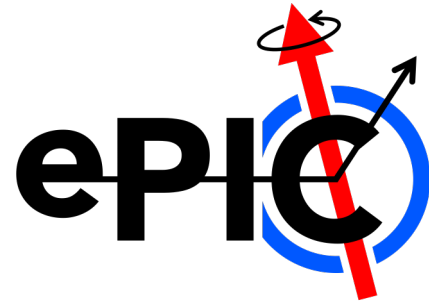


Calorimetry CC WG report.

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ePIC Collaboration Meeting
Faculty of Physics, University of Warsaw
July 28, 2023

General information.

- **Calorimetry**

Convener: Oleg Tsai <tsai@physics.ucla.edu>

Indico: <https://indico.bnl.gov/category/405/>

Email-list: eic-projdet-calorimetry@lists.bnl.gov

Subscribe to mailing list through:

<https://lists.bnl.gov/mailman/listinfo/eic-projdet-calorimetry>

- Nominally bi-weekly meeting on Wednesday at 12:30 p.m. (EDT)

In context

- Calorimetry CC WG is continuing work of joint Calorimetry WG
- Joint Calorimetry WG (April 2022 – March 2023) hold ~ 33 meetings

Conveners: Carlos Munoz Camacho, Friederike Bock, Paul E Reimer, Oleg Tsai.

Joint detector WG charge

§ The overall goal of the detector WG's is to optimize the ECCE reference design towards a technical design within the constraints listed above. In working towards this goal, the DWG's

should collaborate with existing detector consortia (EICSC, EEEMCAL, MPGD, DIRC, DRICH, AC-LGADs, etc.), all detector R&D efforts relevant for Detector-1, and any additional efforts

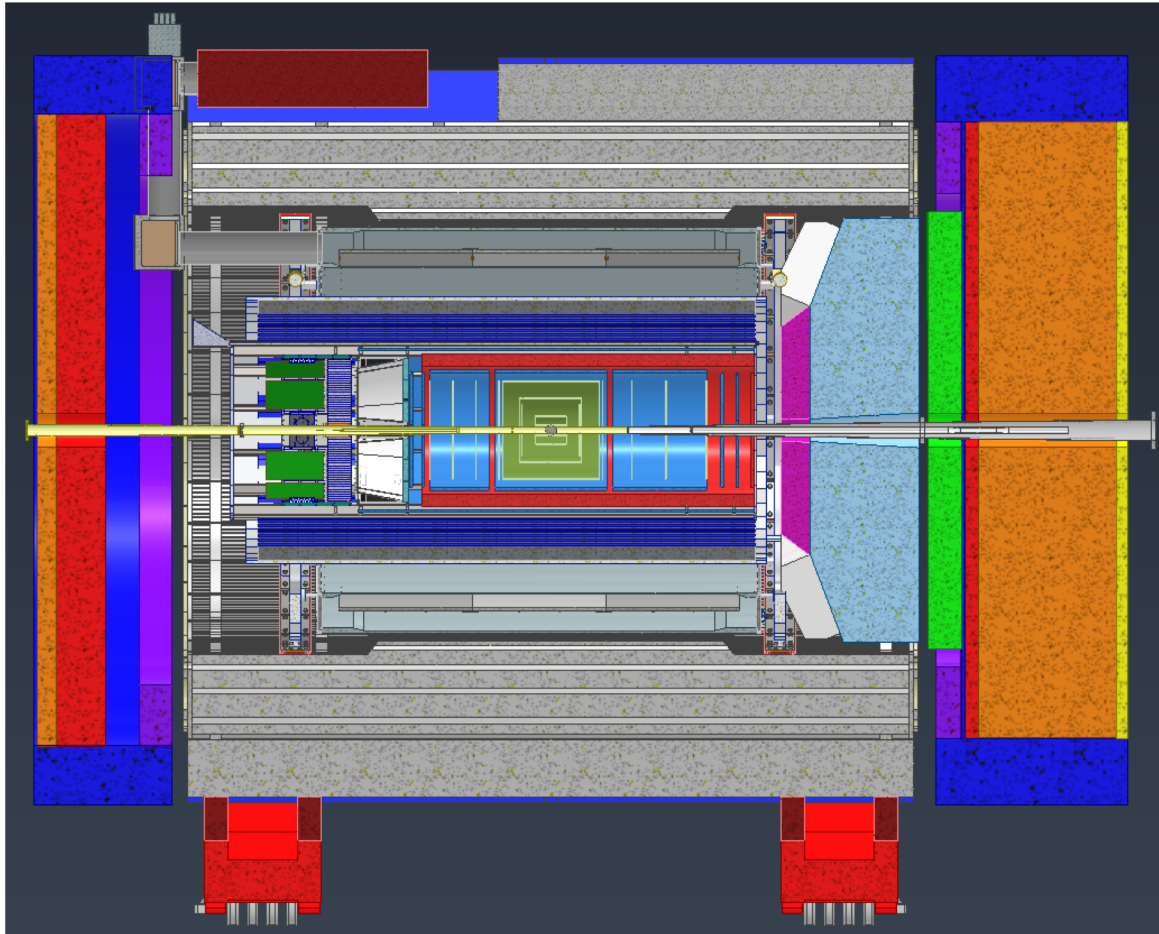
within the EIC scientific community.

§ All working groups will work closely with the Global detector/integration working group and the EIC project towards a technical design that optimizes the global detector performance, taking into account global integration and physics performance.

§ Each joint WG should hold at least one kickoff meeting where the designs of each proposal are presented in detail. **It is critically important that WG members understand the scientific and technical reasoning behind different design choices** before engaging in optimization discussions.

§ The WG conveners will lead a discussion to identify any non-trivial differences and/or aspects in need of further optimization.

§ For each non-trivial difference working groups will then work to prepare a pro/con list accounting for technical performance, risk and cost. The resolution of non-trivial differences should be discussed in close consultation with the Global detector/integration WG, physics working groups, the EIC project, relevant detector consortia and R&D efforts.



Joint Calo WG was very successful.

With a review of barrel ECal on March 13-14, 2023, and approval of change control process on May 1'st **all calorimetry technologies for ePIC were finalized.**

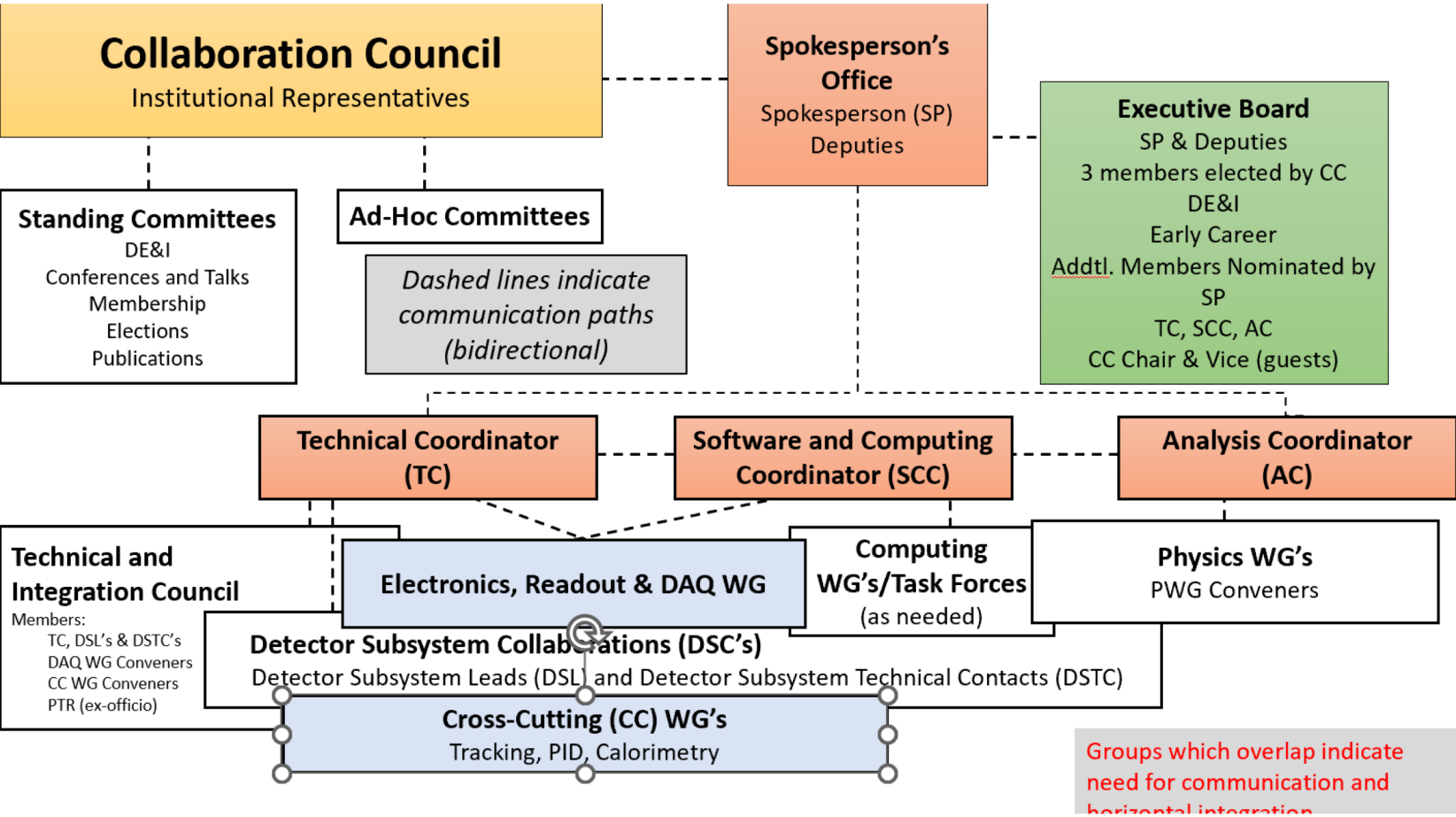
- Forward ECal
- Forward HCal
- Insert
- Barrel ECal

- Negative HCal case is in development.

Big Thank You to Carlos, Friederike and Paul for organizing, energizing and keeping lively and interesting discussions during past year, which were critical to made this nice model !

What is next?

ePIC management call for CC Calorimetry WG to Address common concerns of calorimetry in ePIC.



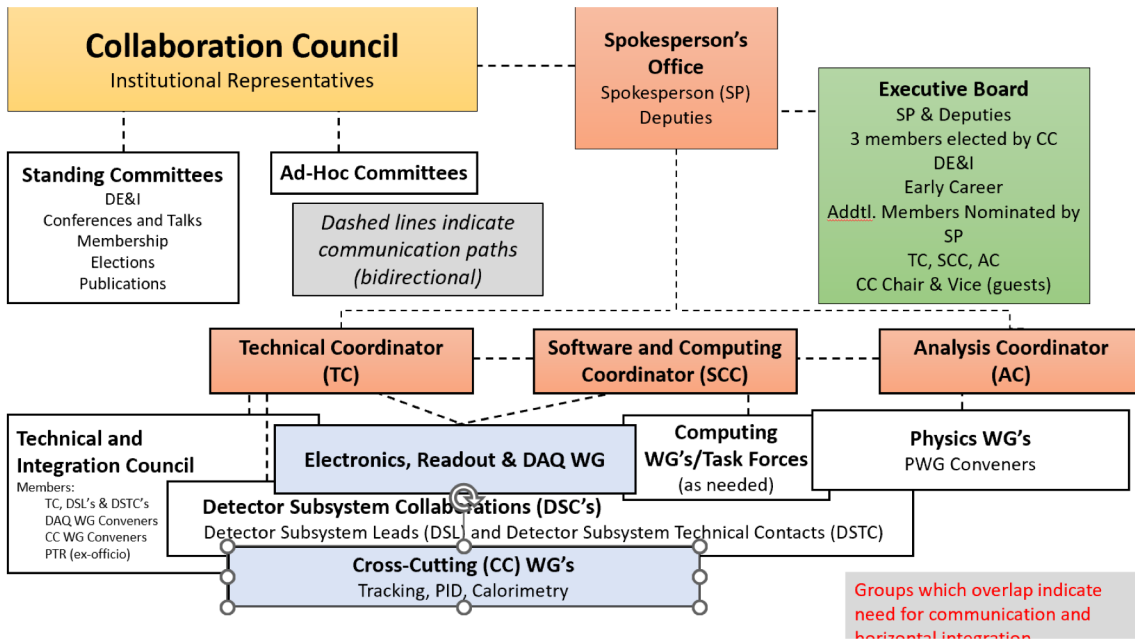
- A different calorimeter sub-systems now holds their own meetings and workshops to advance design of detectors to TDR level, work with project team, pass reviews etc...
- There are calorimetry related ongoing R&Ds as well.

Yet, some common questions will be more efficient to discuss in a broader audience, as was successfully done in joint calorimetry WG during past year.

- Brain power, and views on a problem from a different directions, which requires different expertise.

- Help groups with limited manpower, for example case of nHcal.

How it works. Recent Example, HGCR OC applications for ePIC calorimeters readout.



Electronic, Readout & DAQ WG meeting 06/08
<https://indico.bnl.gov/event/19653/>

Mid. June , Spoksepersons charged Calo CC WG to collect requirement information and present at TIC meeting mid July.

Calo WG group hold initial discussion 06/27
<https://indico.bnl.gov/event/19947/>

Calo WG Follow up meeting, extended list of questions and examples how they may be filled 07/05
<https://indico.bnl.gov/event/19983/>

TIC meeting 06/10
<https://indico.bnl.gov/event/19411/>

Calo WG Follow up discussion, status and timeline 07/12
<https://indico.bnl.gov/event/20029/>

Initial table with calorimeters readout parameters were discussed in 2022 few times and can be found here.
https://docs.google.com/spreadsheets/d/18Cl2xWAC8HqhZmD1MT8JZWSVGm_WZQN2PT92f5KjNaE/edit#gid=2090491516

Seemingly too many meetings on the same subject ? Why?
 The short answer the devil is in the details.

A longer answer...

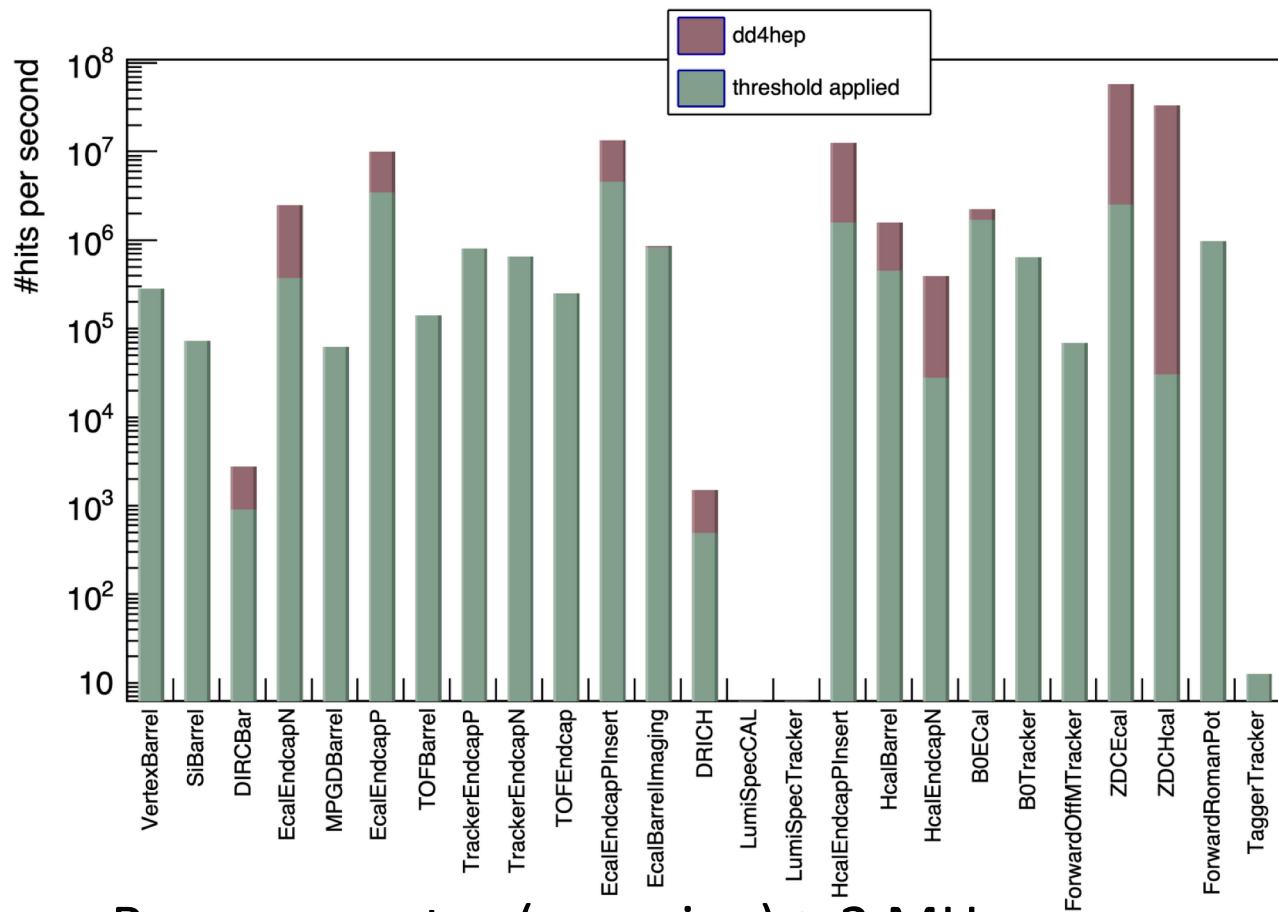
- It is critically important that WG members understand the scientific and technical reasoning behind different design choices. (recall charge on slide 3) It takes time to sort out all details.
- Design of detector still in a very fluid state. Some parameters we put in tables last year, and before that, were called 'requirements' without proper justifications. Now it is time to take a hard look at some of these.
- Opportunities such as an external contributions may arise and they desired to be addressed quickly (this is why we hold meetings every week...)

What we got out of these recent discussions in CC Calo WG regrading ASICS:

1. Timeline to come up with solid set of requirements to pass to developers is ~ December 2023. (Initial expectations probably were more optimistic). It become clear that presentation at TIC meeting mid July will not be productive -> hence, that meeting was cancelled → already positive outcome 😊.
2. Some numbers will require additional thoughts, simulation and re-evaluation, as they will have big impact on requirements for potential ASICS.

Example:

- requirements on minimal energy (expecting presentation from Sasha Bazilevsky soon (fECal) .
- maximum rates in calorimeter channels – here we'll need help from background task force and appropriate software infrastructure.

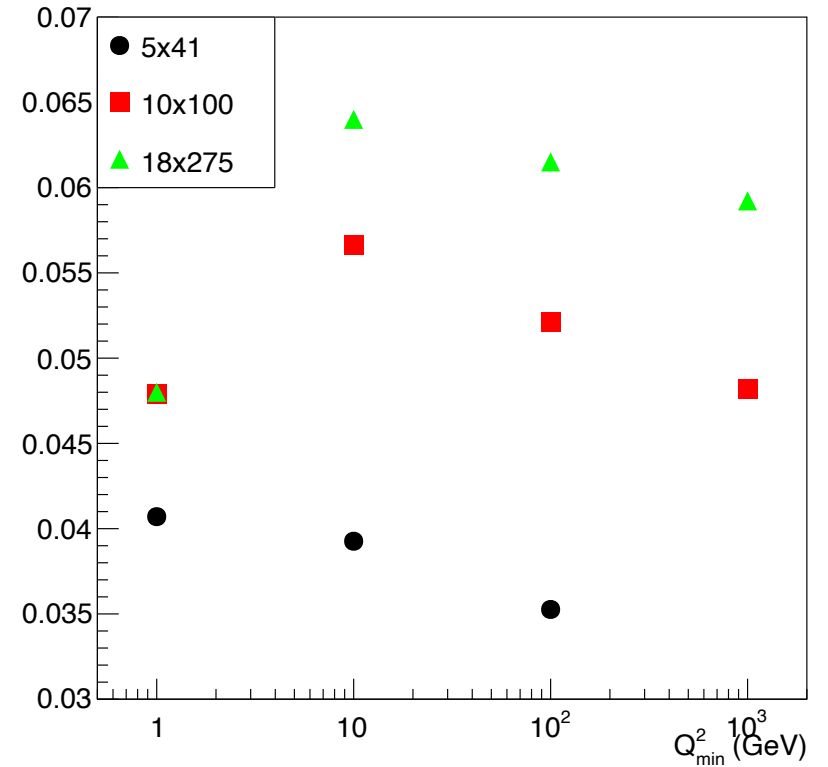


Beam gas rates (guessing) ~ 2 MHz

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



Prob with $E_{\text{twr}} > 15$ MeV in $\eta = 3.5\text{--}3.7$



DIS, rates in fEcal at highest luminosity is about 2.4 kHz at highest rapidity for a single channel.

- Rate may be a bottleneck, huge difference for any readout scheme.
- It becomes clear that it will require efforts from multiple groups to get it done.

Well, this is why they called CC WG...

CC Calo WG had 6 meetings so far:

We discussed:

- Sensors
- Global detector optimizations (areas between calorimeter sub-systems).
- Readout (ASICS).
- Common software topics.
- New ideas for calorimeters beyond central detector (ZDC).

In the pipe line:

- Thresholds.
- Rates.
- Validations beyond single particles.

Summary:

- Calorimetry CC WG is working.
- We will try to keep same quality of discussions we had during joint calo WG time, which depends on your active participation!
- Meetings will be called as needed. (Nominally bi-weekly).

If you have a topic you like to discuss with a broad ePIC calorimetry community please contact me.

Thank you !