

Backward Hadronic Calorimeter

TDR planning

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THE OHIO STATE UNIVERSITY

- 1 Introduction and organization
- 2 Work planning towards TDR
- 3 Summary

Webpage set up - see for up to date info

https://wiki.bnl.gov/EPIC/index.php?title=Backward_Hcal

Mailing list

epic-backward-hcal-1@lists.bnl.gov

Mattermost channel

<https://chat.epic-eic.org/main/channels/det-hcal-backward>

Institutions

OSU, CTU in Prague, UNH, BNL (help)

Detector design and technology choice:

- Few ideas to present and discuss soon:
 - LFHCAL style with larger tiles (may be costly)
 - Option to use thicker tiles and put SiPM on the side (to be tested with simulation)
 - Belle-II KLM long scintillator planks with WLS fibers
 - ~ 2 m length might be an issue
 - May need different FEB from HGCROC to get the position from the timing
 - Tiles with WLS fibers
- TBD based on the results of:
 - Position resolution study
 - CTU in Prague working on that (1-2 months to complete)
 - May need more time and manpower to test different detector configurations
 - Clustering needs optimization (1-2 months to complete in coordination with experts)
 - Neutron detection study (both RECO hits and ML reco with GNN)
 - Student at OSU looking at RECO hits (1-2 months to complete)
 - Student at OSU working with ML (to present update soon, a few weeks to complete, need more manpower to test different configurations)
 - UNH group working on PID with GNN and possible optimization of geometry based on ML response
 - Need more help and coordination with LFHCAL group (still waiting for some answers)
 - Jets with neutron reconstruction
 - Help from Brian, data available now
 - Every adjustment of needs a new simulation campaign or full event simulation (updates month by month)
 - May need more help and manpower here

- Tile tests with cosmic rays at OSU
 - Preparing test station with SiPMs and tiles (a few weeks to complete)
- Fermilab can provide more tile samples, need to establish contact through LFHCAL group

Beam tests:

- To be planned once the design is finalized
- Need engineering design
 - We should get mechanical engineer at OSU to work with BNL engineers (up to OSU leadership)
- Zoom call with Oleg Oyser (CAM) planned for today to discuss this topic
- We may need beams:
 - protons: 0.3 – 20 GeV
 - pions: 0.3 – 20 GeV
 - electrons: 0.3 – 20 GeV
 - Spallation neutrons? ~ 1 GeV to test low energy neutron performance

- Electronics coordinate with the LFHCAL group - HGCROC
 - Long scintillator planks with WLS may require alternative solution
- Once design is determined we will provide connection topology to Norbert
- Sparsely placed temperature sensors for temperature monitoring
- LEDs 1/channel to calibrate the response with single photon spectra

- Not a priority right now
- Study with single muons should not be a problem
- Need manpower for that
- May need a dedicated simulation with VM in realistic events for TDR
- Simple study with standalone VM simulation also possible

I have no prior experience writing TDRs - may need help

- Detector design
 - Overview
 - Detector requirements
 - Radiation requirements
 - Test beam results
- Performance
 - Single particle studies
 - Clustering (to be done soon)
 - Neutral jet reconstruction (coordinate with Brian)
 - Vector meson reconstruction with dimuons
- Mechanics (TBD by the design)
 - Module structure
 - Assembly
 - Support structures
 - Seismic and load deformation studies (coordinate with other subsystems)
 - Scintillator performance
- Readout (waiting for design - to be coordinated with Norbert)
 - SiPM boards
 - FEB design
 - Connection topology
- Cooling
 - Heat load simulation (coordinate with other subsystems)
 - NO cooling needed
- Calibration (waiting for design - to be coordinated with Norbert)
 - LED system
 - Temperature monitoring
- Integration
 - from previous work
 - ready to write up
 - partially to write up
 - lots of work required

Summary

- Clear plan towards TDR
- Lots of work required to finalize the design, but we are on the right path
- Minimal required manpower seems available, but need more help with detailed studies
- A lot depends on the simulation campaign cycle (month by month)
 - Need to complete various steps to be ready for each simulation campaign (risk for the timeline)
 - Make sure the tasks are completed on time

BACKUP