

Status and Plan to Optimize the Tracking Layout

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Introductory comments:

John Lajoie and Silvia Dalla Torre have proposed that ePIC ~now transitions its working group structure,

Matt Posik and I have been put forward to become conveners for the tracking working group in the evolved working group structure,

John Lajoie and Silvia Dalla Torre have proposed to start the change control process for the barrel EM calorimeter and the backward RICH,

None of these are finalized at this time. Collaboration Council voting is closing, and that is simply a step towards the change control process in the case of the subsystems.

The current tracking working group conveners are Francesco Bossu, Kondo Gnanvo, Laura Gonella, and Xuan Li. Thank you for all your work over the past period!

We have had several good discussions - thank you - and will probably have a few more.

So, here I will simply present a few of my own thoughts as the available time so far did not allow us to conclude or reach consensus. That is, I will simply put forward some of my own thoughts and observations. On a positive note, this will take less than the scheduled 30 minutes.

Since shortly after DPAP, we had a reference to start from. For the tracker, this was a hybrid with MAPS, MPGDs, and dual-function AC-LGADs:

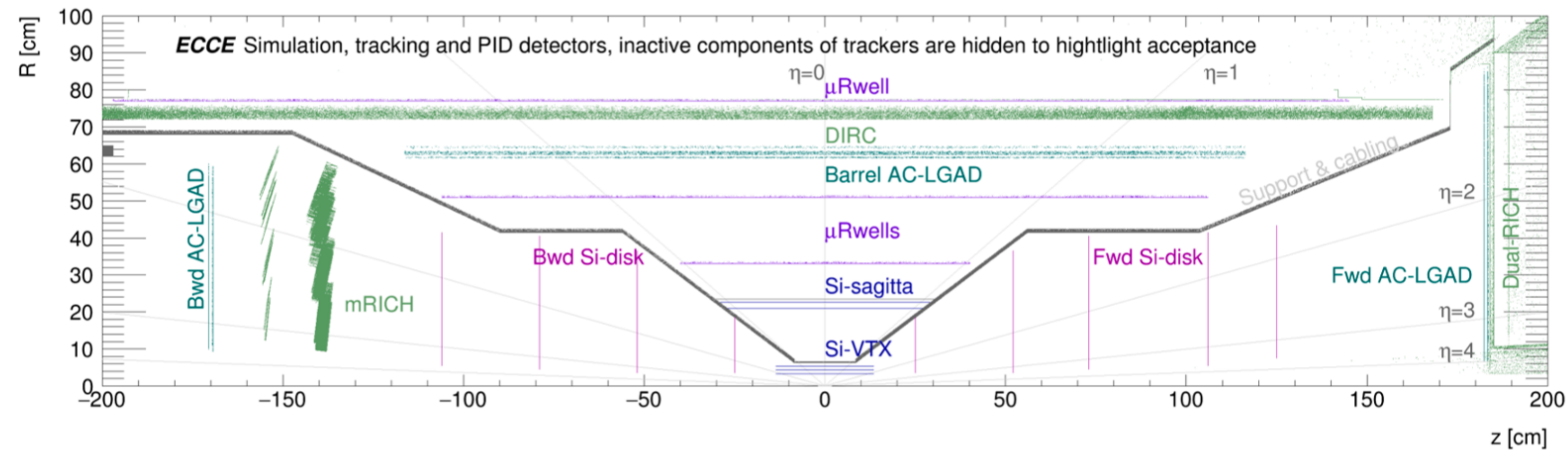


Figure 2.5: Schematic view of the ECCE tracker, including silicon, μ RWELL, AC-LGAD, DIRC, mRICH and dRICH detector systems.

Review very quickly revealed the need for substantial revision.

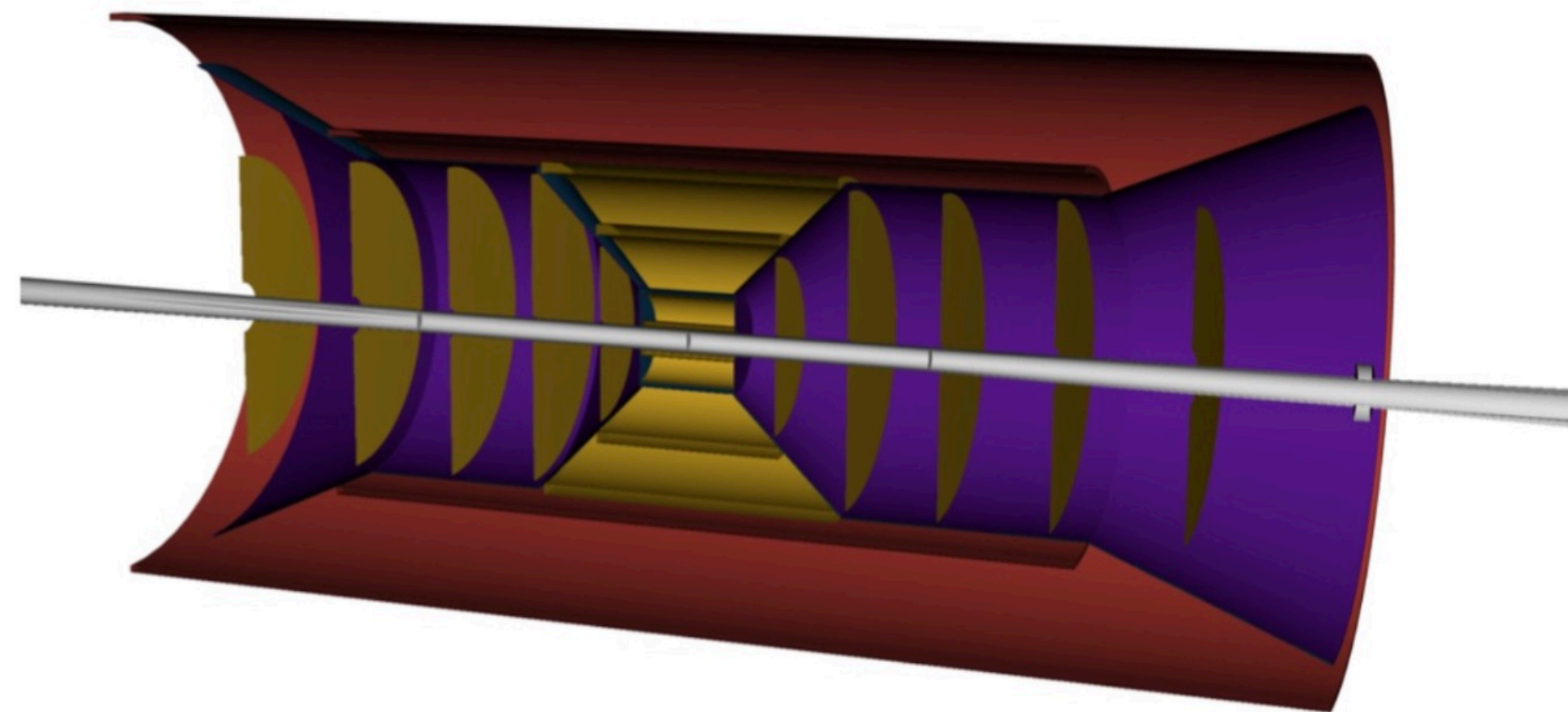
Importantly, the magnet has changed and now has a nominal field strength of 1.7 T. This is extremely helpful. Its geometry has not changed.

The proposed changes to the barrel EMCal may affect outer barrel tracking capabilities and needs,

The proposed changes to the backward PID may affect the available envelope for tracking,

We have been and are on a very tight schedule to the next project milestone(s).

The MAPS tracking and vertexing system layout has mostly been resolved — lots of work by many.



Five barrel layers at radii r_{X_0} and lengths L of

$$r_{0.05\%} = 36, 48, 120 \text{ mm}; L = 270 \text{ mm}$$

$$r_{0.25\%} = 270 \text{ mm}; L = 540 \text{ mm}$$

$$r_{0.55\%} = 420 \text{ mm}; L = 840 \text{ mm}$$

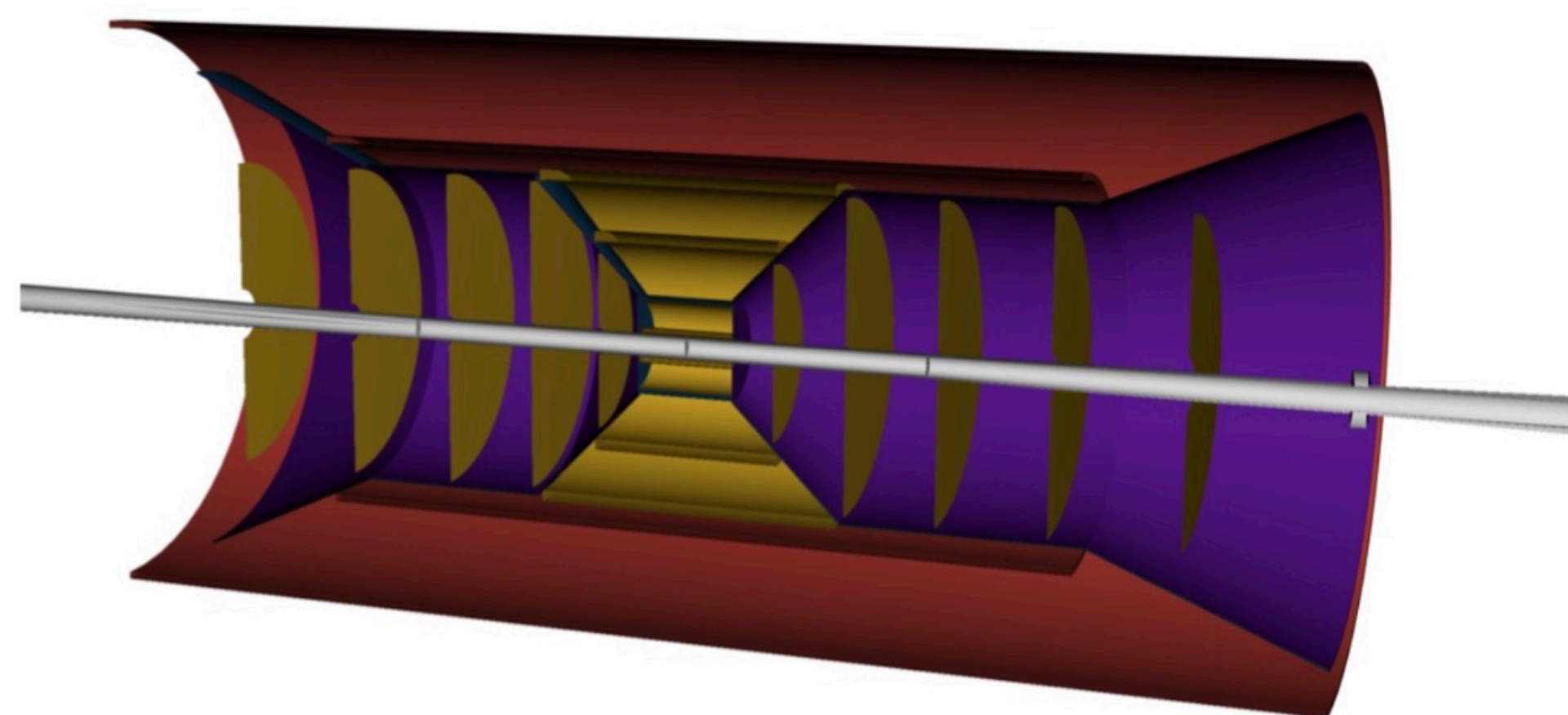
Extended disk arrays, as space permits, with $X_0 \sim 0.24\%$ per disk

As more is being learned about background levels, in combination with $\sim \mu\text{s}$ MAPS timing characteristics, it is clear enough to me that the need for a well-integrated outer-tracker (MPGD, AC-LGAD) remains as ever. This is not currently backed up by simulations; that work remains ongoing. The need here is not about resolutions at the collision point; that is backed up by simulations. Material and resolutions are paramount.

Two concepts have been discussed among the existing conveners and the potentially incoming conveners. Both concepts take the AC-LGAD envelopes as a constraint and use the remaining space productively.

Work remains in particular to more commonly understand the actual tracking needs and performance at PID.

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Backward envelope will depend on the actual choice of the PID system; my take is that the backward tracker arm will evolve into a combination of the five MAPS disks and one or more MPGD disks.

Forward arm and envelope is firmed up. YR resolutions can be met within this volume (and are with the MAPS layout).

Barrel region has ~ 30 cm to use productively for MPGD and AC-LGAD tracking.

Convergence must happen on a clock. My take is that:

progress and meetings will need to transition to a more goal-oriented form,
subsystems must be actively engaged in simulations,

one of the lessons learned could be that one of the issues with with communication is the assumption that it has happened.