

PID performance studies for dRICH@ePIC

dRICH Simulation Meeting

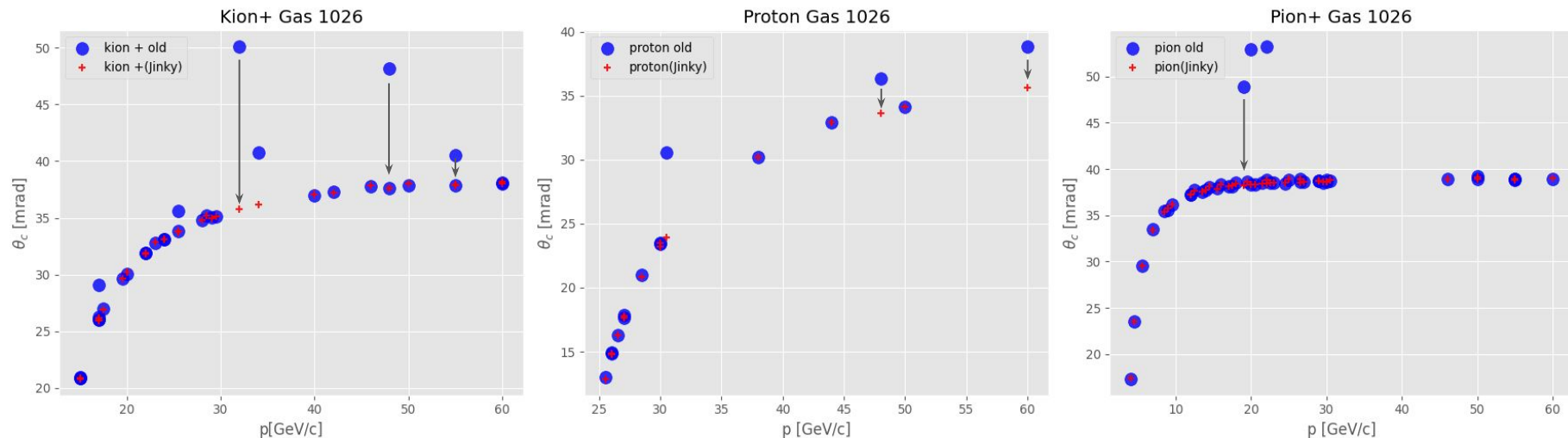
5 Dec 2024

Outline

- Jinky's update was tested and found working. But reconstruction warnings and errors were seen
- LUT plots
- Pixelization Studies (in progress)
- Mass squared plot (simulations in progress)

Jinky's updated code:

https://indico.bnl.gov/event/25662/contributions/99707/attachments/58722/100841/drich_simulation_studies_21112024_JA.pdf



Analysis Credits: Adithyan

LUT specific codes and data

- Code to generate the delphes card code:
 - https://colab.research.google.com/drive/1Luxcx3X1-vLDwmOGEK70Ner_53p_gHkz#scrollTo=Fs7VAOGlrp35
 - The above code also contains locations of the the summary files from which the code is generated.
 - Generates a .C file that can be run inside the eic-shell
 - **Warning: delphes has to be compiled ! Code is now in irt/delphes-chandra/ in CUK-GPU**
- Code to generate the plots from the LUT files:
 - <https://colab.research.google.com/drive/19vZxb7w6TG2v4nir4Uzs3pTu08GvUBY3#scrollTo=miTb0QBUyMJR>
- Delphes cards and tdr.txt and tdr.root files
 - https://drive.google.com/drive/folders/1yKRgSrsiZ501B6h2Z_i1FoPHrKljJB9z?usp=sharing
- Bins link
 - <https://docs.google.com/spreadsheets/d/1qNh3giwhRENJi25z45lgeh5d7QwIw5Uy3lepISHCv9Y/edit?gid=2032570815#gid=2032570815>
 - Sheet: New Bins

Updated data

https://docs.google.com/spreadsheets/d/1TCIqdxys_c0iHtjNk9iBEA23IjwohOfo1pCJkUWV4i8/edit?gid=0#gid=0

Minor error in colab code:

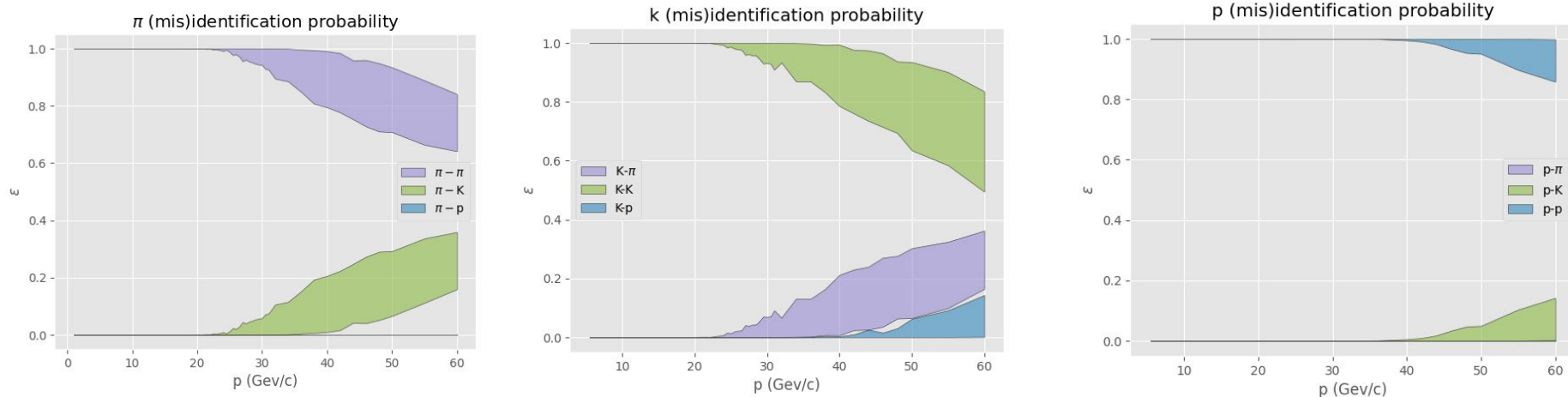
Due to an error in the code,

- **gas_thetac_res_fit_sigma**, showed the same value as of
- **aero_thetac_res_fit_sigma**

This was identified and corrected on 3 Dec 2024. Further, as Chandra advised, the residual plots are fit only in the range (-4 : 4).

The new LUTs are shown in the next slide

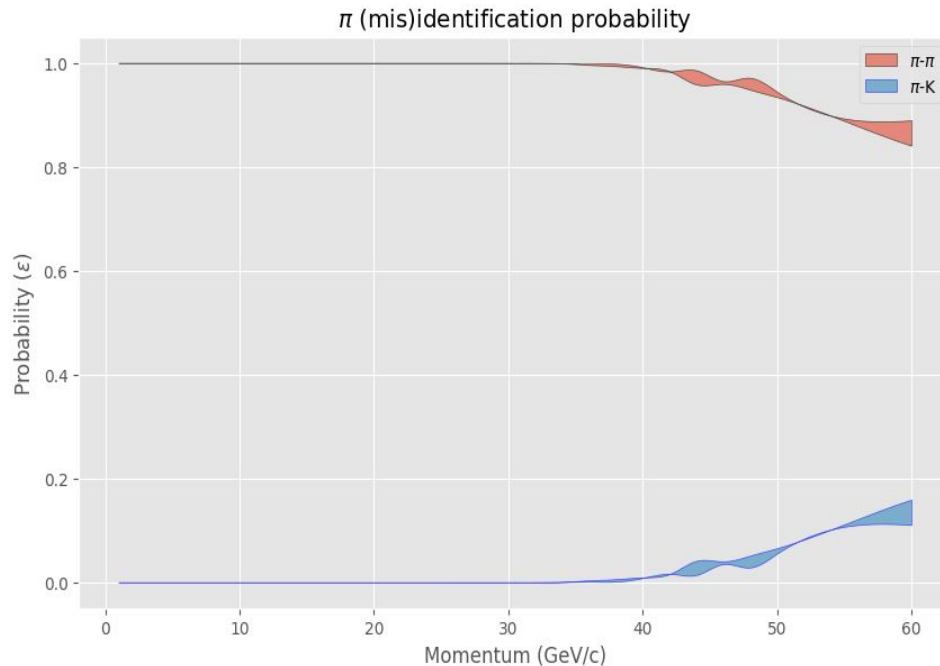
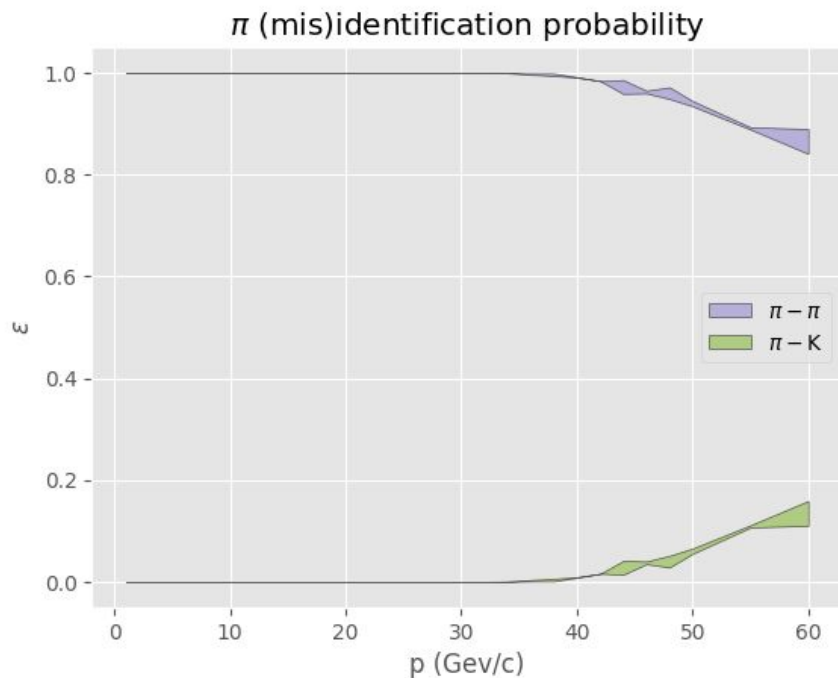
Merged probabilities: Both radiators (Aerogel + Gas)



- (Mis)Identification: The (lowest) highest probability of gas or aerogel is taken as the “merged probability”

https://docs.google.com/spreadsheets/d/1_rt3rc_5fWjoTcX1788xMw_Qie0yw8mli0XpVuUbzHw/edit?usp=sharing

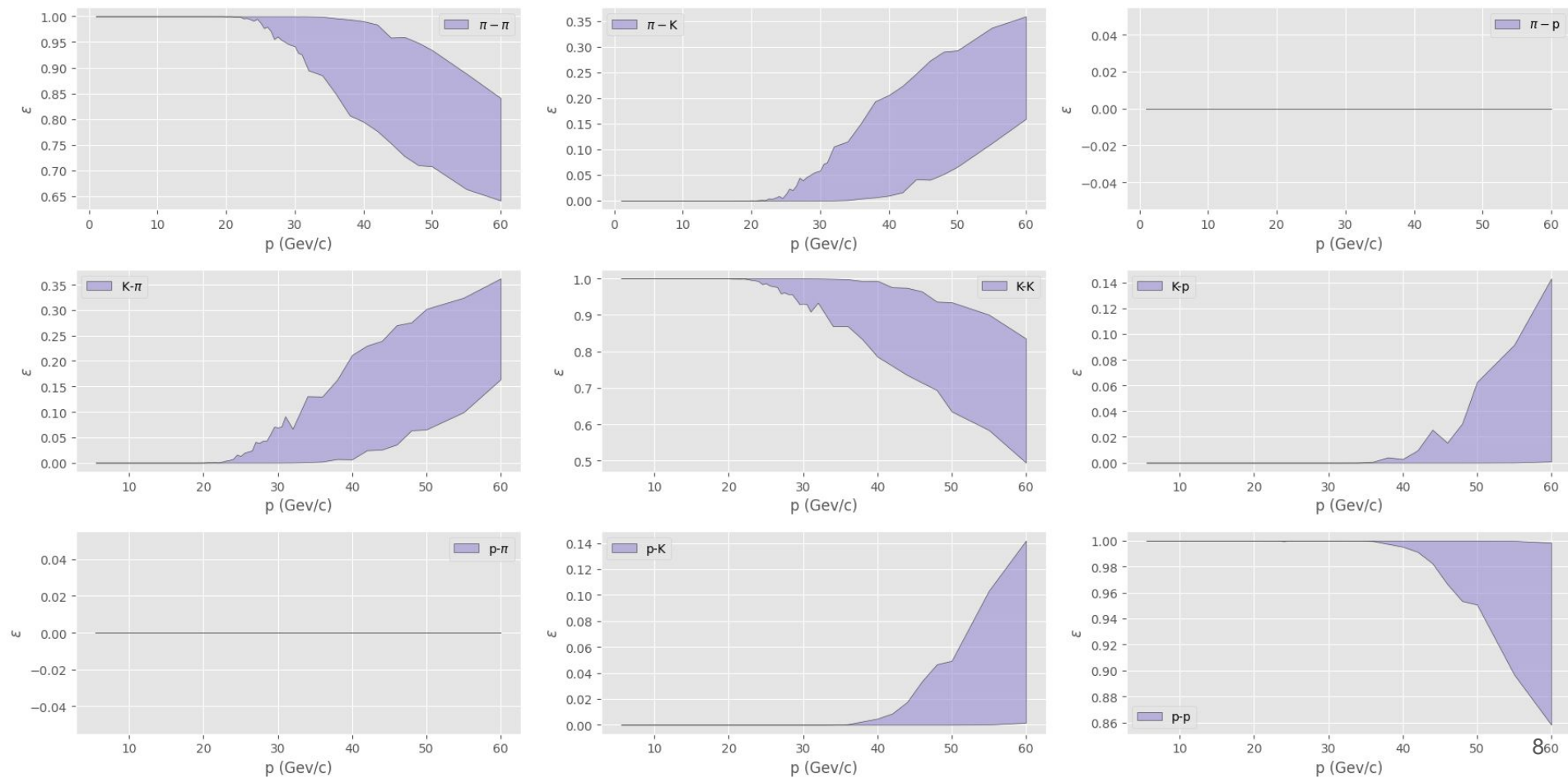
Merged probabilities: Both radiators (Aerogel + Gas)



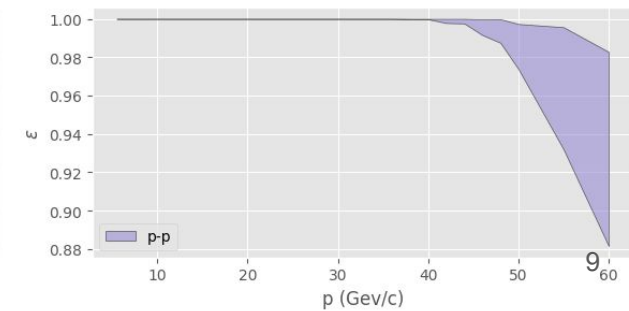
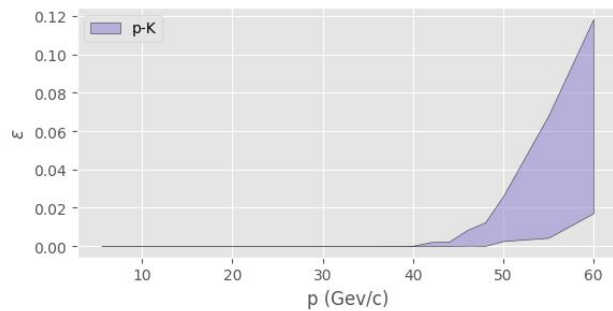
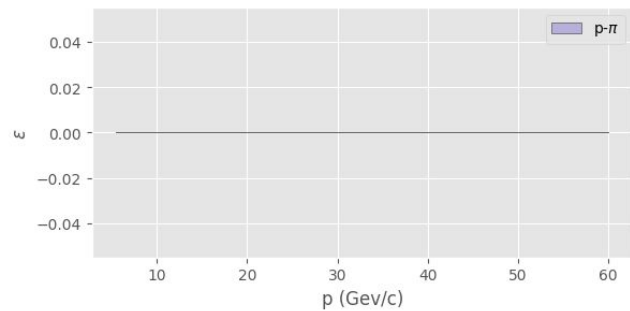
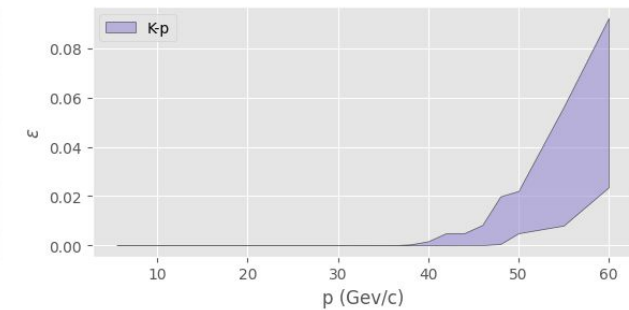
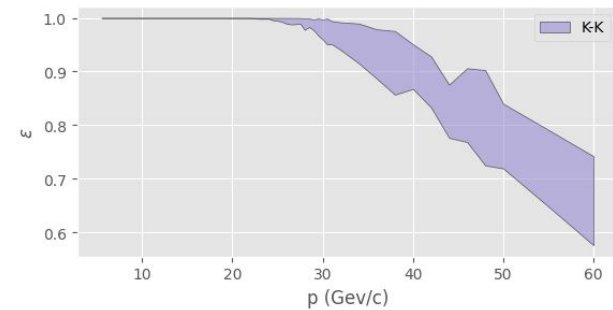
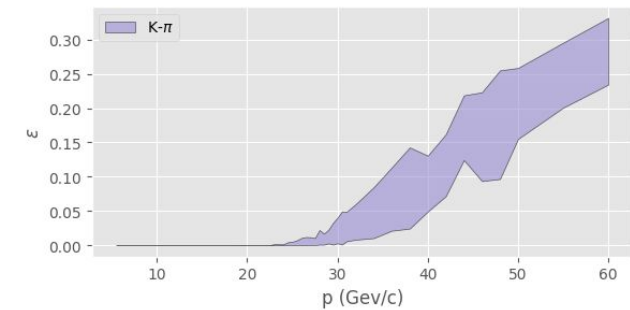
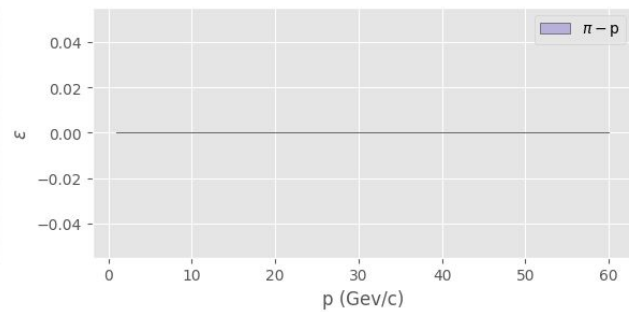
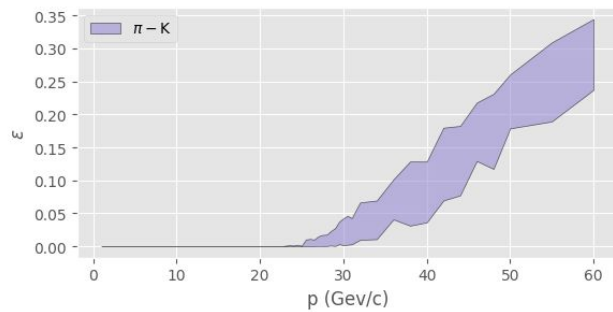
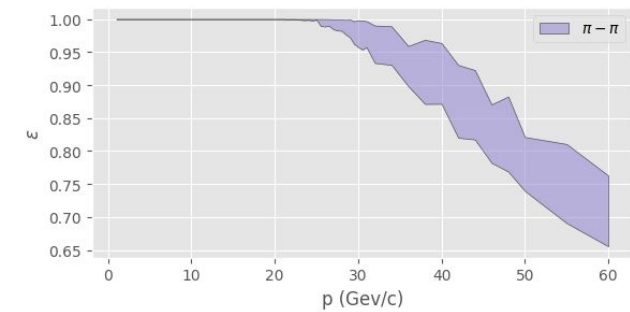
- After suggestion: only in higher eta-region (3.2-3.5)

AFTER SUGGESTIONS

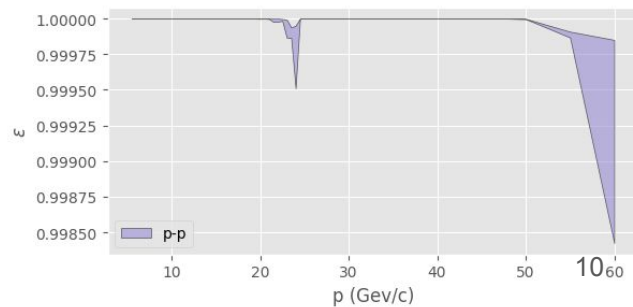
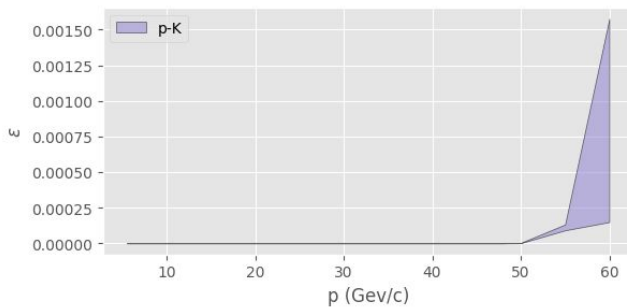
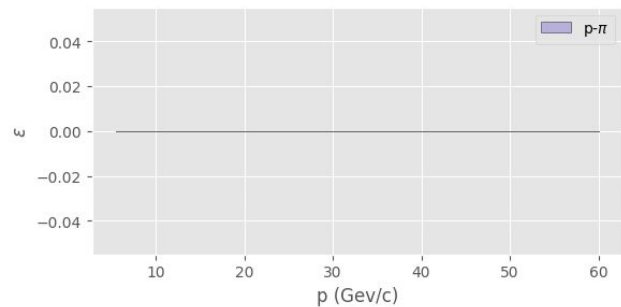
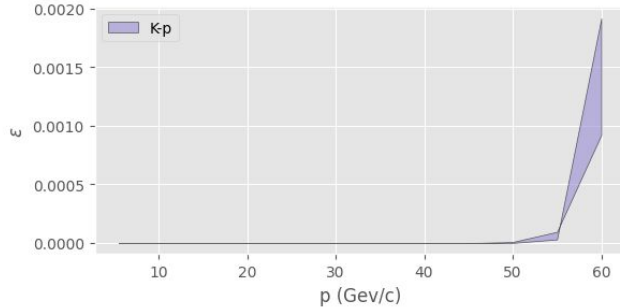
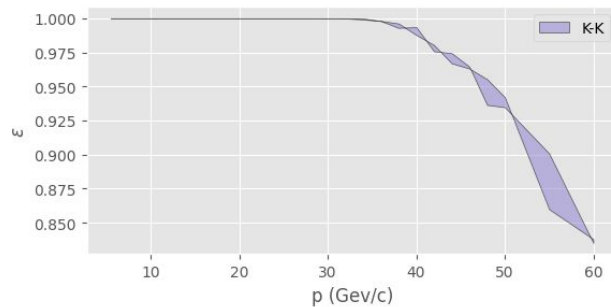
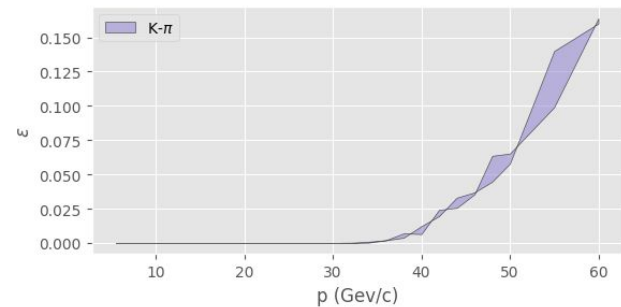
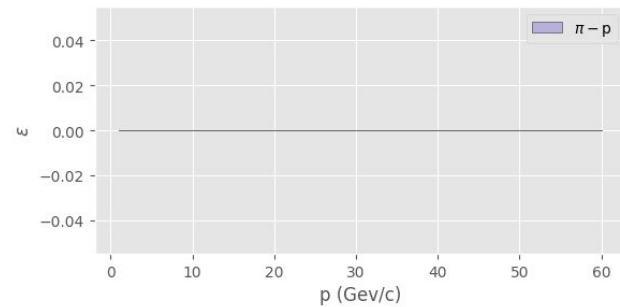
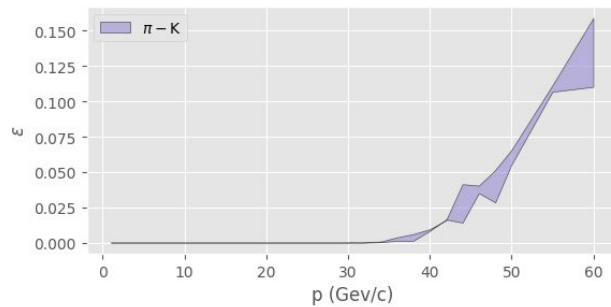
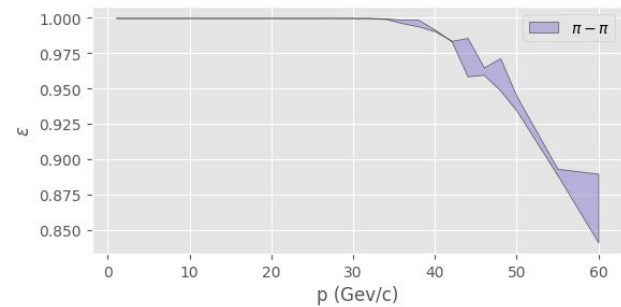
eta: 1.5-3.5 (full range)



eta: 1.7 - 2.0

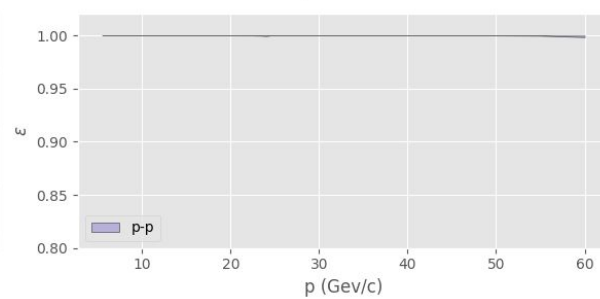
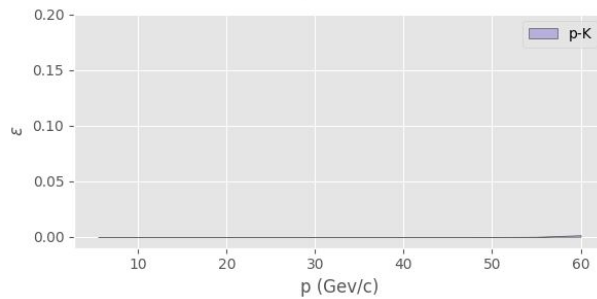
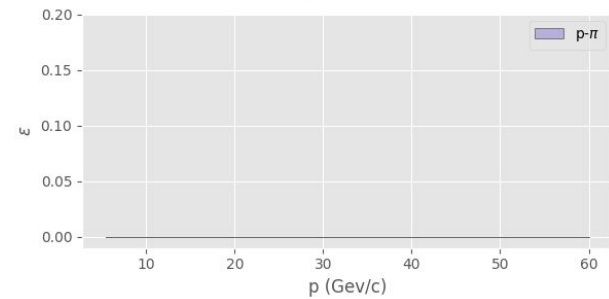
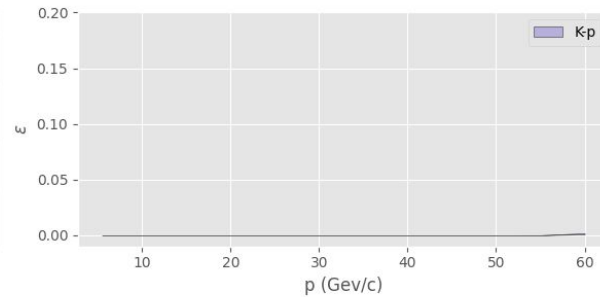
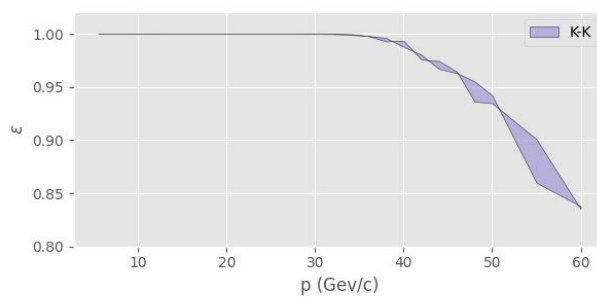
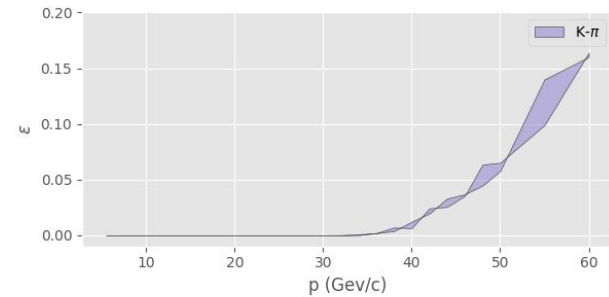
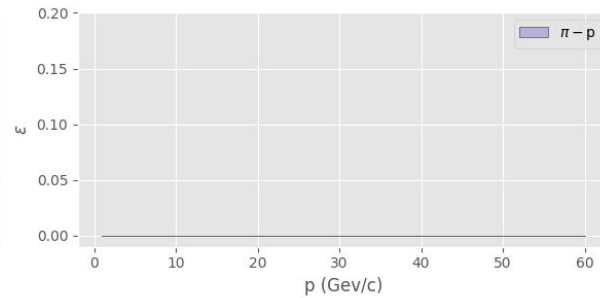
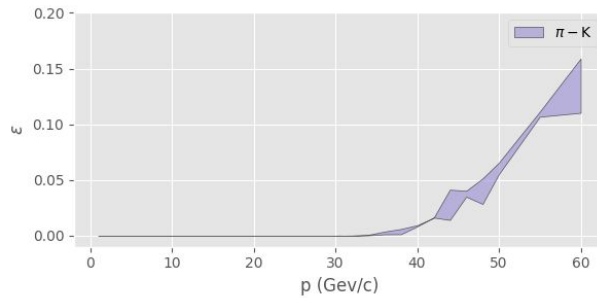
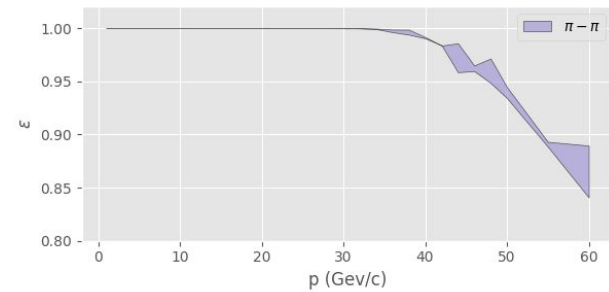


eta: 3.2-3.5



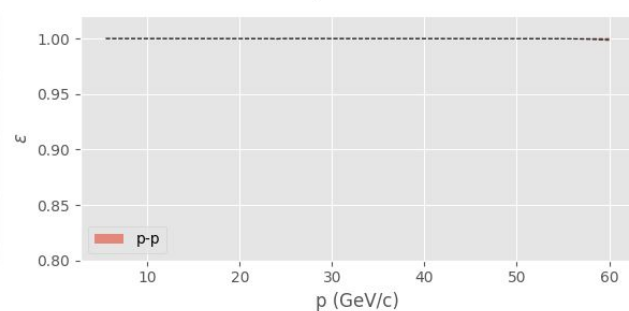
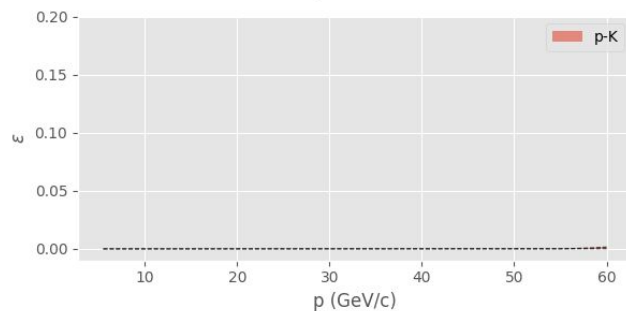
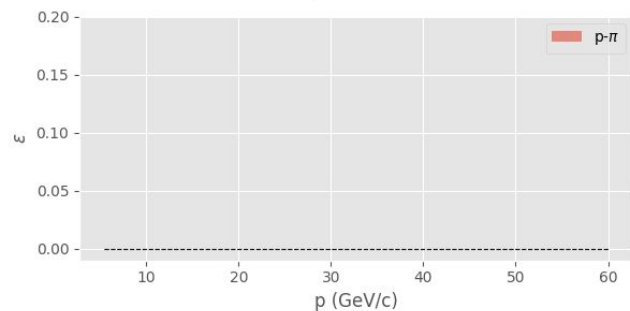
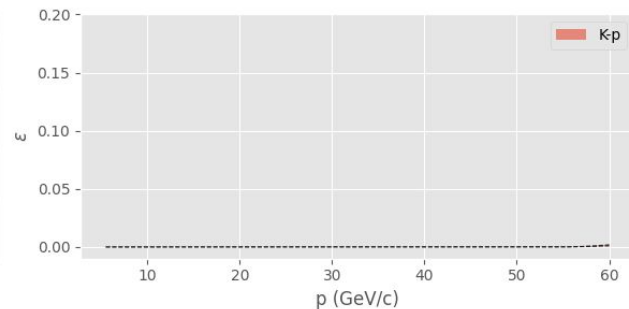
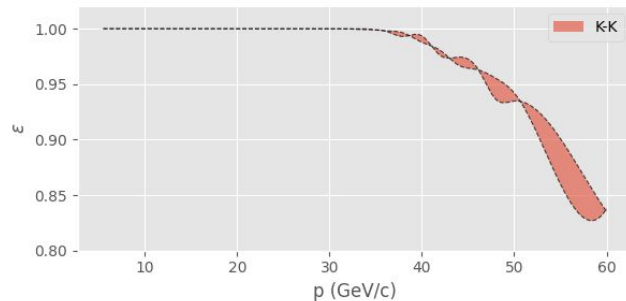
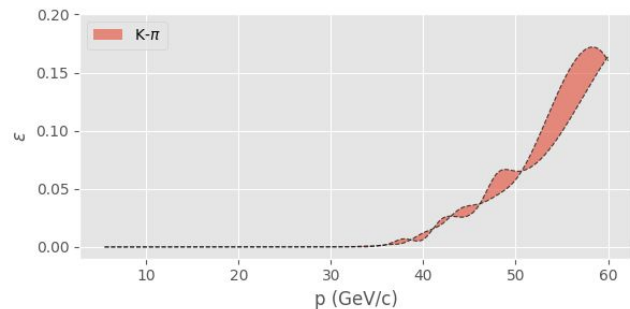
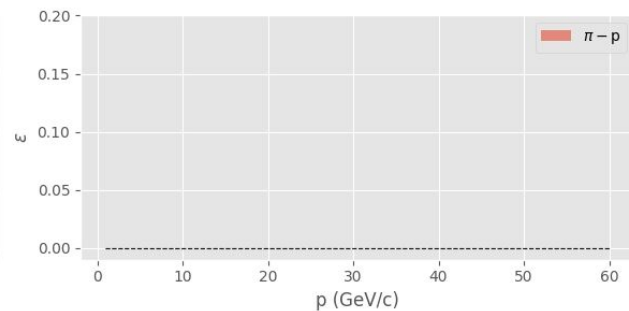
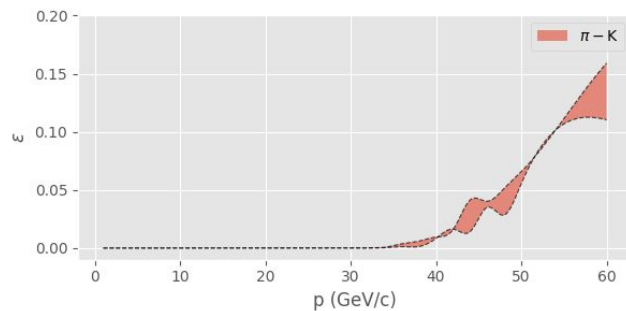
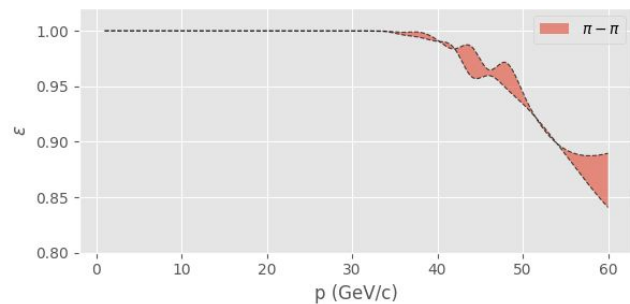
eta: 3.2-3.5

AFTER SUGGESTIONS



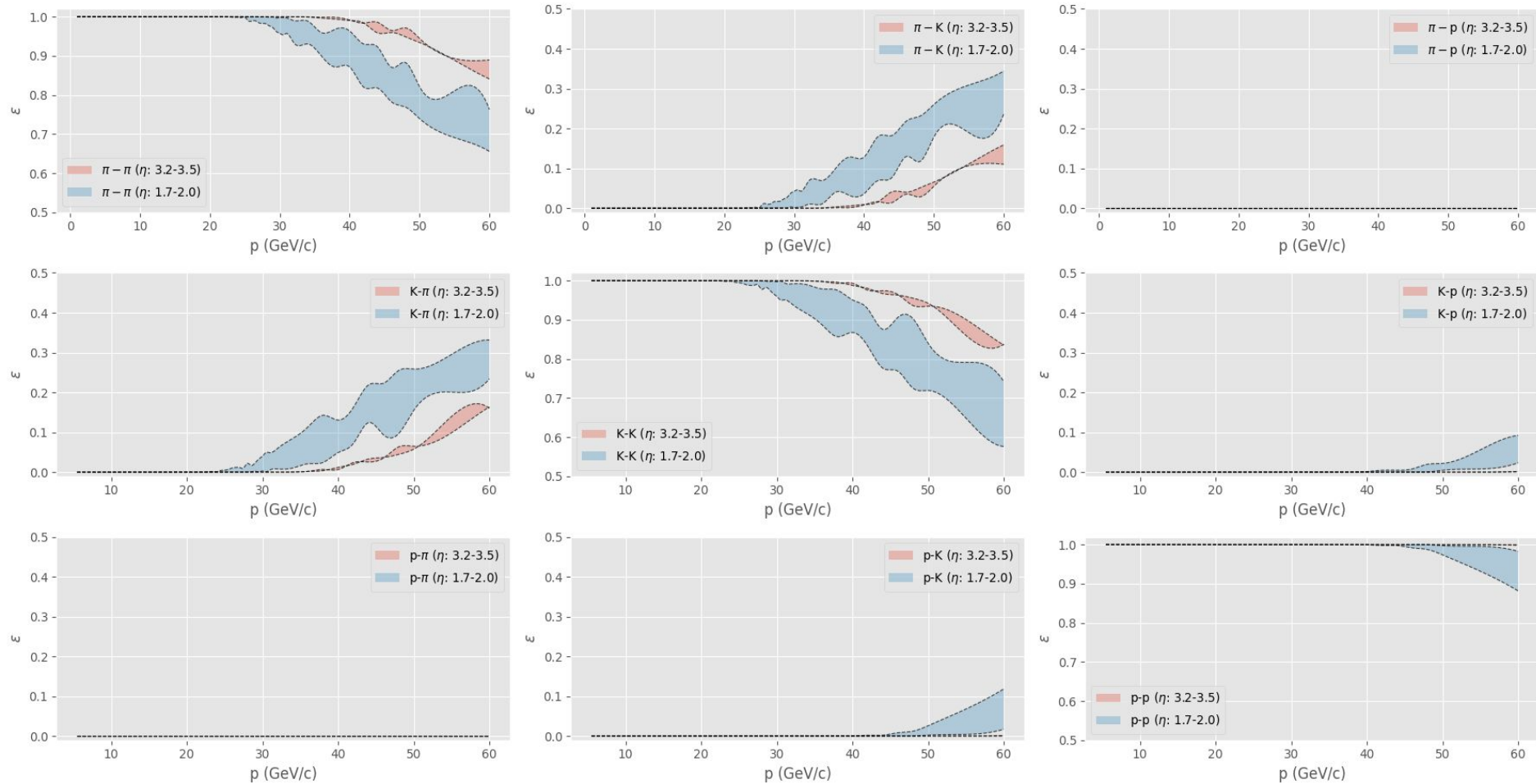
eta: 3.2-3.5

AFTER SUGGESTIONS



eta: 3.2-3.5 & 1.7-2.0

AFTER SUGGESTIONS



Bins for pixel analysis

- <https://docs.google.com/spreadsheets/d/1qNh3giwhRENJi25z45lgeh5d7QwIw5Uy3lepISHCv9Y/edit?gid=329744789#gid=329744789>
 - Without digitization: Using MC particle position on the surface of SiPm
 - With digitization

Eta bin	Eta	Eta bin begin	Eta bin end	Mom	phi_bin	phi degrees	Multiplier	Particles		
5	2	1.999	2.001	5	0	0	0	200		
10	2.5	2.499	2.501	15	1	45	0.25	200		
15	3	2.999	3.001	25	2	90	0.5	200	Total files=	576
20	3.5	3.499	3.501	35	3	135	0.75	200		
				45	4	180	1	200		
				55	5	225	1.25	200		
					6	270	1.5	200		
					7	315	1.75	200		

IN PROGRESS