

Update & Plans



Miguel Arratia,
California EIC consortium meeting,
08/21/23 @ UC Berkeley

UCR EIC team in 2023

Undergraduate students;

Luis Garabito (now at MSU), Miguel Rodriguez, [JiaJun Huang](#) (upcoming grad UCR)
Peter Carney, Mia Macias, Samir Kulkarni, Bruce Bagby (graduated),
[Youseff Abdelkadous](#)

Graduate students:

Ryan Milton, Xilin Liang, [Sean Preins](#)

Postdocs: Weibin Zhang (0.5 FTE) [MRPI] & STAR in Barish's group
Bishnu Karki (0.5 FTE) [DOE AI] & STAR in Barish's group
[Sebouh Paul](#) (0.5 FTE) [JLab EIC] & CLAS12 in Arratia's group

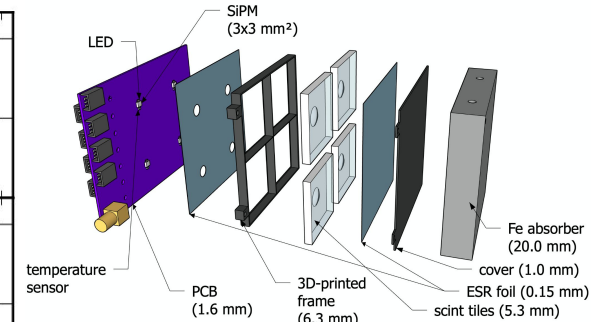
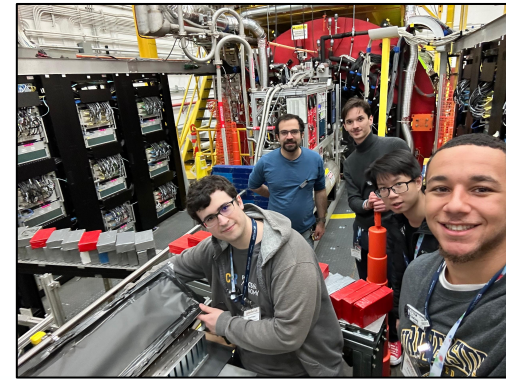
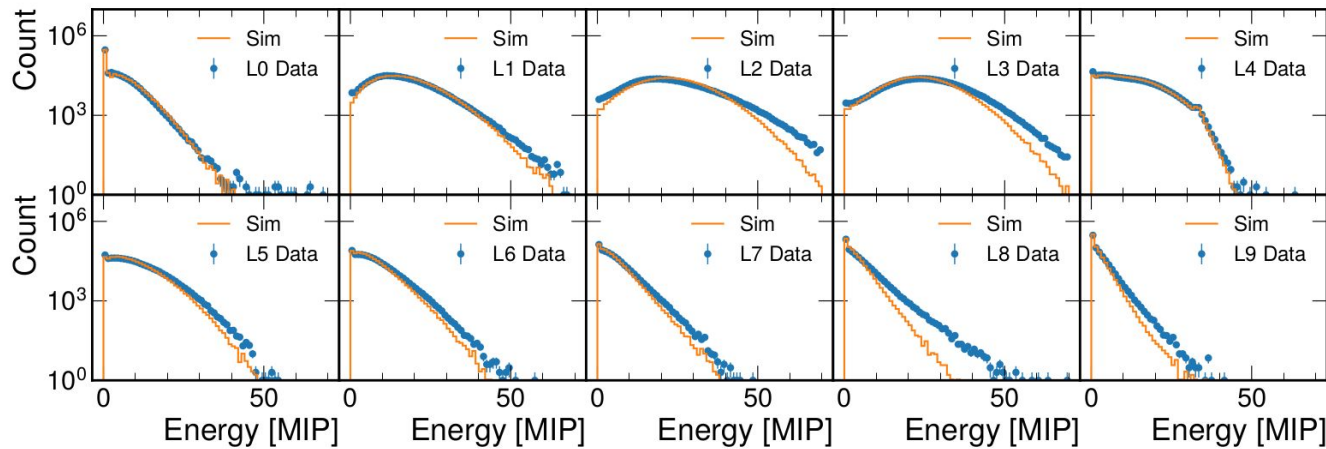
Faculty: Barish, Long, Seto, Arratia

Outline

- Calorimeter Insert updates
- A proposal for a insert-like ZDC
- A few-degree calorimeter
- Fission @ EIC

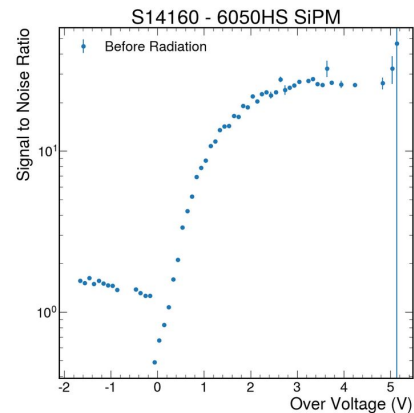
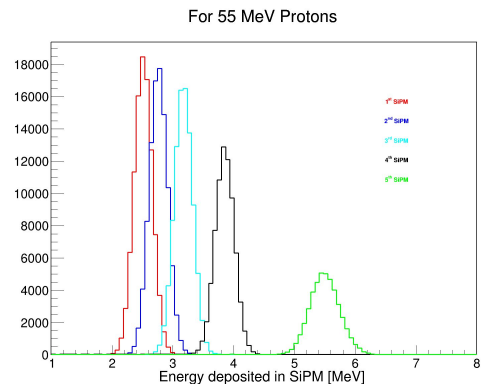
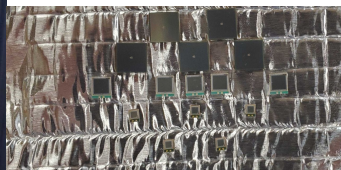
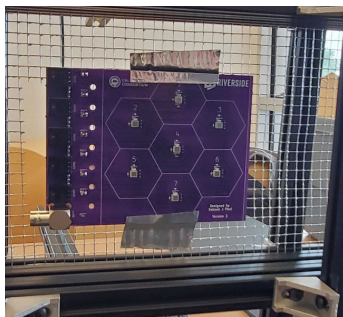
Status of 1st Calorimeter Insert Test Beam Paper

- Refined analysis, calibration, and improvement of sims since our last mtg.
- Spearheaded by lead editor Weibin Zhang (postdoc) and Sean Preins (grad)
- Results to be submitted to arXiv very soon (as detailed by Sean's talk today)



SiPM irradiation test at the 88” *unfortunately canceled due to cyclotron shutdown.

- Team led by Barak prepared testbeam setup and simulations.
- Analysis code for testbench measurements and analysis was developed



other members present but not shown in picture: Kumar, Weibin, Barak (lead)

Insert building block studies is published in JINST

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Journal of Instrumentation

PAPER

Studies of time resolution, light yield, and crosstalk using SiPM-on-tile calorimetry for the future Electron-Ion Collider

Miguel Arratia^{1,2}, Luis Garabito Ruiz¹, Jiajun Huang¹, Sebouh J. Paul¹, Sean Preins¹ and Miguel Rodriguez¹

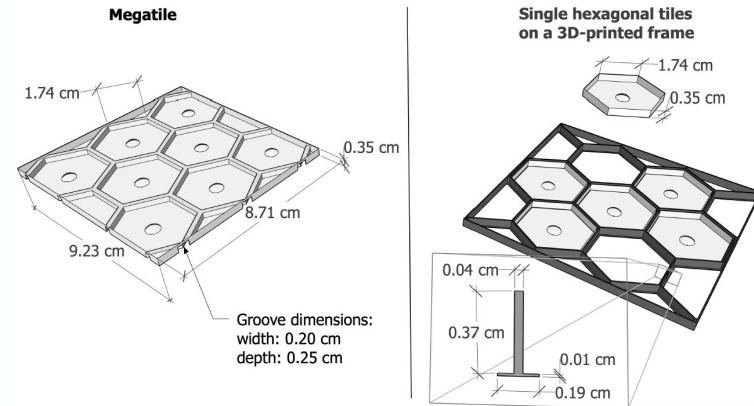
Published 26 May 2023 • © 2023 IOP Publishing Ltd and Sissa Medialab

[Journal of Instrumentation, Volume 18, May 2023](#)

Citation Miguel Arratia et al 2023 *JINST* 18 P05045

DOI 10.1088/1748-0221/18/05/P05045

- Most studies already presented in UCLA mtg



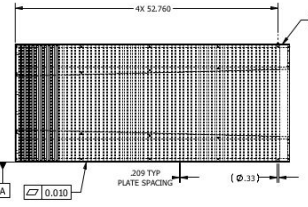
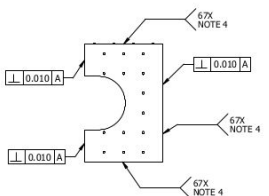
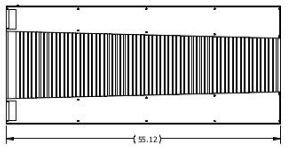
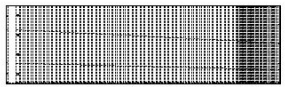
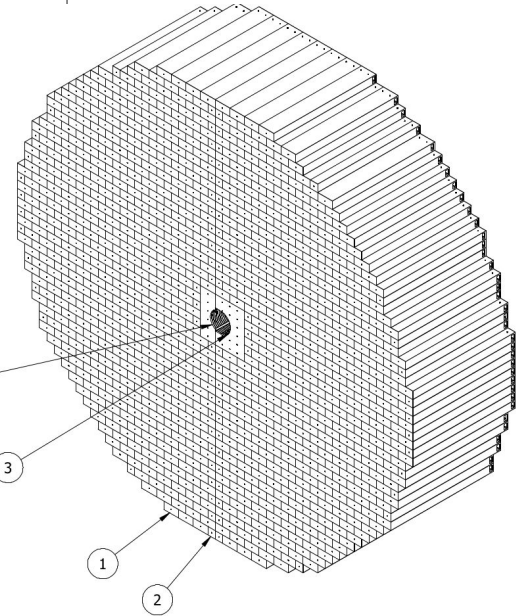
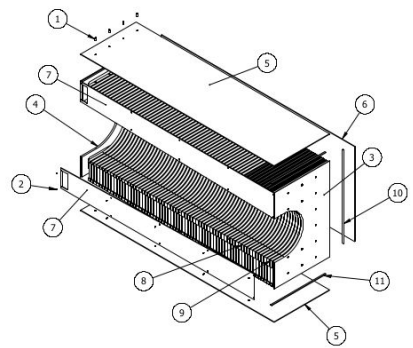
The CALI subsystem is fully integrated in engineering design, project cost & schedule, ePIC collaboration structure, official simulations, etc



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NOTES

- PIN 8 & 9 ARE TO BE INSTALLED NUMERICALLY BASED ON THE LAYER I CORRESPONDING DRAWINGS STARTING AT THE FRONT PLATE OF THE BE INSTALLED 1, 2, 3 - SS. PIN 8 WILL BE INSTALLED 1, 2, 3 - SS.
- PIN 8 LAYER 55 WILL BE ORIENTED WITH THE PRESS FIT HOLES FACIN 1) WILL BE INSTALLED AFTER WELDING.
- E-BEAM WELD ALONG CENTERLINE OF CONTACTING FACES ALL PARTS

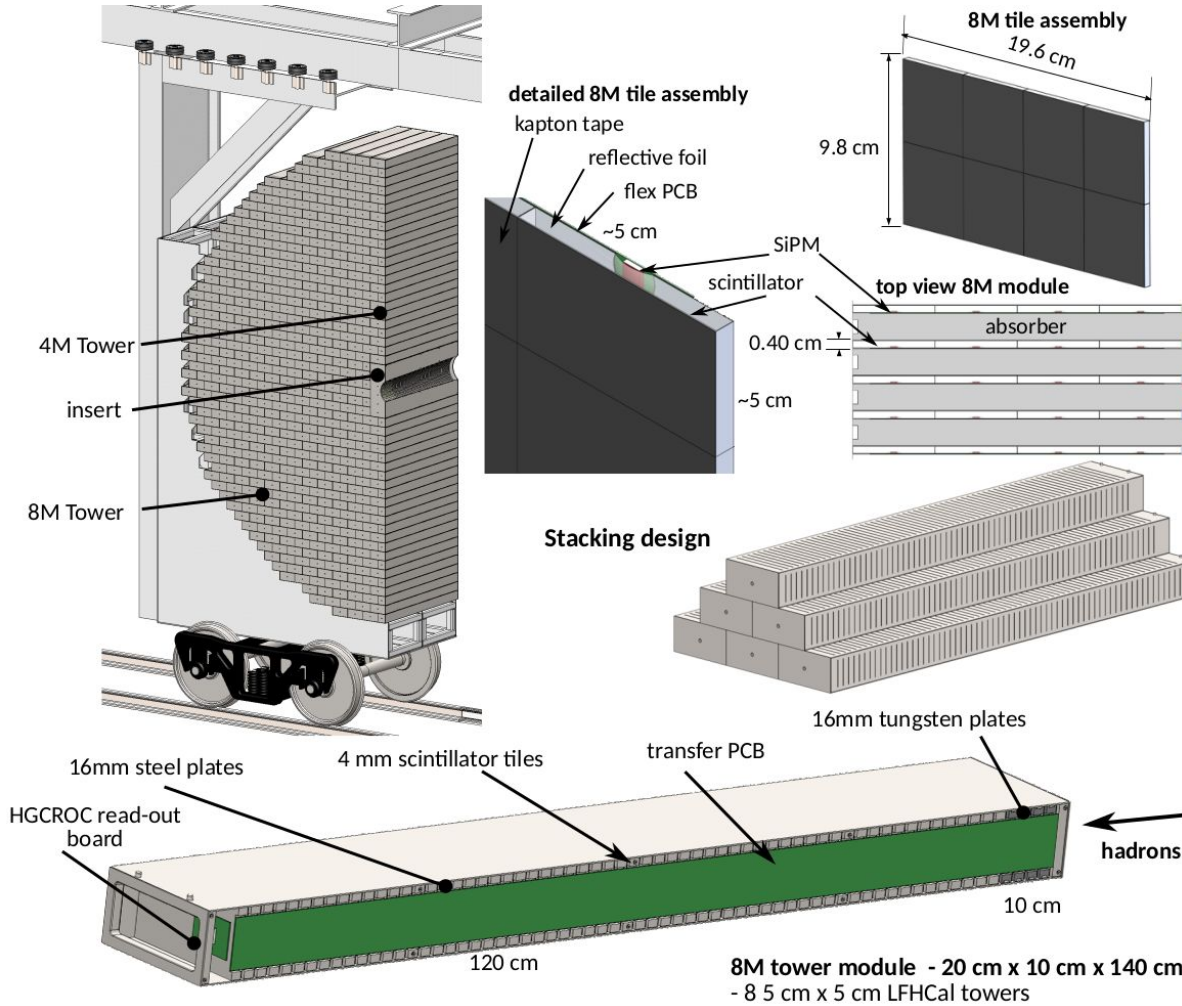


11	20	SHORT BINA	1045 CARBON STEEL	11 GA SHIP
10	10	LONG BINA	1045 CARBON STEEL	11 GA SHIP
9	10	TRIGGER ANCHOR PLATE	304L STAINLESS	PLA1
8	10	SIDE ANCHOR PLATE	1045 CARBON STEEL	PLA1
7	2	POLE COILS	1045 CARBON STEEL	10 GA SHIP
6	1	SIDE PLATE	1045 CARBON STEEL	10 GA SHIP
5	2	TOP TIE ROD PLATE	1045 CARBON STEEL	10 GA SHIP
4	1	BACK PLATE	1045 CARBON STEEL	PLA1
3	1	FRONT PLATE	1045 CARBON STEEL	PLA1
2	20	MICHAELSON RODS (R1)	ALLOY STEEL	103.3 X 1000
1	4	MICHAELSON RODS (R2)	STEEL	8000 X 2000 X 1000

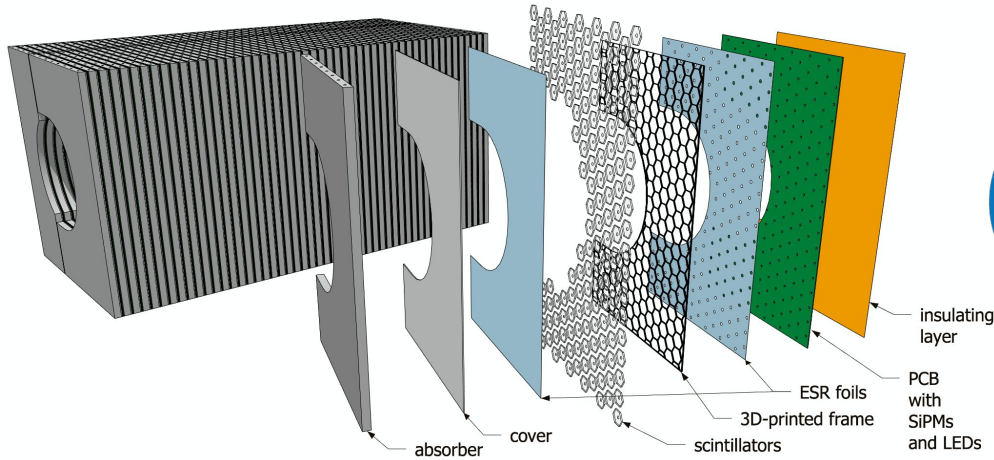
QUALITY VERIFICATION REQUIREMENT CHECKPOINTS MATERIAL MILL TEST REPORT DATA TEST REPORT DIMENSIONING WELDING INSPECTION REPORT FIRST TYPICAL REPORT OPERATIONAL REPORT IMPROVED WELDING COST FUNCTIONAL TEST REPORT COUPLER REPORT PERFORMANCE REPORT		APPROVALS DES. BY FOUNDATION DATE 01/20/20 DES. BY FOUNDATION DATE 01/20/20 DES. BY FOUNDATION DATE 01/20/20 QA DATE 01/20/20	OAK RIDGE NATIONAL LABORATORY 4009 CENTRE DRIVE KENTON, TN 37831-6009 REMOTE SYSTEMS GROUP EPIC INSERT ASSEMBLY RIGHT SIDE WELDMENT 3744.10 LBS EPIC-100 EPIC-410 SCALE 1:1 SHEET 1 OF 1
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D
C
B
A

The Calorimeter Insert is the first subdetector (and technology) not included in any proposal that is currently part of the ePIC baseline



“We will design these [detectors] and attract construction funds to California”

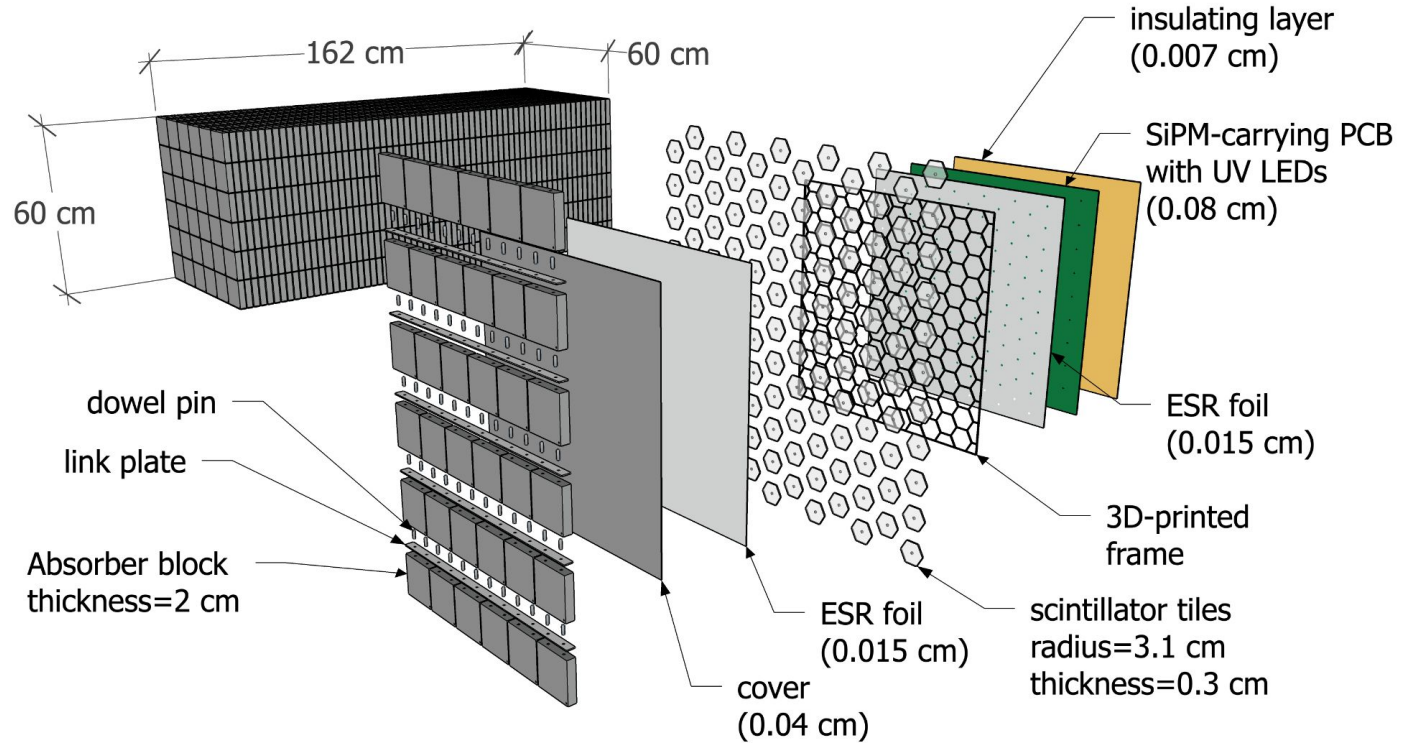


**CALIFORNIA EIC
CONSORTIUM**



An insert-like Zero Degree Calorimeter

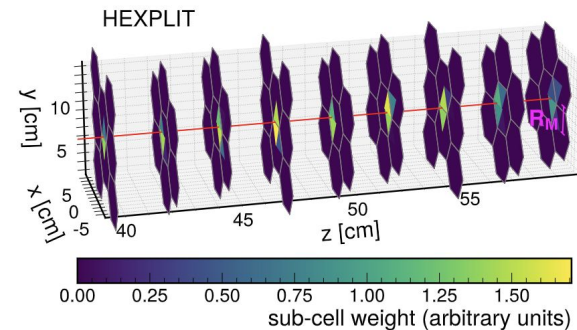
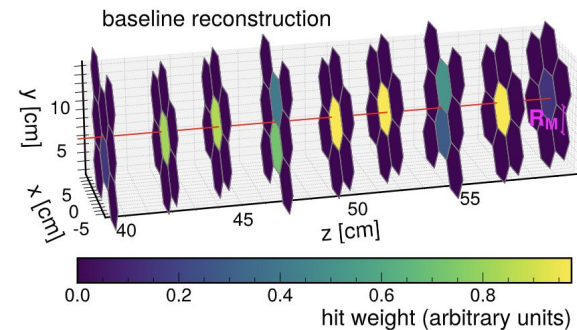
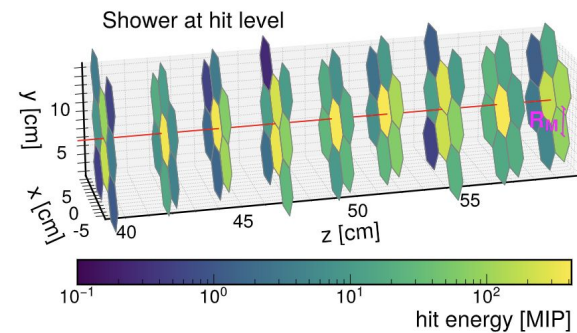
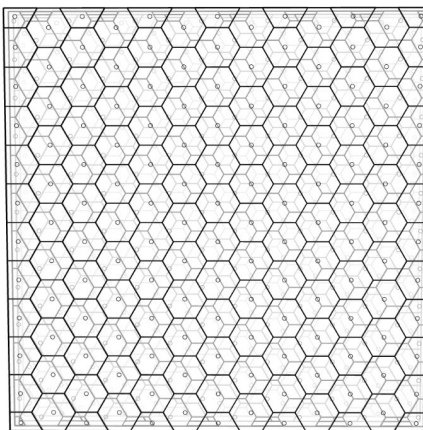
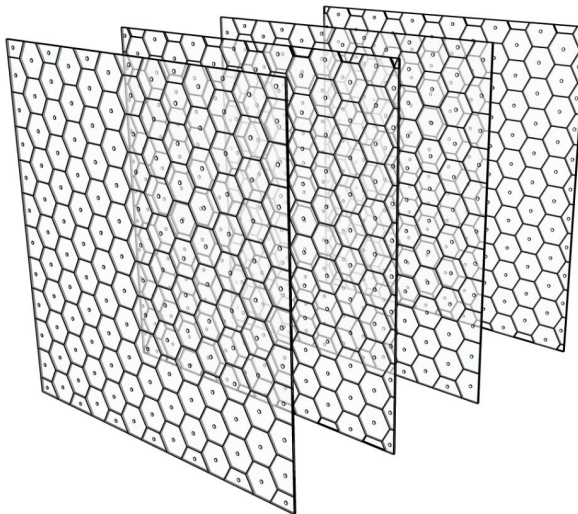
High-granularity
& low cost
(reused STAR
HCAL blocks)



Staggering and the HEXPLIT algorithm

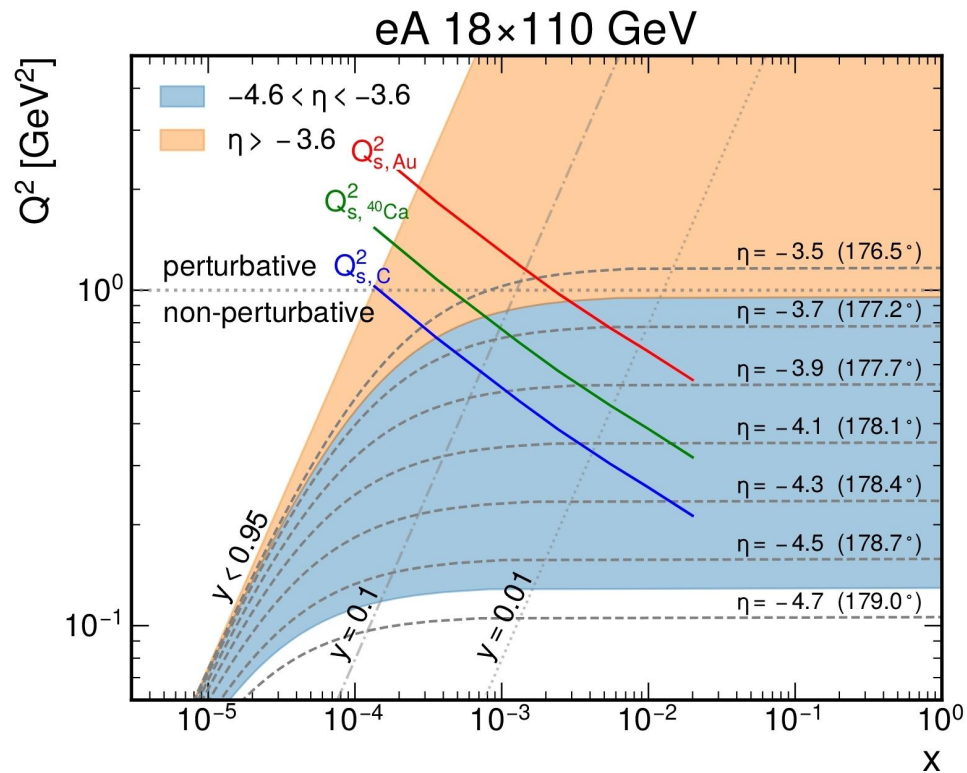
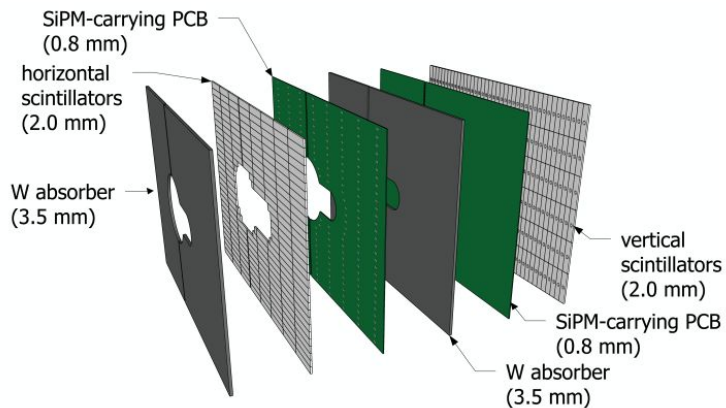
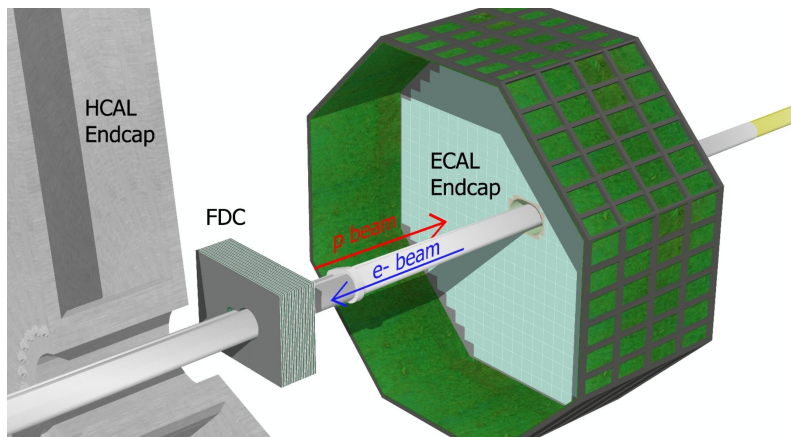
[arXiv:2308.06939](https://arxiv.org/abs/2308.06939)

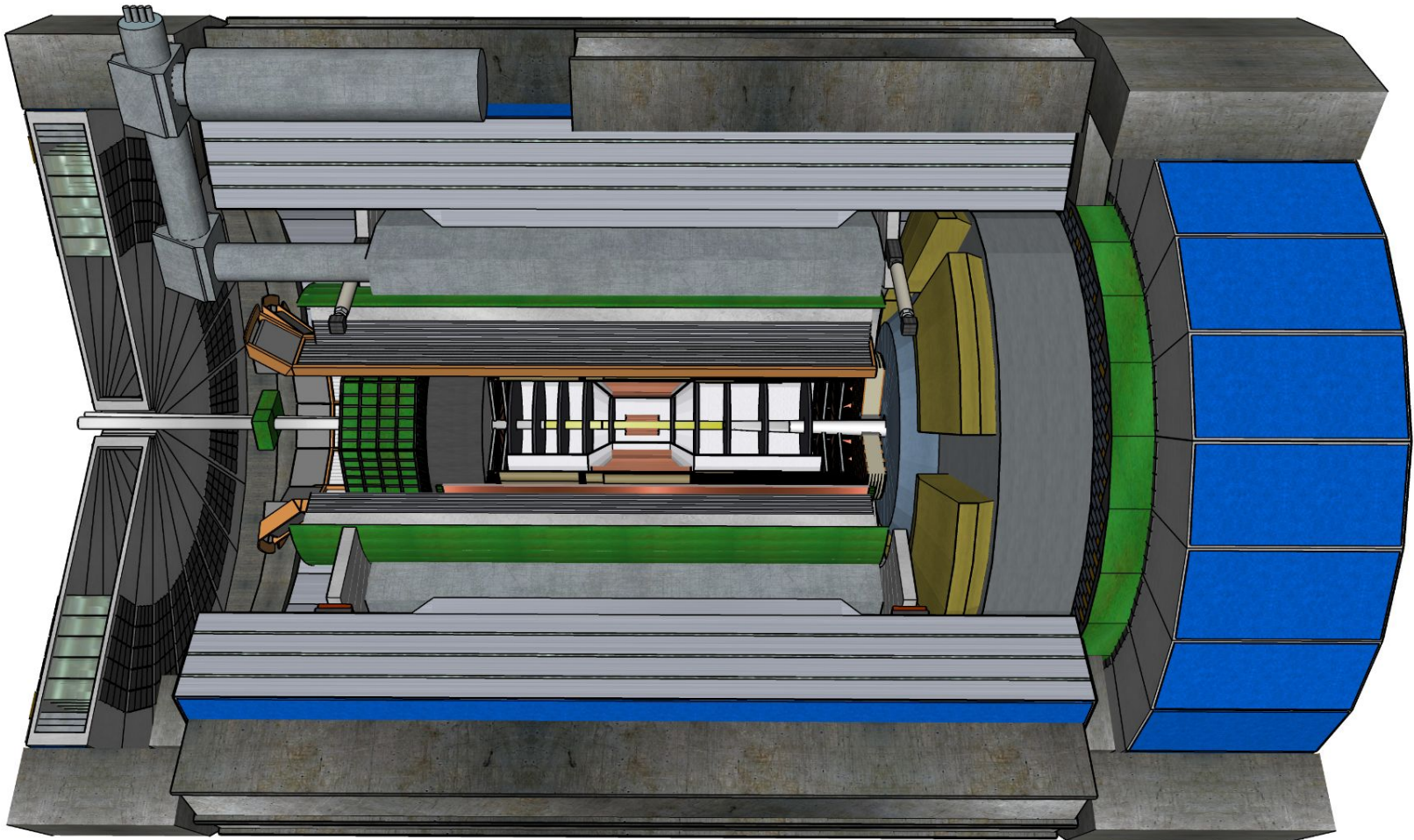
More details in
Sebouh's talk today



A Few Degree Calorimeter

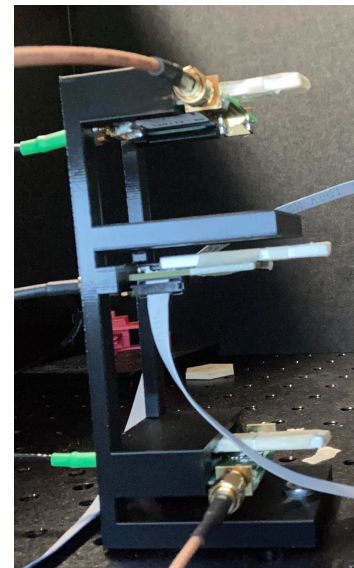
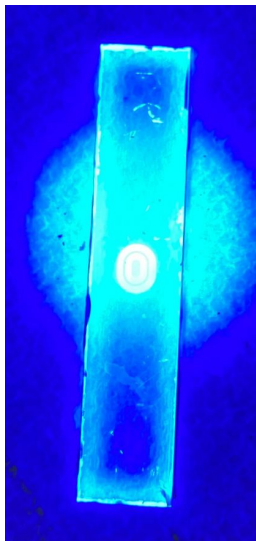
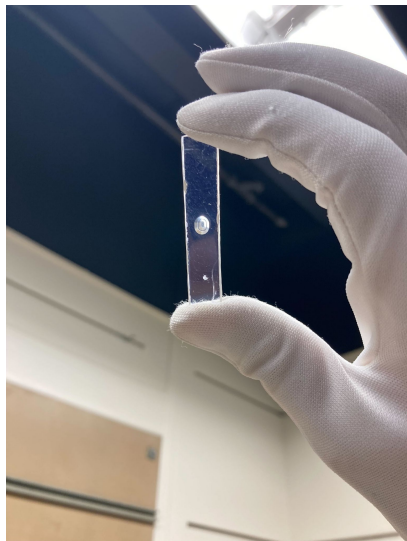
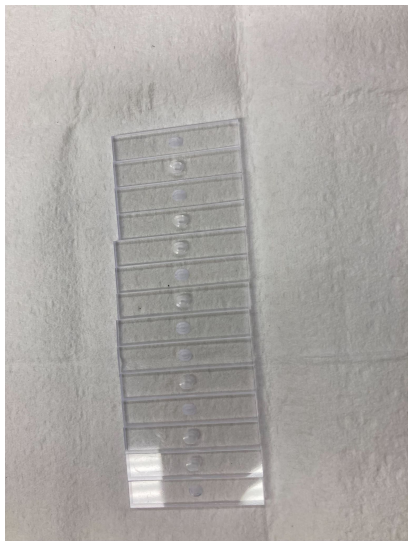
arXiv:2307.12531





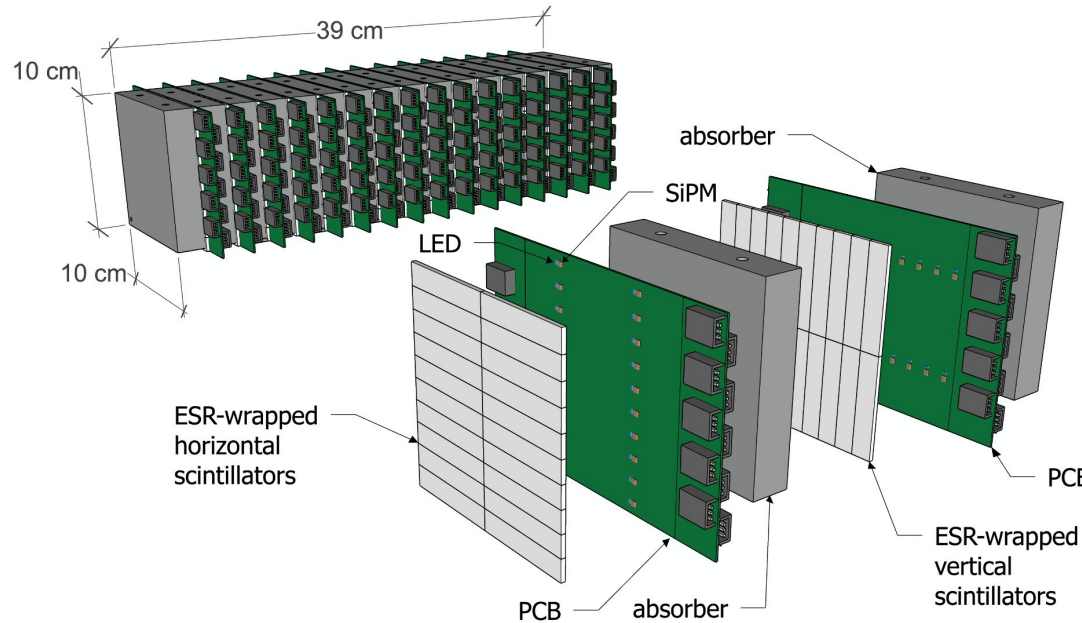
FDC R&D

We have made initial steps towards R&D for FDC ([detailed in Youseff's talk today](#))



R&D Plans for FDC (submitted to EIC generic R&D)

- Characterization of building blocks
- Development of timing layer
- Development of 5D algorithms to tag background
- Build prototype & test at JLab



Forward ECAL

We plan to contribute to forward ECAL project

- In near term with SiPM board calibration.
(we just finished setting contract with BNL for eRD106)
- Then mounting a W/SciFi block QA site, possible more?
(depending on circumstances)

Fission @ EIC

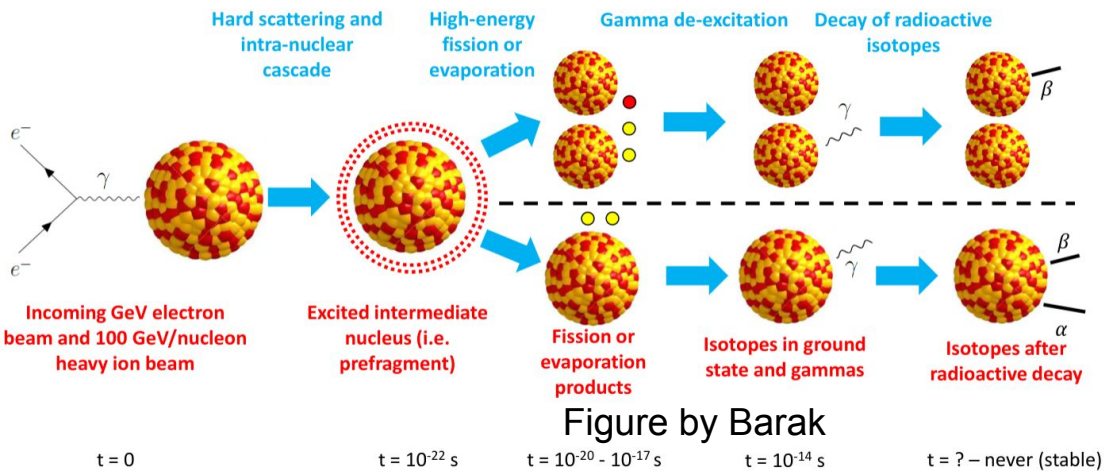
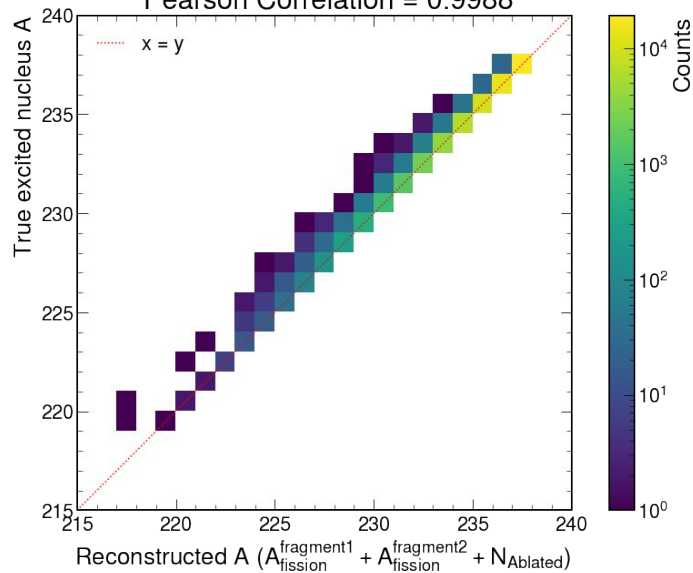


Figure by Barak

Reconstructing fission isotopes + ablated neutron at detector level Roman Pots 2
Pearson Correlation = 0.9988



We plan in working developing Barak's idea, and pursue fission studies in particular (as detailed in Jiajun's talk today).

Will be synergistic to ZDC R&D, and new detector to measure fragment's Z ("FZD")

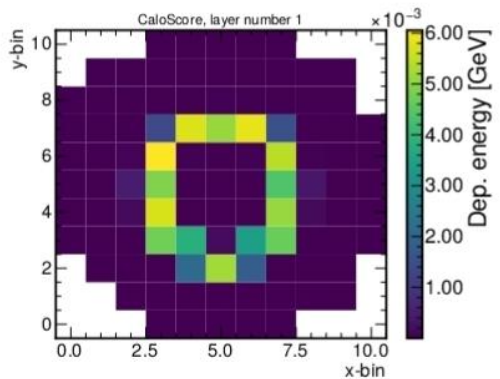
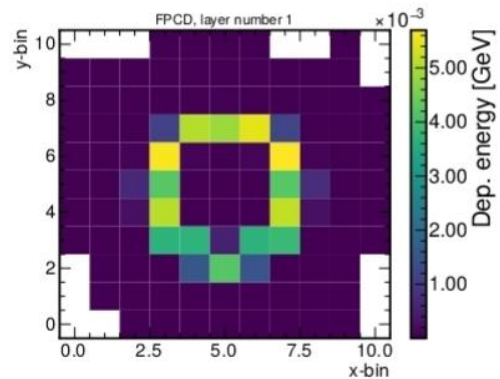
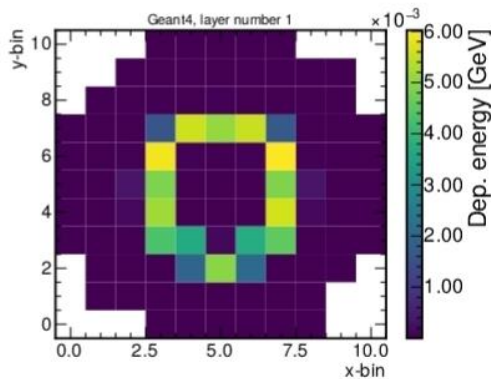
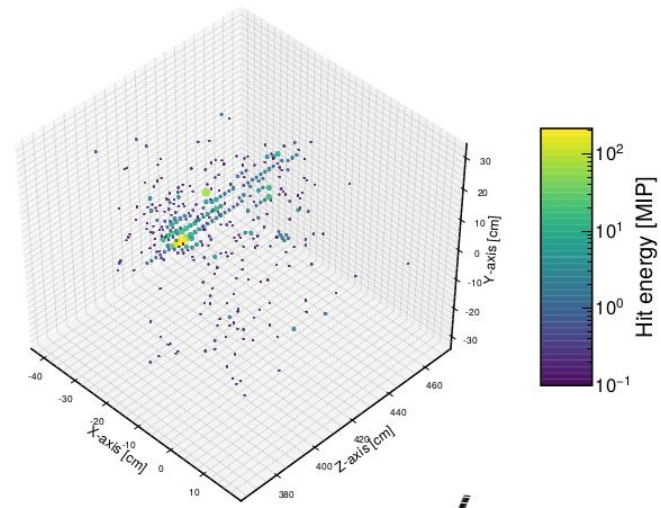
Possible new collaborations within consortium?

AI (collaboration with LLNL)

We continue to collaborate with LLNL on AI research focused on EIC applications.

Optimization of calorimetry for EIC is our current focus (DOE supported).

Recent paper out 2307.04780



Summary of Update and Plans

- Insert was fully integrated in ePIC (yay!)
- Insert building block test paper → in JINST
- Insert 1st testbeam paper soon to be in arXiv
- Setup for SiPM irradiation campaign is ready
- New idea for ZDC → algorithm paper in arXiv
- New idea for FDC → design paper in arXiv
- Plans:

Continue development of Insert, particularly production

Push for ZDC & develop fission ideas

Contribute to W/SciFi ECAL project (eRD106 & beyond)

Seek to continue AI/ML collaboration with LLNL (Aaron et al)

