ECCE Calorimeter Options & Main Questions to Physics WG

ECCE PWG Meeting

May 10, 2021

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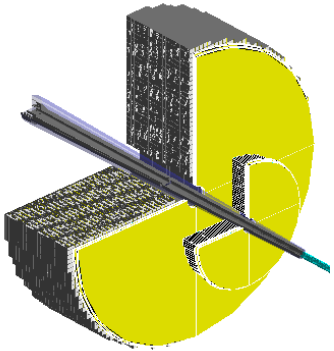
Backward calorimetry options



Options for E-Cal:

- $PbWO_4$ - crystal calo
- Sci-Glass calo
- Hybrid $PbWO_4$ and Sci-Glass calo

Interested Groups:
AANL, Charles U. Prague, CUA, FIU, IJCLab-Orsay, JMU, Lehigh U., MIT, UKY

Options for H-Cal:

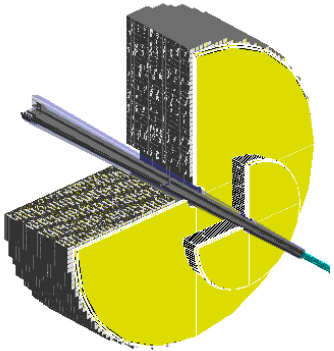
- Re-use STAR-forward HCal
- new PSD (SHINE) like - HCal (longitudinal separation)

Interested Groups:
ORNL, Wayne State, OSU

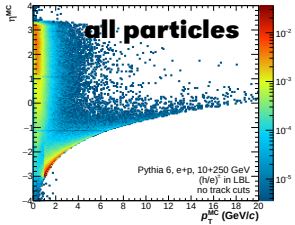
Many open detector questions to ourselves:

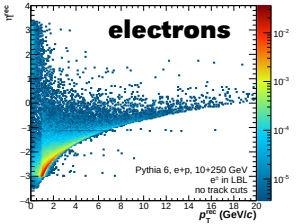
- Do we want/ can we afford timing layers in front/in between calorimeters?
- Where exactly do we place the calorimeters?
- Are the YR requirements for the HCal correct $(50(45)/\sqrt{E} + 10(6)\%)$?
- How much material budget can we allow for tracking detectors?

Backward calorimetry - physics questions



- Which observables are driving the HCal resolution $(50(45)/\sqrt{E} + 10(6)\%)$?
- Do we really need an HCal? Can tracking compensate?
- Which separation is the most critical? e/π, π/K, $e/\gamma/\pi^0$, ...?
- How good does the separation need to be at different momenta?
- Does the constant term play a role for the HCal?
- Which resolution do we need for the neutrals?
- How much η gap for the can we afford between backward & barrel cal
- Which η/ϕ resolutions do we need for the HCal?



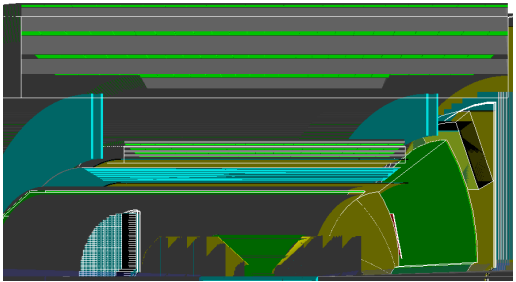


Barrel calorimetry options

Options for E-Cal:

- $PbWO_4$ - crystal calo
- Sci-Glass calo
- Re-use sPHENIX EMC

Interested Groups:
MIT, CUA, OSU



Options for H-Cal:

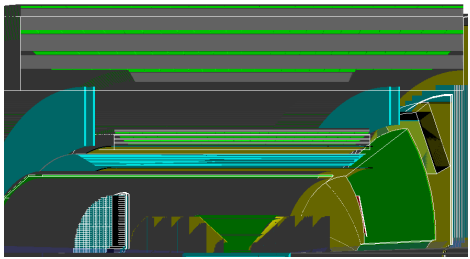
- Re-use sPHENIX HCal
- ?

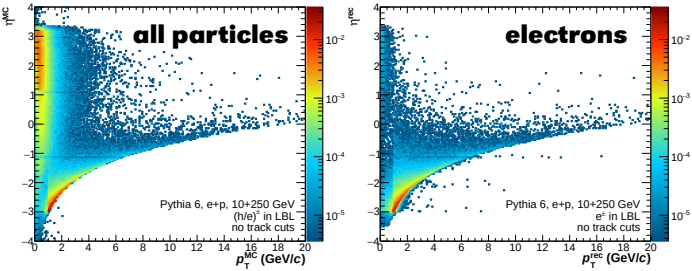
Interested Groups:
Lehigh U., Rutgers U., ISU

Many open questions to ourselves:

- Do we want/ can we afford timing layers in front/in between calorimeters?
- Are resolutions of the sPHENIX calorimeter good enough?
- How low in R can we go without impacting the PID detectors?
- Are there other options for the HCal?
- What is the optimal way to instrument the ECAL support frame?

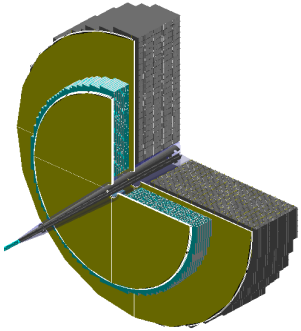
Barrel calorimetry - physics questions

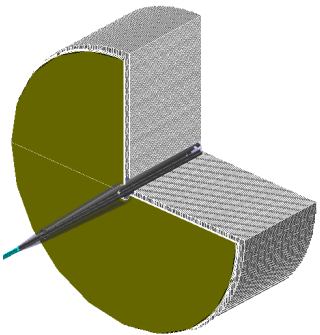


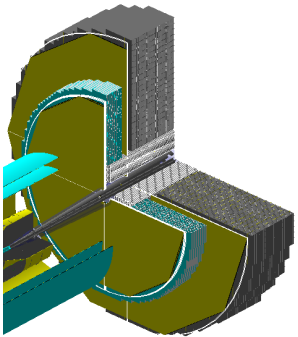


- Which observables are driving the ECal resolution ($\sigma/E \approx (10-12)\%/\sqrt{E} \oplus (1-3)\%$) and HCal resolution ($\sigma/E \approx 100\%/\sqrt{E} \oplus 10\%$)?
- Do we need the same ECal resolution over the full barrel η?
- Which separation is the most critical? e/π, π/K, e/γ/π^0, ...?
- Does the constant term play a role for the HCal? Hadrons are mainly low momentum.
- Which is the desired resolution for the neutrals?
- Which η/ϕ resolutions do we need for the calos?

Forward calorimetry options







Options for E-Cal:

- Re-use PHENIX Shalik-ECal
- Other re-use or new E-Cal
- Dual read-out

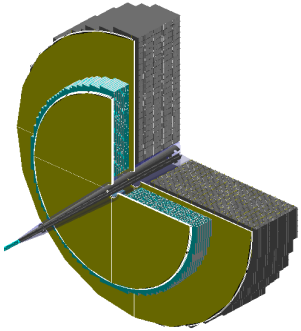
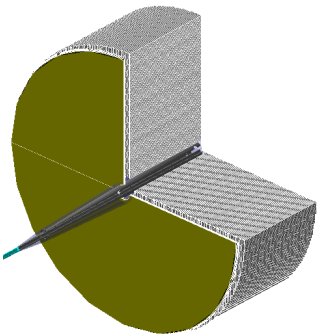
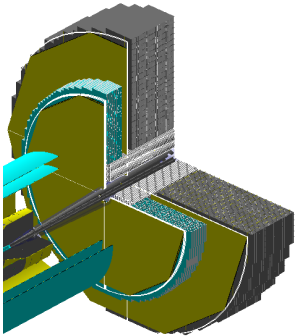
Interested Groups:
ORNL, Sejong U., KNU, Yonsei U., PNU

Options for H-Cal:

- Re-use STAR forward HCal
- new PSD (SHINE) like - HCal (longitudinal separation)
- Dual read-out
- Hybrid Dual read-out & re-use

Interested Groups:
ORNL, WSU, Sejong U., KNU, Yonsei U., PNU

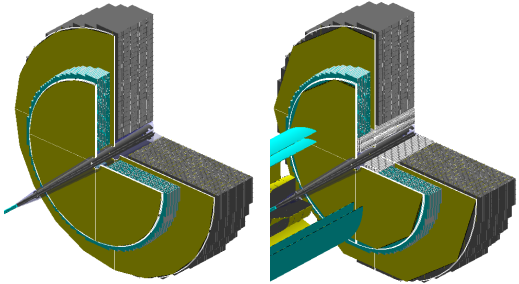
Forward calorimetry options

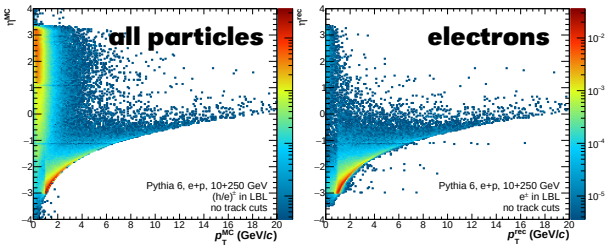




Many open questions to ourselves:

- Do we want/ can we afford timing layers in front/in between calorimeters?
- Can we fulfill the YR requirements with conventional HCals?
- Will Dual readout be ready in time?
- Can we afford a hybrid version or full dual readout calo?
- Which other options do we have for the ECal?

Forward calorimetry - physics questions





- Which observables are driving the ECal resolution ($\sigma/E \approx (4-12)\%/\sqrt{E} \oplus 2\%$) and HCal resolution ($\sigma/E \approx 50\%/\sqrt{E} \oplus 10\%$)?
- Are these requirements valid for the full forward η?
- Which exact η coverage do we need? How large of a gap between barrel and forward can we accept?
- What do we gain in physics going from $\eta = 3 \rightarrow 3.5 \rightarrow 4$?
- Which separation is the most critical? e/π, π/K, e/γ/π^0, ...?
- Which resolution do we need for the neutrals (in particular π^0)?
- Which η/ϕ resolutions do we need for the calos?

Join us!

Participate in these important decisions!

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