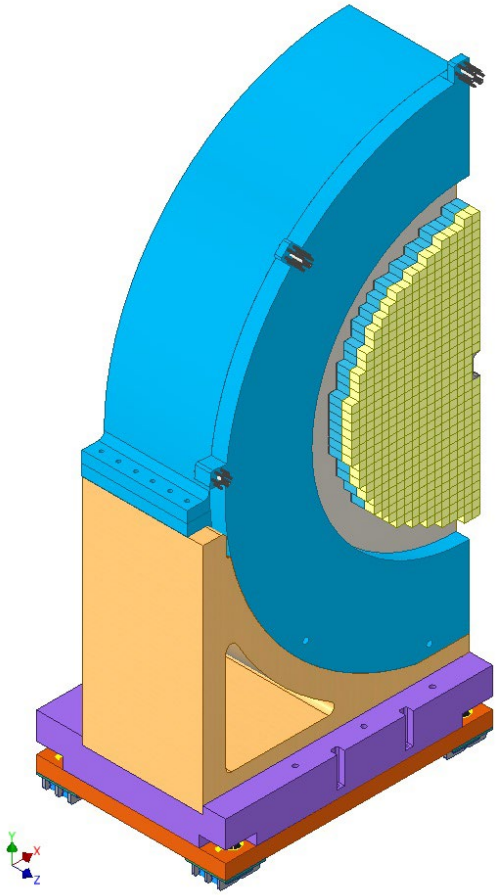
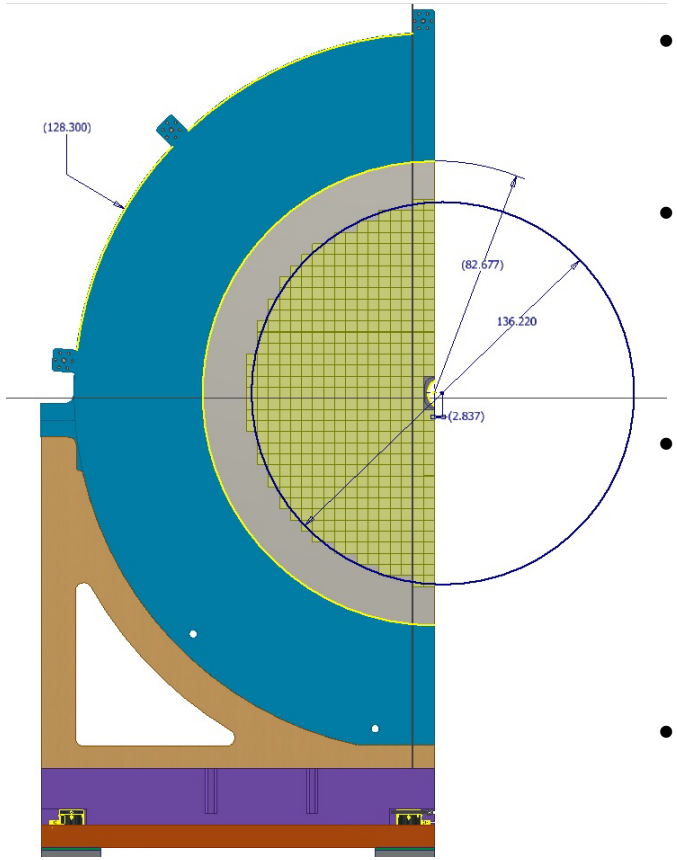
Status of Forward EMCal design (BNL-Indiana-UCLA)





- Mounting scheme, beam line interface defined.
- Outer radius may change a bit due to changes in inner radius of bECal. Zhongling is working on this.
- First iteration of shell design and routing of utilities and cables were discussed with BNL engineer, layout should be ready this week.
- Indiana will start to work on detailed cooling/cabling routing maps.

eRD106 status (Indiana- Fudan-UCLA-UCR-BNL)

- **Production blocks being made at Fudan and UCLA (at UCLA we made 6 blocks with improved production method)**

- **Four blocks were used to make installation block at BNL, some tolerances issues uncovered, being corrected now.**

- **Light Guide of different version were produced (Indiana, UCLA, BNL). Latest version is close to be to final production version.**
- **Production method and needed tools were developed.**
- **Light Guides were characterized (talk by Yunshan)**

- **UCLA electronics shop is iterating SiPM boards for the test run. The first board for 64 channels were made, some SiPM populated, these were needed to check the alignment tolerances. Indication that light collection may be improved by shrinking output surface of LG from 6.5 mm to 6.3 mm (see also Yunshan's talk)**

- **UCR received rest of needed SiPMs for the test run.**

- **Aiming to have 16 ch. ECal blocks ready for the beam test end of April (FNAL schedule is not known yet)**

eRD109 is progressing with design of readout electronics (Indiana-UCLA)

- **Initial bench test measurements with 'noisy' SiPMs showed that at 50 MeV S/N may be still acceptable.**

These measurements need to be performed with SiPMs irradiated at Davis.
Also new results from Yunshan should be used for this estimates.

- **We are reconsidering some details of configuration of SiPM boards and mounting scheme of FEEs.**

This is work in progress. Assembly of LG + SiPM board was sent to Indiana for evaluation.
Current plan is to move from 64 SiPM board to 16 SiPM board to allow 'ease' of replacement of SiPM boards in situ.

- **Re-evaluated space budget for readout. Gave 3 cm of integration space along Z to dRICH, as was asked by the project.**

Integration/Installation.

- **Re-evaluating sequence of installation block assembly. (Gluing installation block from four production block, gluing LG, staking, gluing SiPM boards, installing FEEs etc.)**
- **Changes, SiPM boards first glued to LG (alignment), then LG/SiPM assembly glued to installation block. Requires careful installation procedures.**
- **Prototyping installation procedures at BNL this spring with blocks produced at Fudan/UCLA**

Update on fEMCal Project Members

- **fEMCal project will be joined by an Indian consortium.**
- **Both EIC/ePIC managements asked us to work with Indians groups.**
- **Hold productive meeting with colleagues at NISER, tentatively plan to setup a production line for fEMCal blocks in India. This will be in-kind contribution.**
- **Potentially other components may be produced in India as well (Light Guides). In-kind contribution.**

Forward EMCal TDR. Contents

DRAFT

Draft has not been discussed yet within entire fEMCal group

1. Executive Summary.
    - 1.1 ePIC Experiment
    - 1.2 Forward Electromagnetic Calorimeter
    - 1.3 W/ScFi technology
    - 1.4 SiPM Photo Detectors
    - 1.5 Electronics
    - 1.6 Mechanics and Integration
    - 1.7 Calibration and Monitoring
    - 1.8 Simulations
    - 1.9 Performance
    - 1.10 Conclusion
2. Design Considerations
    - 2.1 introduction, EM and hadronic particle reconstruction
    - 2.2 Acceptance Considerations
    - 2.3 Resolution Considerations
    - 2.4 Environment
        - 2.4.1 Surrounding Detectors
        - 2.4.2 Rates and Occupancy
        - 2.4.3 Operation Considerations
3. Production and Assembly
    - 3.1 Production Schemes
    - 3.2 Assembly Schemes
    - 3.3. QA
4. Production 2x2 tower block details
    - 4.1 Scintillation Fibers
    - 4.2 Tungsten Powder
    - 4.3 Glue materials
5. Installation 4x4 towers block details
    - 5.1 Design
    - 5.2 Assembly steps
    - 5.3 Stress tests
6. Light Guide Design
    - 6.1 Design Considerations
    - 6.2 Efficiency and Uniformity of light collection
    - 6.3 Bench test measurements
7. Photo Detectors
    - 7.1 SiPMs introduction
    - 7.2 Characteristics
    - 7.3 Radiation Damages
    - 7.4 SiPM ordering
    - 7.5 SiPM currying board design
    - 7.6 SiPM boards QA and calibrations
    - 7.7 SiPM boards mounting on light guides
8. Electronics
    - 8.1 General EMcal Readout Scheme
    - 8.2 Preamplifier Shaper (Requirements, Specifications, Implementation (RSI))
    - 8.3 ADCs (RSI)
    - 8.4 SiPM biasing (RSI)
    - 8.4 Digitizing Module (RSI)
    - 8.5 SPICE Simulations and Bench Test Results
    - 8.6 Signal routing and Cabling
    - 8.7 Cooling
    - 8.8 Slow Controls
9. Mechanics, Integration, Installation
10. Calibration and Monitoring
    - 10.1 Calibration with Physics
    - 10.2 Monitoring with LED system
11. Simulations
    - 11.1 Acceptance (barrel/endcap region)
    - 11.2 Resolutions (energy, position)
    - 11.3 Effects of dead material upfront on performance
    - 11.4 Dynamic range, rates
    - 11.5 Pi0/gamma discrimination with ML
12. Performance
    - 12.1 Test beam results with prototypes.
13. Collaboration
14. Safety
15. Schedule

Legend:
Black – ready for writing
Red – on-going R&D 106/109
Brown – require more work, engineering support, PD, collaboration growing