

eRD106. Forward ECal. Proposal for FY23

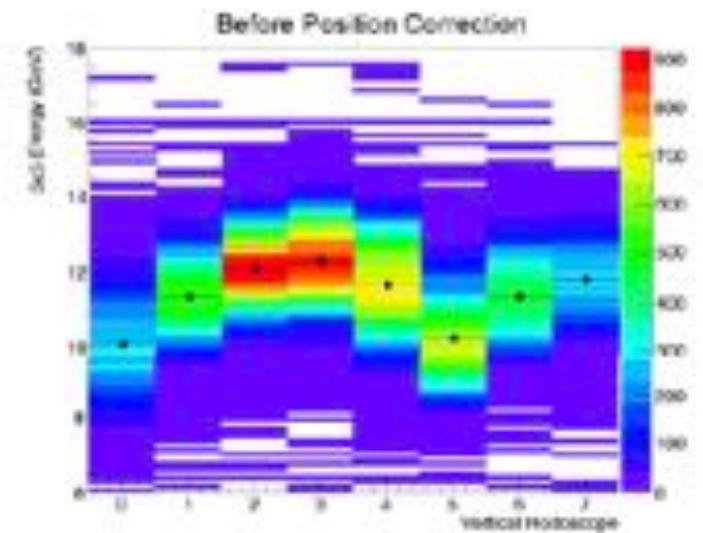
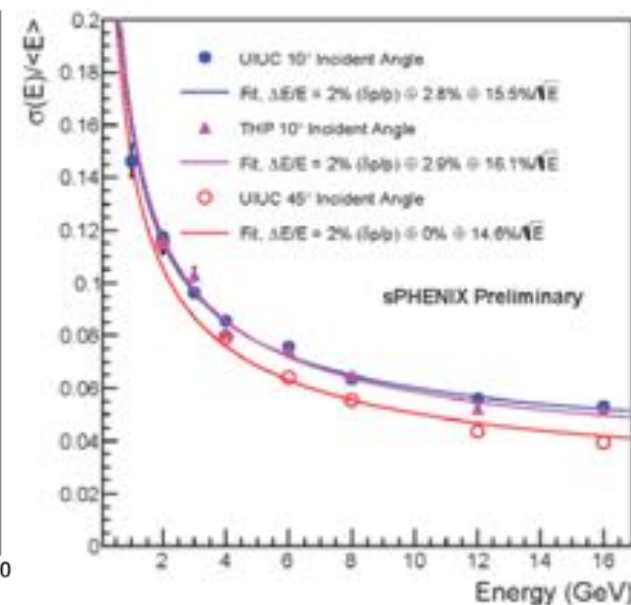
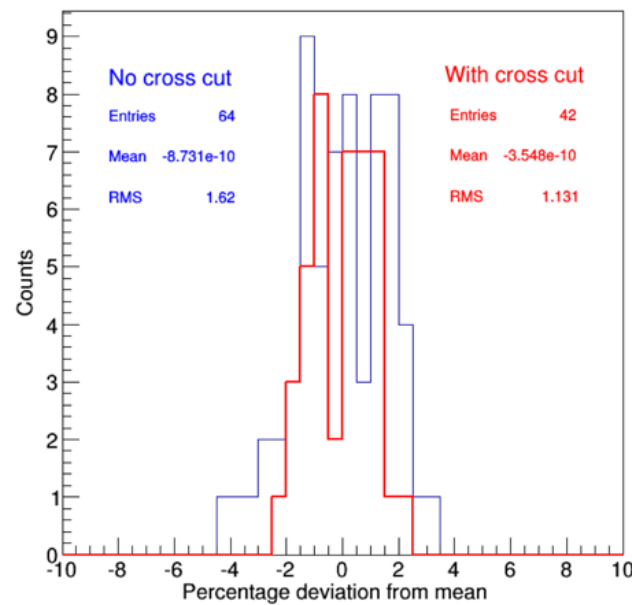
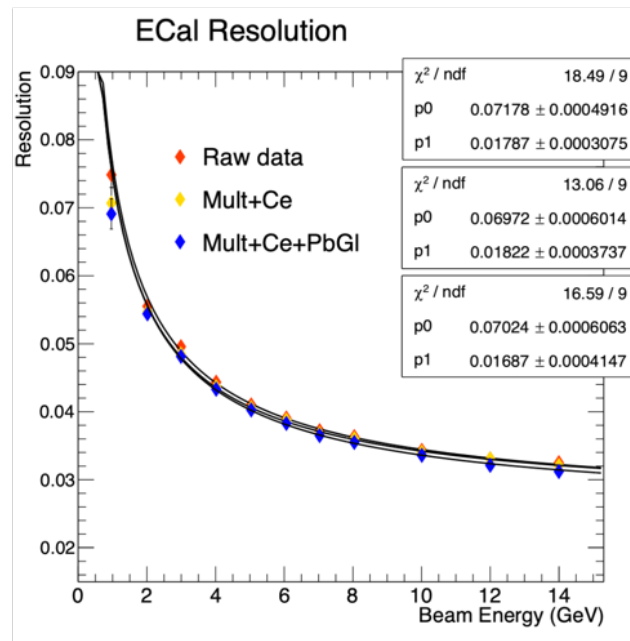
O. Tsai (UCLA/BNL) for eRD106 Consortium

BNL, Chinese EIC ECal Consortium (Fudan, Shandong, Tsinghua Universities), Indiana University, UC EIC Consortium (University of California at Los Angeles, University of California Riverside)

eRD106. There are two remaining technical questions for W/ScFi technology from the generic R&D program that we intend to address in eRD106:

1. Uniformity of light collection → constant term ~2% in energy resolution in YR.
2. Efficiency of light collection - > updated YR requirement on min. energy ~ 15 MeV.

eRDI, Results 2016



'Ideal Light Collection' PMT+ long light guide
Constant term 1.7%

Short Light Guides, SiPMs
Constant term ~5% (sPHENIX latest numbers)
Light Yield was about 390 p.e. / GeV

Overall Status

- UCLA grant/contract office and BNL finally signed agreement early Aug., delay in funding ~8 months shifted schedule accordingly.

Milestones for FY23:

To address the remaining technological questions:

- Construct 64 channel ECal prototype, using latest method developed by eRD1.
- Optimize light guides – in progress
- Test detector at FNAL.

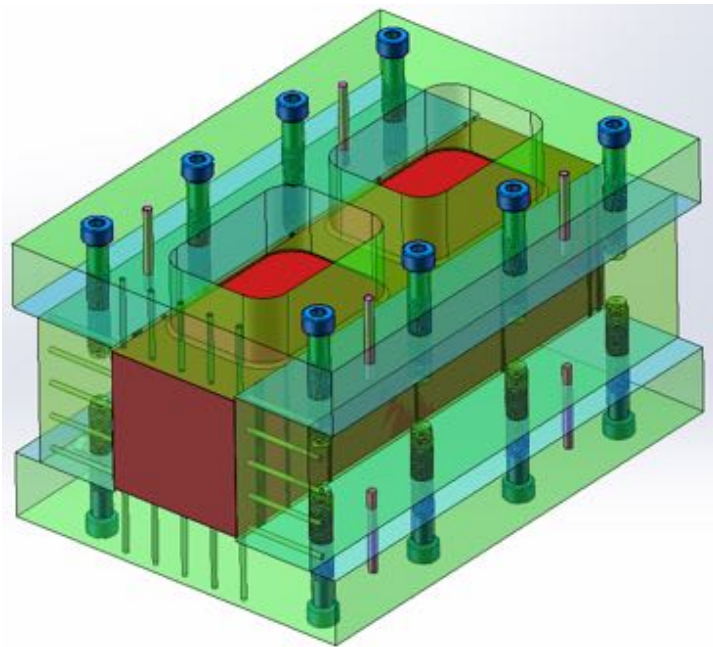
Moving toward CD2/3A:

- Mechanical integration of ECal into ePIC.
- Structural tests (shear and compressions).
- Comparison of 'EIC specs' Saint Gobain (Luxium) and Kuraray fibers.
- Optical/mechanical/electrical integration of readout (with eRD109) – in progress.

FY 22 Detailed Schedule.

1. Run tests with old components at Fudan, old production mold/methods and tooling from UCLA. 12/31/22
2. Comparison of new Bicron BCF-12 Fibers with Kuraray SCSF-78. 1/15/23
3. Assembly of one production block in China from leftover materials 1/31/23.
4. Shear tests complete 3/30/23
5. Acquire Sc. Fibers (all fibers delivered to Fudan) 02/27/23
6. Acquire W Powder (all powder delivered to Fudan) 02/27/23
7. Acquire production meshes and tooling (all meshes and some tooling in Fudan) 02/27/23 -> expecting meshes in hand by the end of Aug.
8. Iteration on production methods and molding forms finished 03/30/23
9. Start production of blocks for test beam prototype 04/01/23
10. Deliver two production blocks to US for inspections 05/01/23
11. QA first production blocks 05/15/23
12. Perform UV scan to check uniformity LY 05/30/23
13. Deliver all production blocks to US 06/30/23
14. QA Production all blocks done 07/15/23
15. Compression tests complete 7/30/23 – not needed/redefined
16. Mechanical/optical/electrical integration with readout complete 8/15/23
17. Light guides for prototype produced 8/30/23
18. 64 channel prototype ready for integrating readout. 09/30/23
19. Readout electronics for test run, software, MC complete 10/30/23
20. Test Run at FNAL complete 12/15/23.

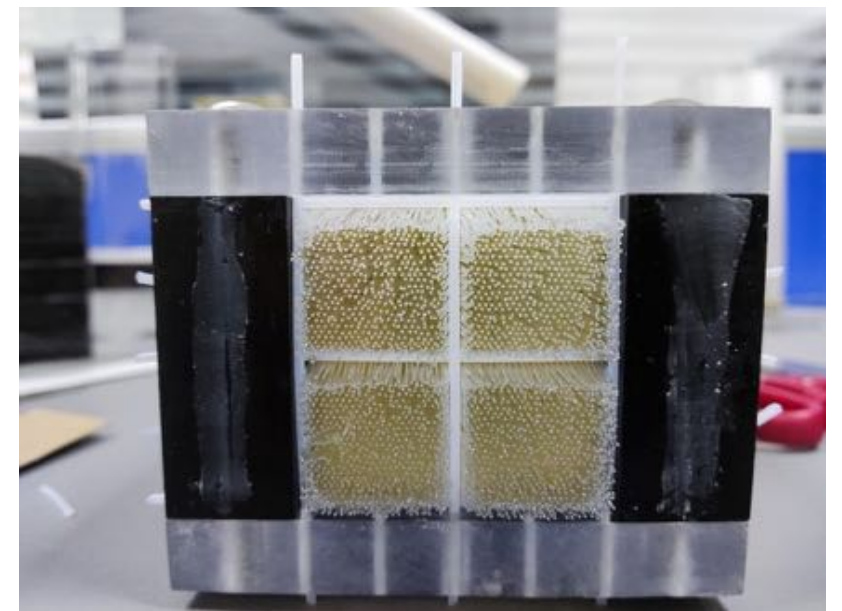
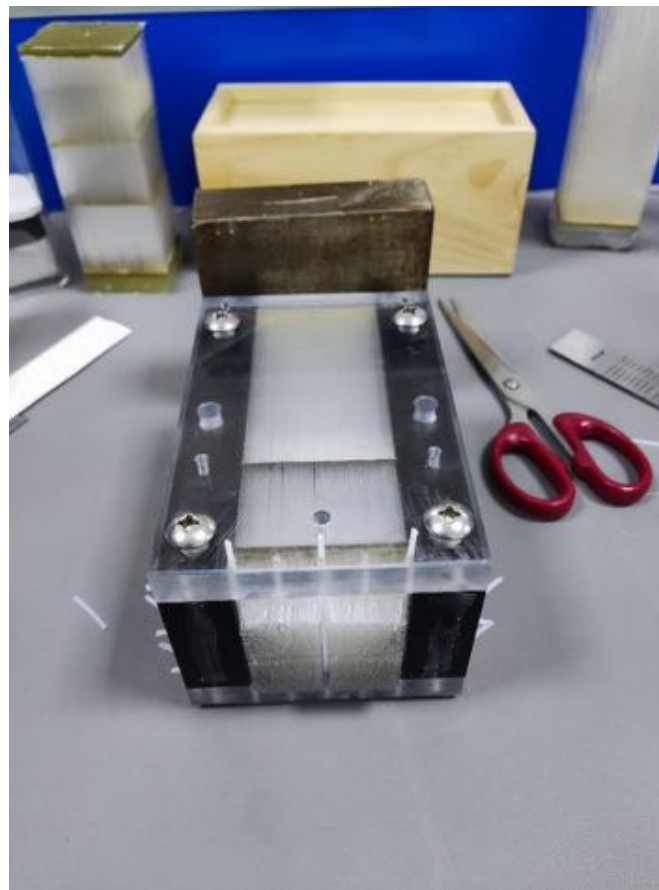
ePIC-fECal block: Mold Test runs at Fudan



- Tools (screws, dowels, capillary tube, etc) for mold assembly are ready at Fudan.
- It works well for putting the fiber set in the mold.
- New molds are ready.

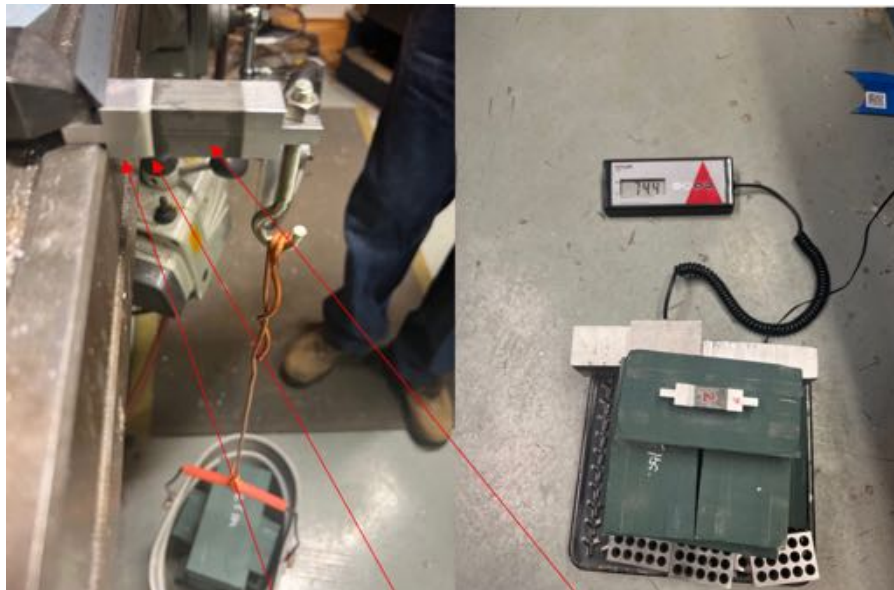


New Mold



ePIC-fECal block: Shear Tests at BNL

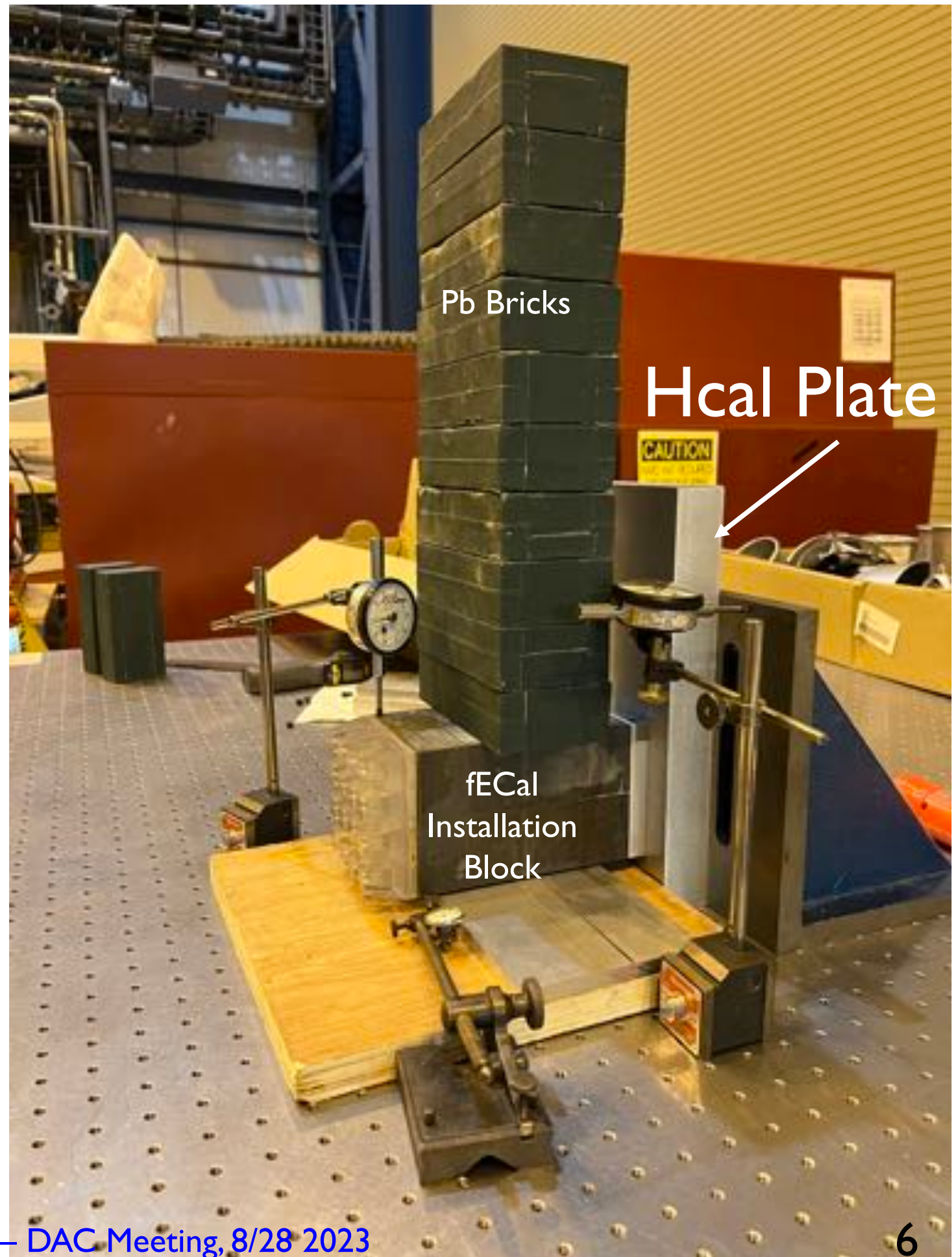
- The purpose of these tests is to measure safety factor for proposed mounting scheme of fECal at the ePIC configuration.
- With the tests performed, a very simple mounting scheme for fECal has been validated. Safety factor is larger than 75.



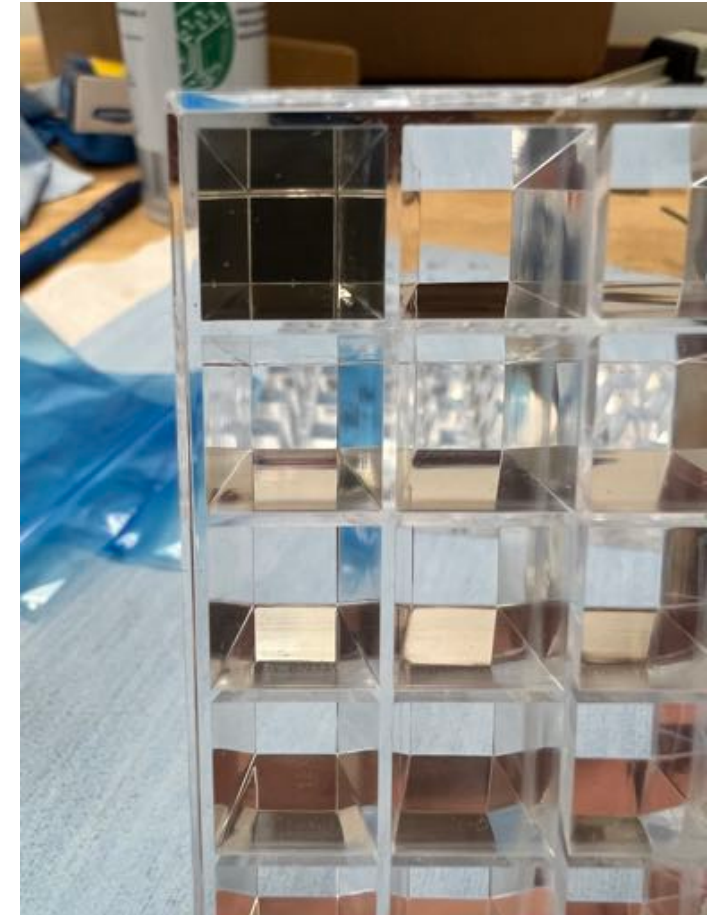
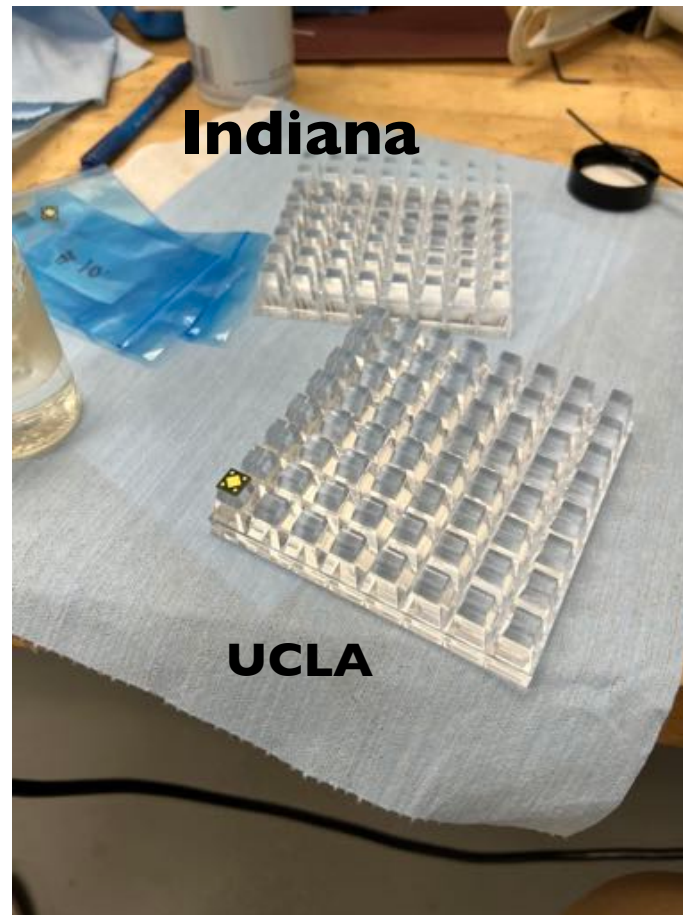
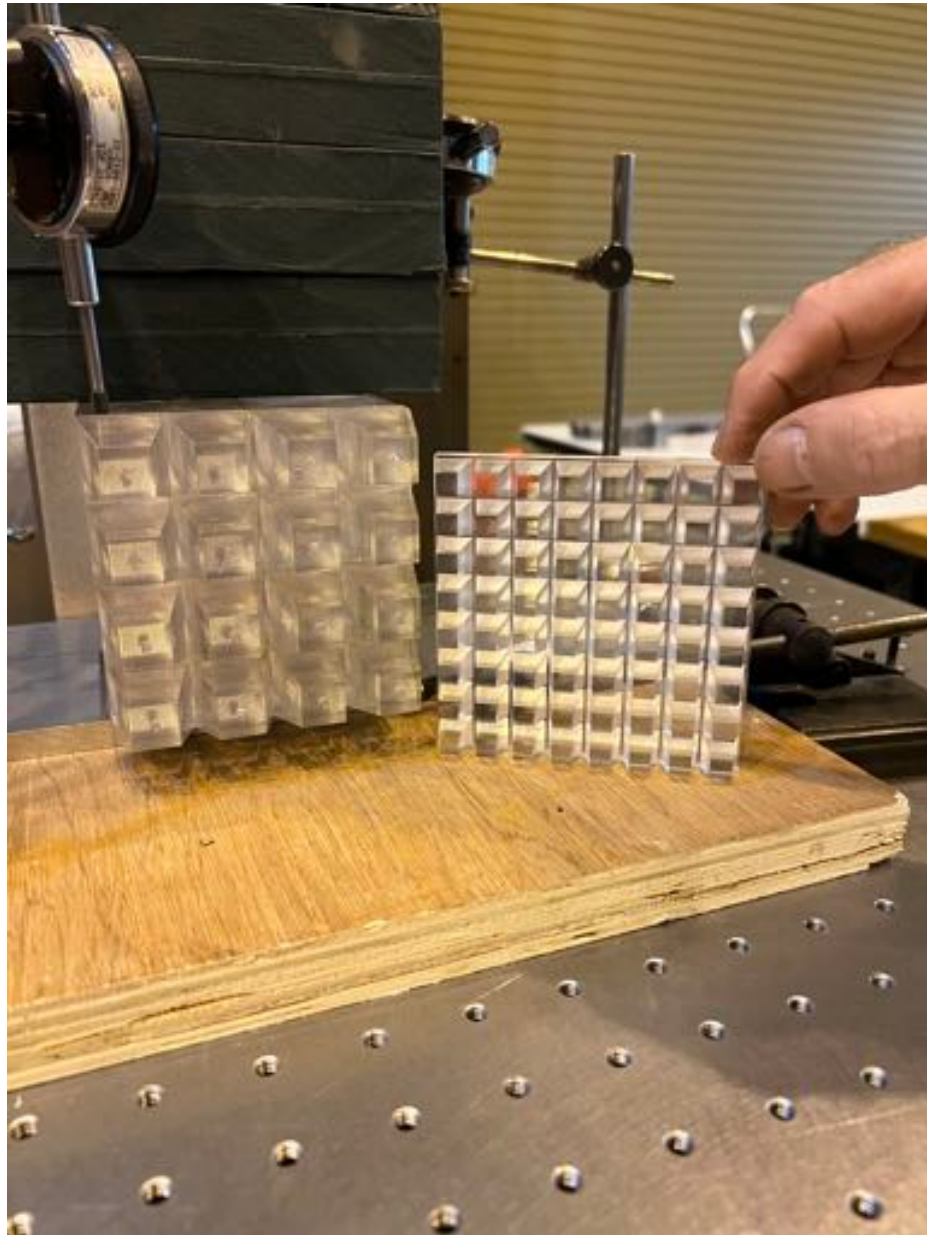
Al strong back, TiO_2 layer 2 mm thick, WScFi body.

- fECal full scale installation block (4 x 4 towers) loaded x4 nominal
- Testin mounting scheme and deflections.

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Light Guides

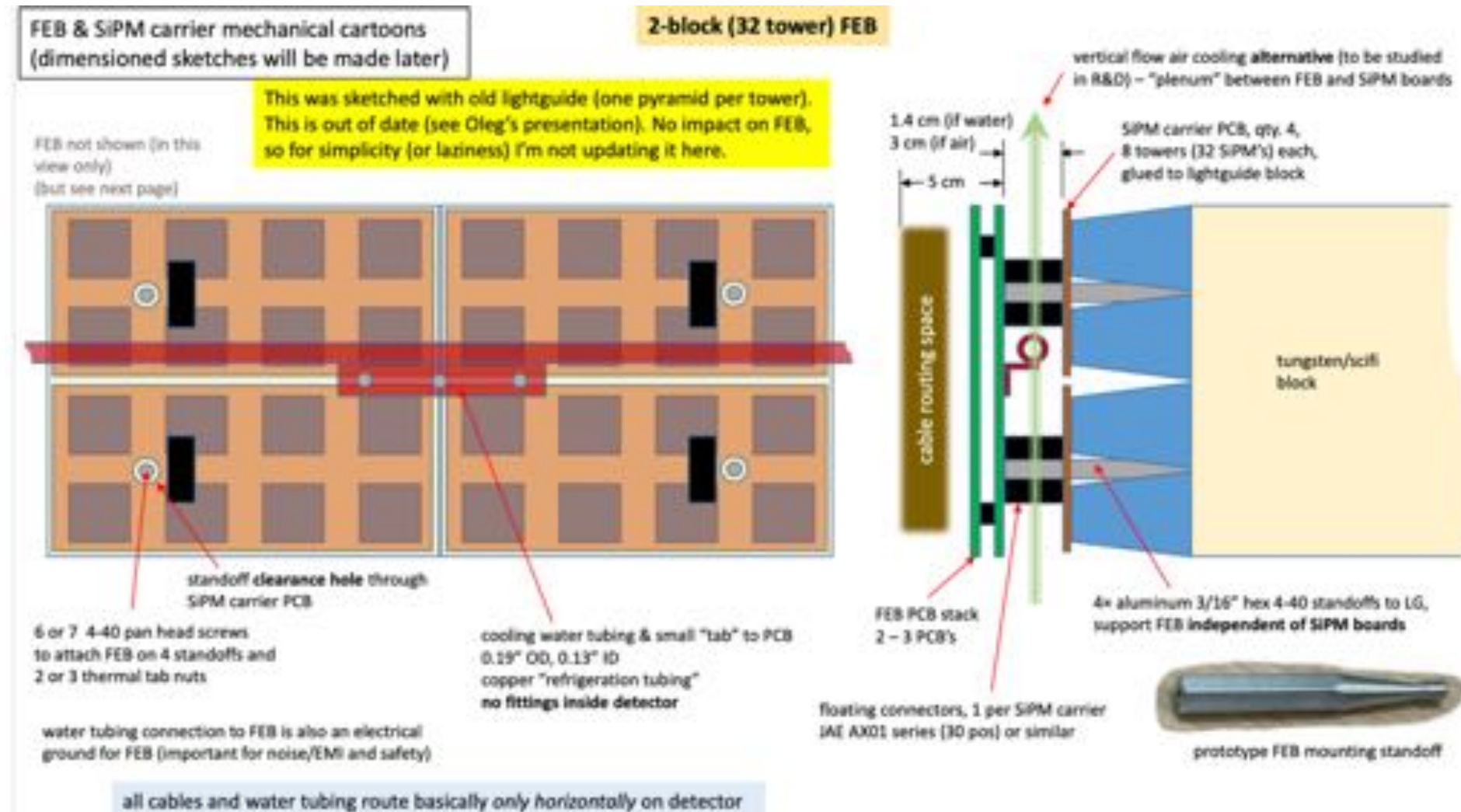


- New light guides – one per SiPM.
- Geometrical, 85% light collection efficiency.
- Improved uniformity (with fiber bundling).

- Machined with different methods: UCLA, Indiana, by end of Sep. BNL central shop.
- Also, talked with EJ (Ludlum) about injection molding, possible.

ePIC-fECal: Readout

A mechanical/optical/electrical integration of readout is part of this proposal. This activity is closely coordinated with eRDI09 project. Latest integration concept developed by G. Visser (Indiana)



It includes redesigned light guides, FEB, SiPM boards and cooling as well as mounting of readout electronics to fECal installation blocks.

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Summary

- Funding delayed, but all participating institutions are making good progress.
 - Mechanical design is in advanced stage.
 - All components for block production finalized.
 - Light guides optimization in process.
 - Integration of readout in progress (eRD I09, Indiana University).
 - Test Run at FNAL in FY24, exact dates TBD (FNAL does not have schedule yet.)
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- In consultation with EIC managers, after current eRD I06 will be finished, future developments for fECal will be under PD.

Thanks!