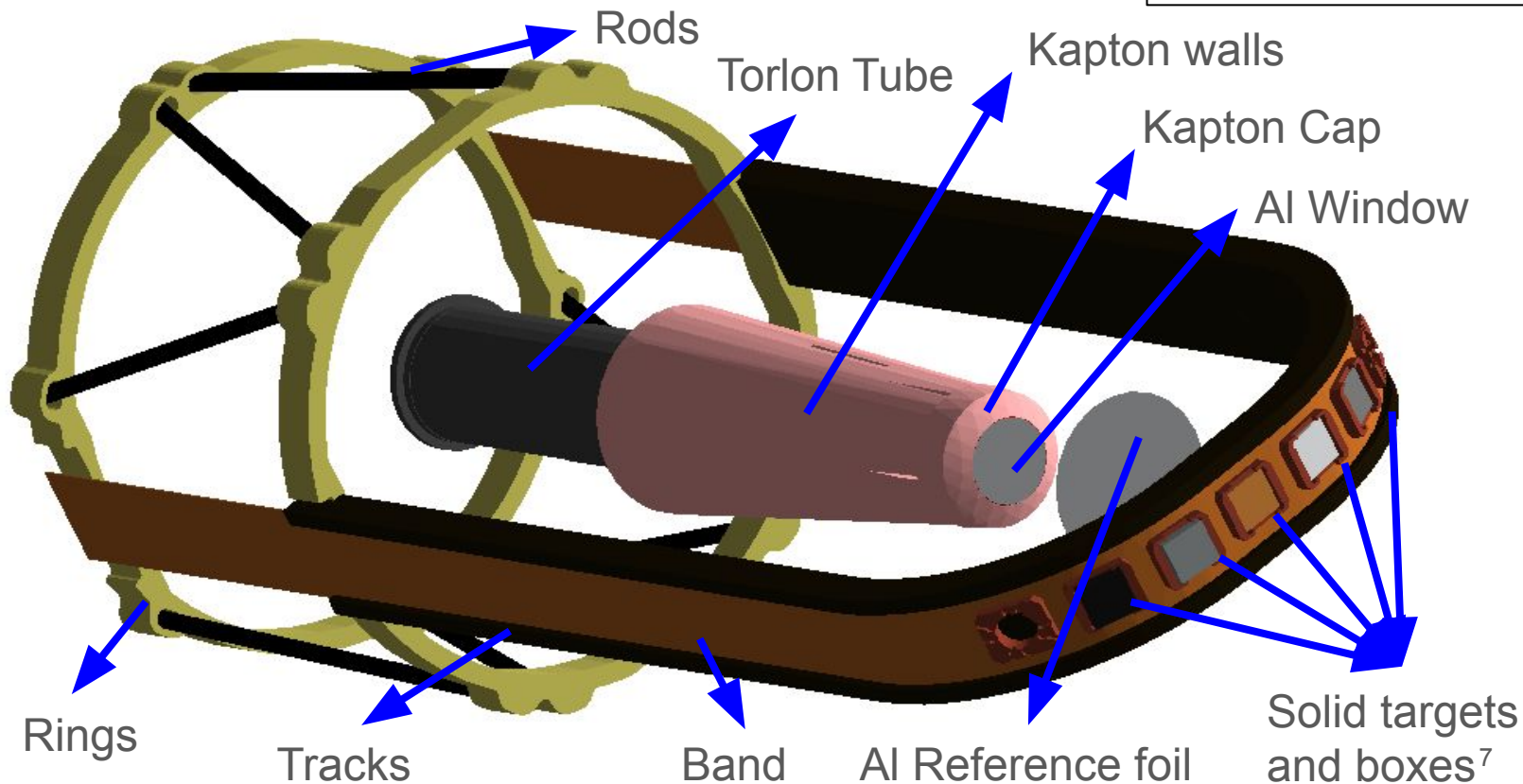
RG	June	July	August	September	October	November	December	January
E						A horizontal timeline bar for November. It starts with a purple box labeled 'alignment' spanning from the beginning of the month to a green vertical line. Below this, a yellow box labeled 'calib review' spans from the green line to the end of the month. To the right of the green line, an orange box labeled 'pass-1 calibration' spans from the end of the month to the beginning of December. A green circle with the number '5' is positioned at the end of the purple box.		A horizontal timeline bar for January. It consists of an orange box labeled 'pass-1 calibration' spanning the entire month.

RG-E implementation in GEMC

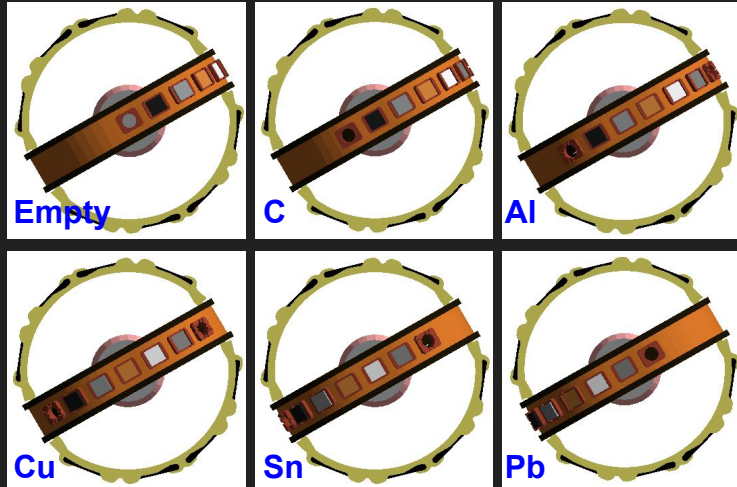
- ✓ Implementation of RG-E geometries in GEMC
 - ✓ Construction of CAD models
 - ✓ Modification of perl scripts
 - ✓ Solve geometry overlaps (BST shield)
- ✓ Incorporation in clas12-config
 - ✓ Gcards for GEMC simulations
 - ✓ Yaml files for reconstruction
 - ✓ Setup configuration file
- Implementation in OSG portal

Geometry implemented

*Scattering chamber and BST shield not shown here



Configurations added to GEMC



```
<!-- targets -->  
  
<!-- Liquid target. Variations include: "2cm-1D2", "2cm-1D2-empty"-->  
<detector name="target" factory="TEXT" variation="2cm-1D2"/>  
  
<!--Solid target. Can be changed here by choosing a CAD subdirectory.-->  
<detector name="rge-dt/[solid_target]/" factory="CAD"/>  
<detector name="rge-dt/common/" factory="CAD"/
```

- RG-E models are currently in module gemc/dev
- 10 gcards and yaml files were added to JeffersonLab/clas12-config
- 5 gcards for solid target and 5 gcards for liquid deuterium vertices

Summary

- Last calibration is version pass0.3. Currently in DC alignment is in progress
- RG-E double target has been implemented in GEMC
- Gcards and yaml files for most important configurations are in clas12-config
- Implementations are in dev branches for now
- Simulations for RG-E in OSG portal integration in progress

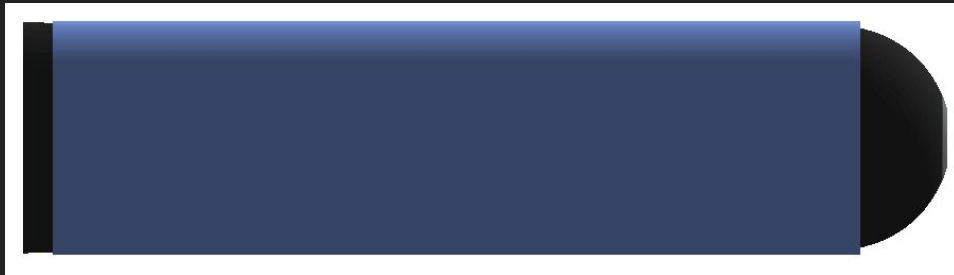
Back up Slides

BST shield overlap in GEMC



Standard BST Shield

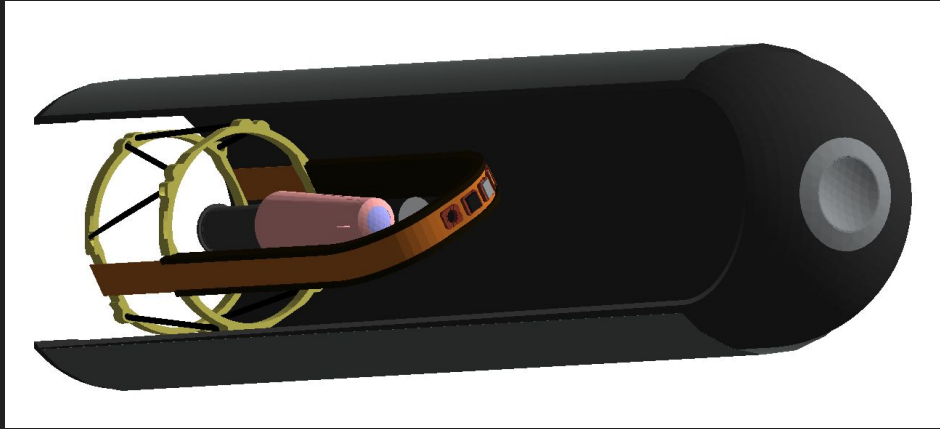
- Carbon fiber scattering chamber overlaps with tungsten shield



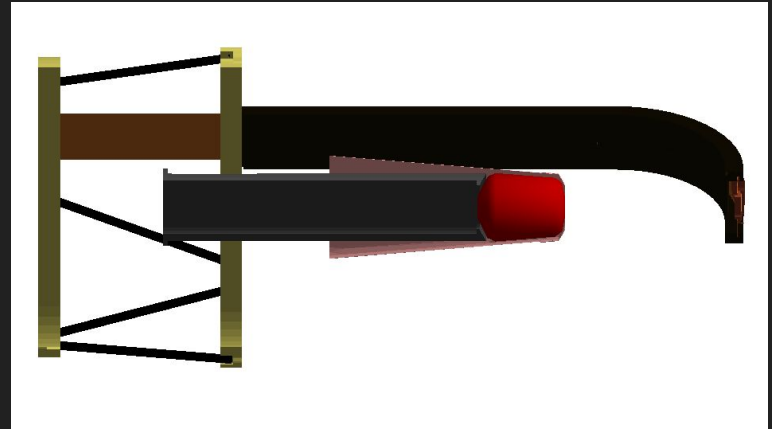
Custom BST Shield for RGE

- 1 mm bigger radius

Double target geometry - Cross section



Complete RG-E geometry



Cross section of the target
LD2 in red