

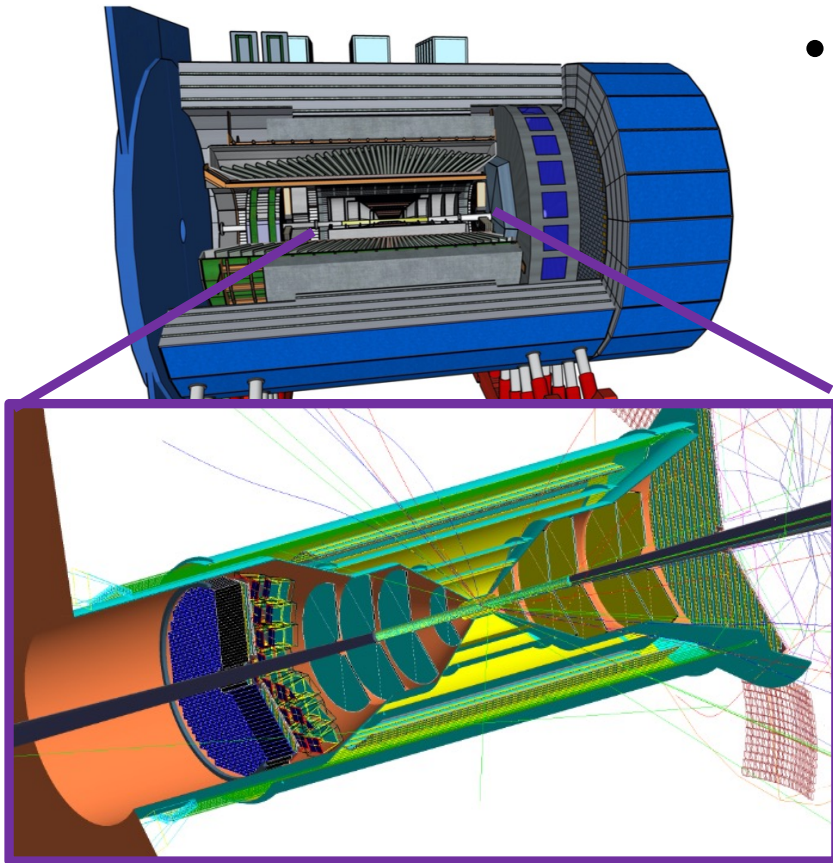
ECCE Silicon Vertex/Tracking Conceptual Design Introduction

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of the ECCE consortium

ECCE tracking reference concept



- The ECCE tracking detector consists of integrated MAPS, μ Rwell and AC-LGAD tracking detectors. Detailed detector segmentation and service parts have been implemented in the Fun4All framework.



- The ECCE silicon tracking systems is based on the ITS-3 type MAPS technology:
 - Barrel subsystem consists of 3 silicon vertex layers and 2 sagitta middle layers utilizing the design from the EIC silicon consortium. Pixel size: $10 \mu\text{m}$
 - Hadron endcap consists of 5 disks. Pixel size: $10 \mu\text{m}$.
 - Electron endcap consists of 4 disks. Pixel size: $10 \mu\text{m}$.

- The ECCE tracking detector geometries have been archived in the Fun4All ECCE associated repositories.

Barrel index	R (cm)	z_{\min} (cm)	z_{\max} (cm)
1	3.3	-13.5	13.5
2	4.35	-13.5	13.5
3	5.4	-13.5	13.5
4	21.0	-27	27
5	22.68	-30	30

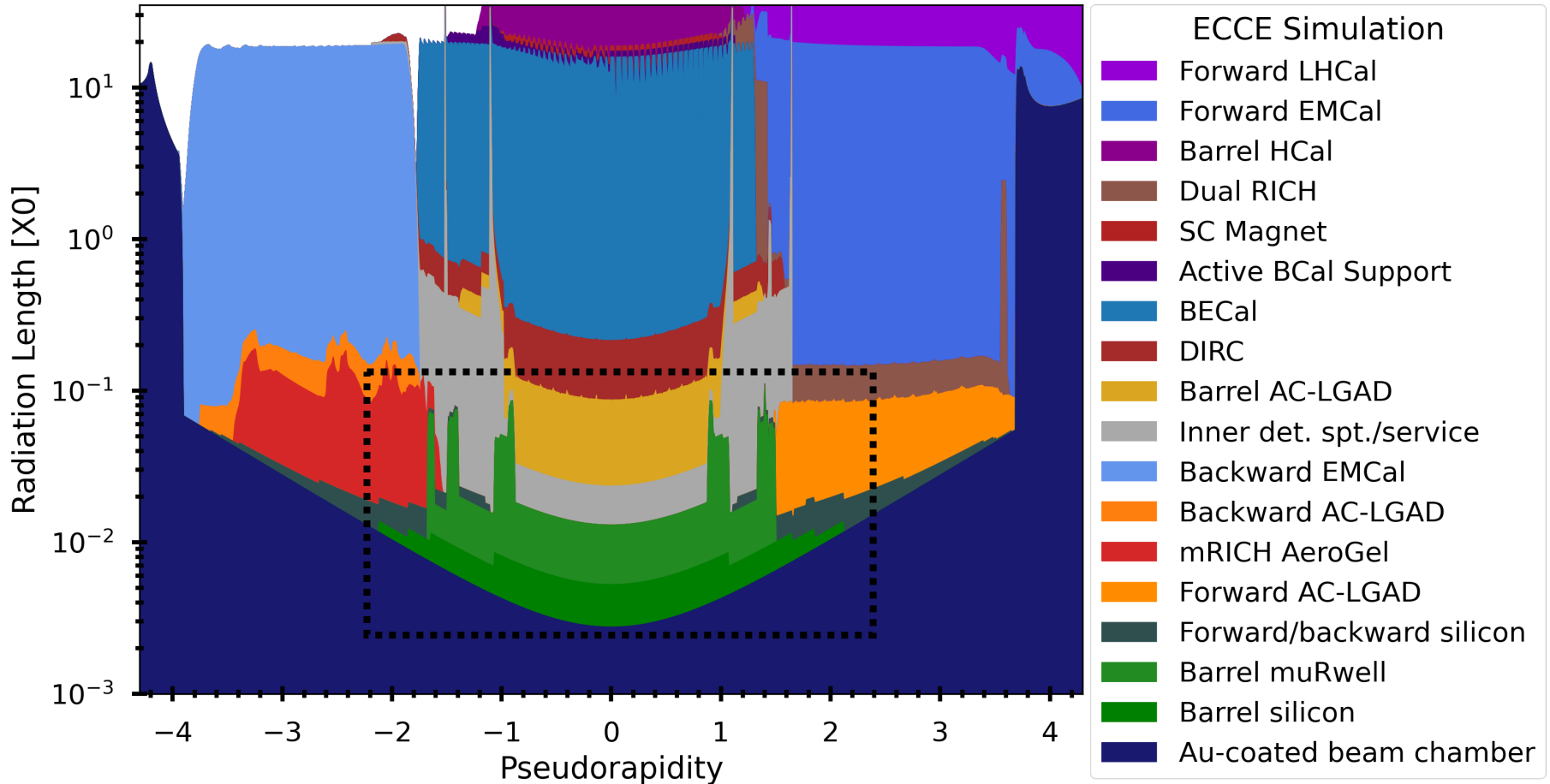
H-endcap index	z (cm)	r_{in} (cm)	r_{out} (cm)
1	25	3.5	18.5
2	49	3.5	36.5
3	73	4.5	40.5
4	106	5.5	41.5
5	125	7.5	43.5

e-endcap index	z (cm)	r_{in} (cm)	r_{out} (cm)
1	-25	3.5	18.5
2	-52	3.5	36.5
3	-79	4.5	40.5
4	-106	5.5	41.5

Material budget scan



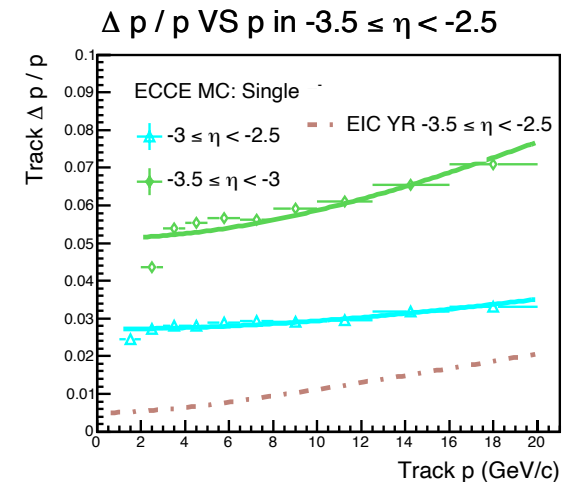
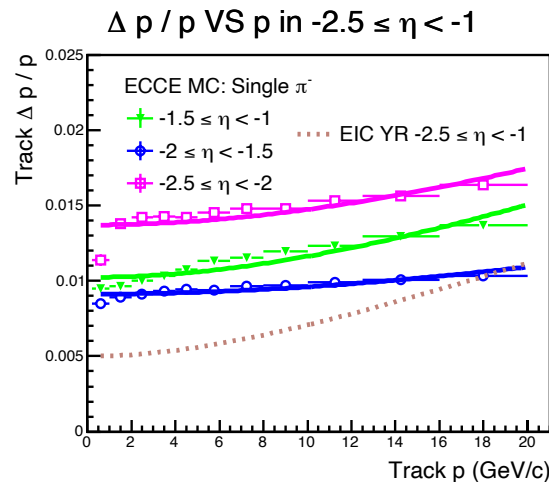
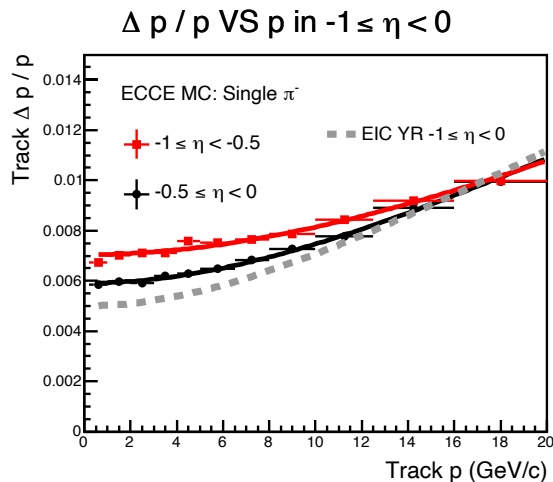
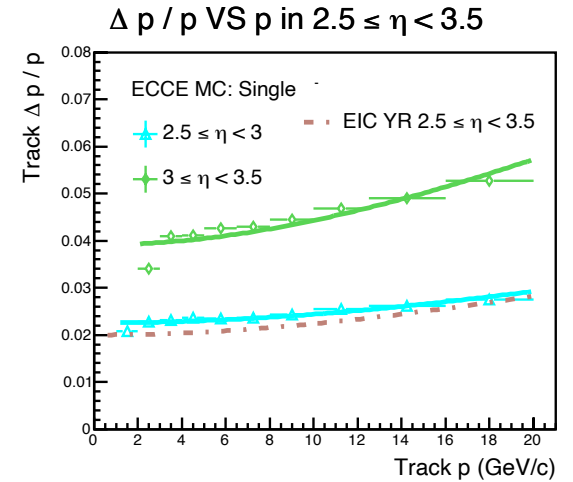
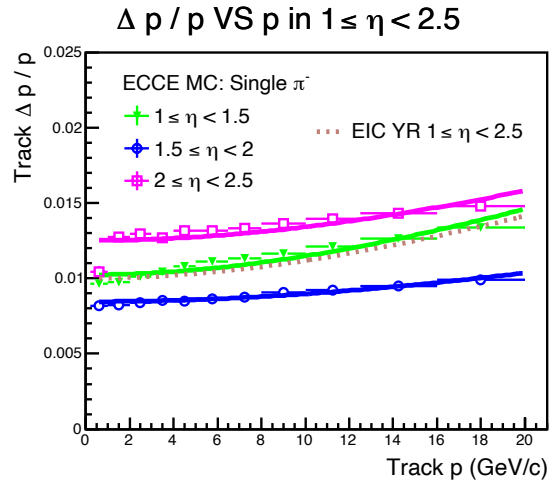
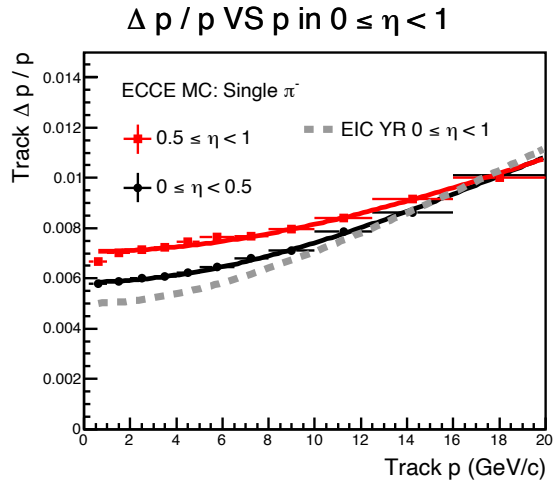
- From the Fun4All simulation, material budget scan of the ECCE detector subsystems.



ECCE Tracking momentum resolution



- Track momentum dependent momentum resolution.

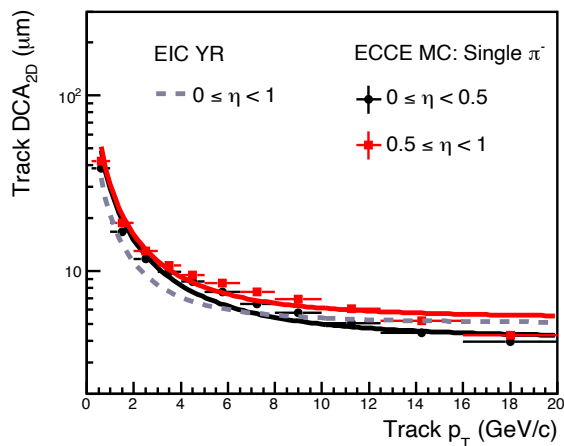


ECCE Tracking DCA_{2D} resolution

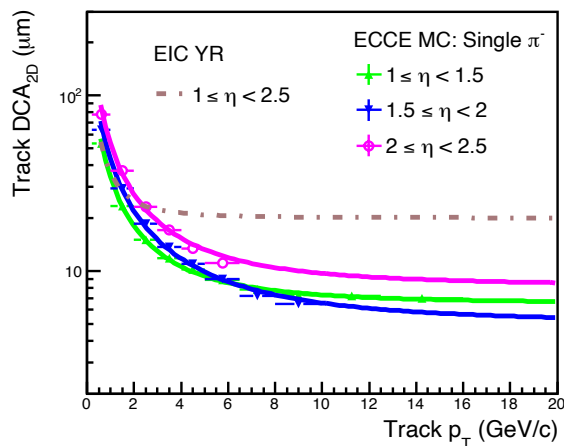


- Track p_T dependent DCA_{2D} resolution.

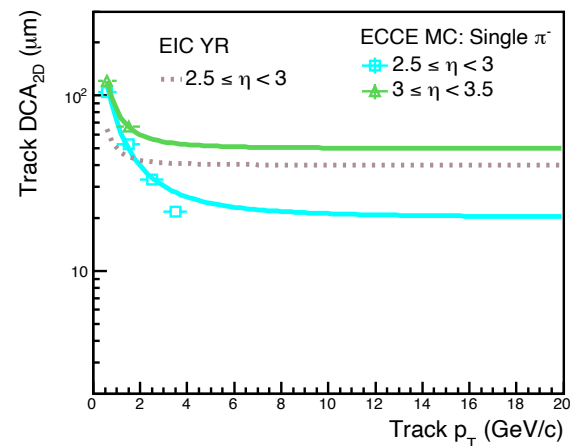
DCA_{2D} resolution VS p_T in $0 \leq \eta < 1$



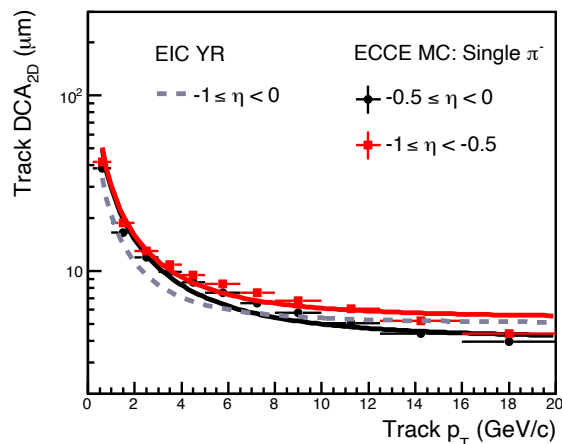
DCA_{2D} resolution VS p_T in $1 \leq \eta < 2.5$



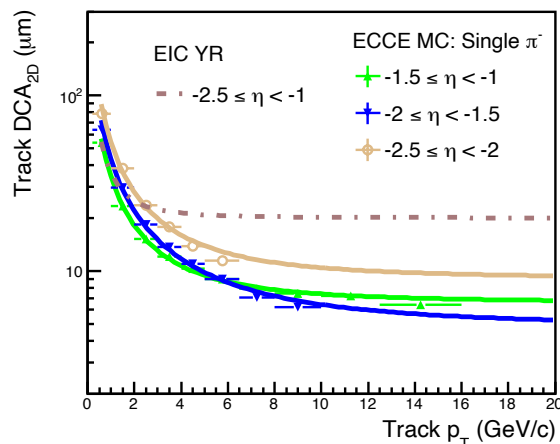
DCA_{2D} resolution VS p_T in $2.5 \leq \eta < 3.5$



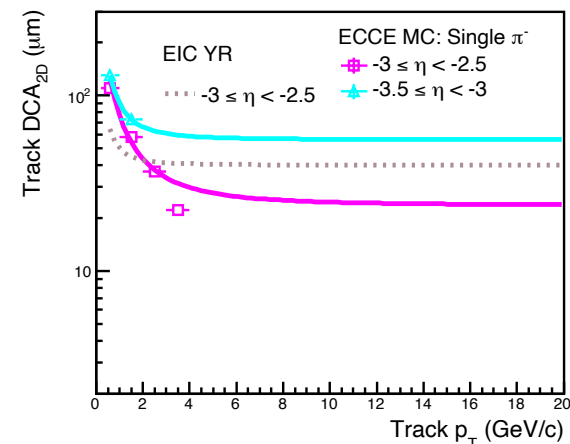
DCA_{2D} resolution VS p_T in $-1 \leq \eta < 0$



DCA_{2D} resolution VS p_T in $-2.5 \leq \eta < -1$



DCA_{2D} resolution VS p_T in $-3.5 \leq \eta < -2.5$



- In addition to the default configuration, several alternative options have been studied, including switching different technologies, apply optimization with AI.
- The silicon vertex/tracking detector performance is critical for inclusive hadron and heavy flavor physics measurements.
- Several ECCE papers, which summarize technical details will be released soon.
- Have included contributions from the EIC Si consortium, LGAD consortium, the ORNL team and the LANL EIC team, will work with eRD104, eRD111 and eRD 112 for detector design and integration.
- We look forward to collaborate with more colleagues to implement latest geometry and technology updates and work on the optimizations together.