LUT (preliminary)

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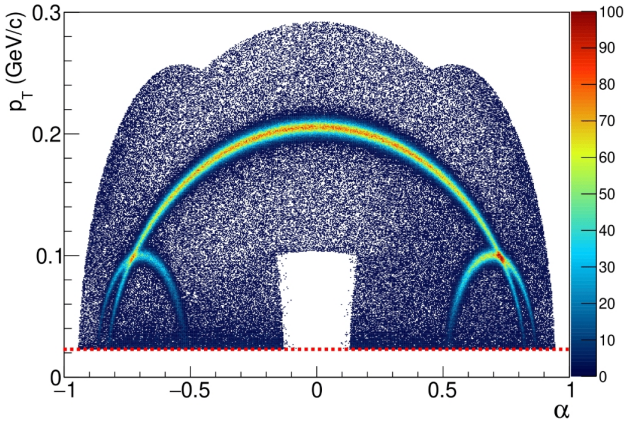
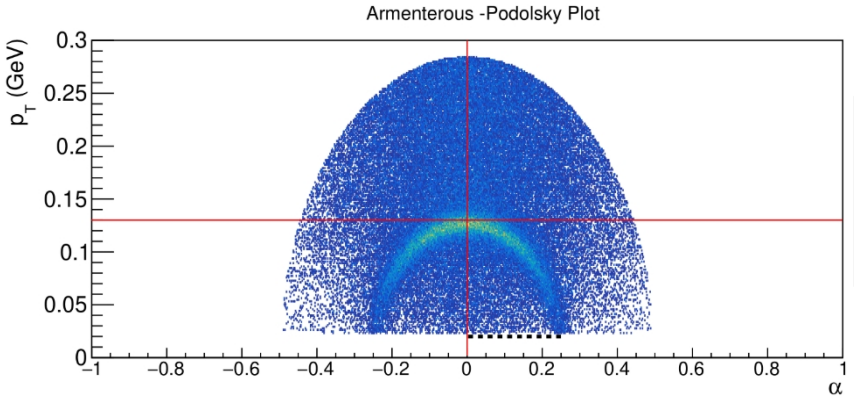
Use of RICH matrix *(an example: COMPASS)*

$$\epsilon(j \to i) = \frac{N(j \to i)}{N(j)}$$

$$M_{RICH} = \begin{pmatrix} \epsilon(\pi \to \pi) & \epsilon(\pi \to K) & \epsilon(\pi \to p) & \epsilon(\pi \to X) \\ \epsilon(K \to \pi) & \epsilon(K \to K) & \epsilon(K \to p) & \epsilon(K \to X) \\ \epsilon(p \to \pi) & \epsilon(p \to K) & \epsilon(p \to p) & \epsilon(p \to X) \end{pmatrix}$$

$$\vec{T}_h = M^{-1}_{RICH} \cdot \vec{I}_h$$





	π	K
mom	$p > p_{\pi,thr}$	$p > p_{K,thr}$
LH(i)/LH(π)	-	1.08
LH(i)/LH(K)	1.0	-
LH(i)/LH(P)	1.0	1.0
LH(i)/LH(Bkg)	1.0	1.24

Our LUT

$$M_{RICH} = \begin{pmatrix} \epsilon(\pi \to \pi) & \epsilon(\pi \to K) & \epsilon(\pi \to p) & \epsilon(\pi \to X) \\ \epsilon(K \to \pi) & \epsilon(K \to K) & \epsilon(K \to p) & \epsilon(K \to X) \\ \epsilon(p \to \pi) & \epsilon(p \to K) & \epsilon(p \to p) & \epsilon(p \to X) \end{pmatrix}$$

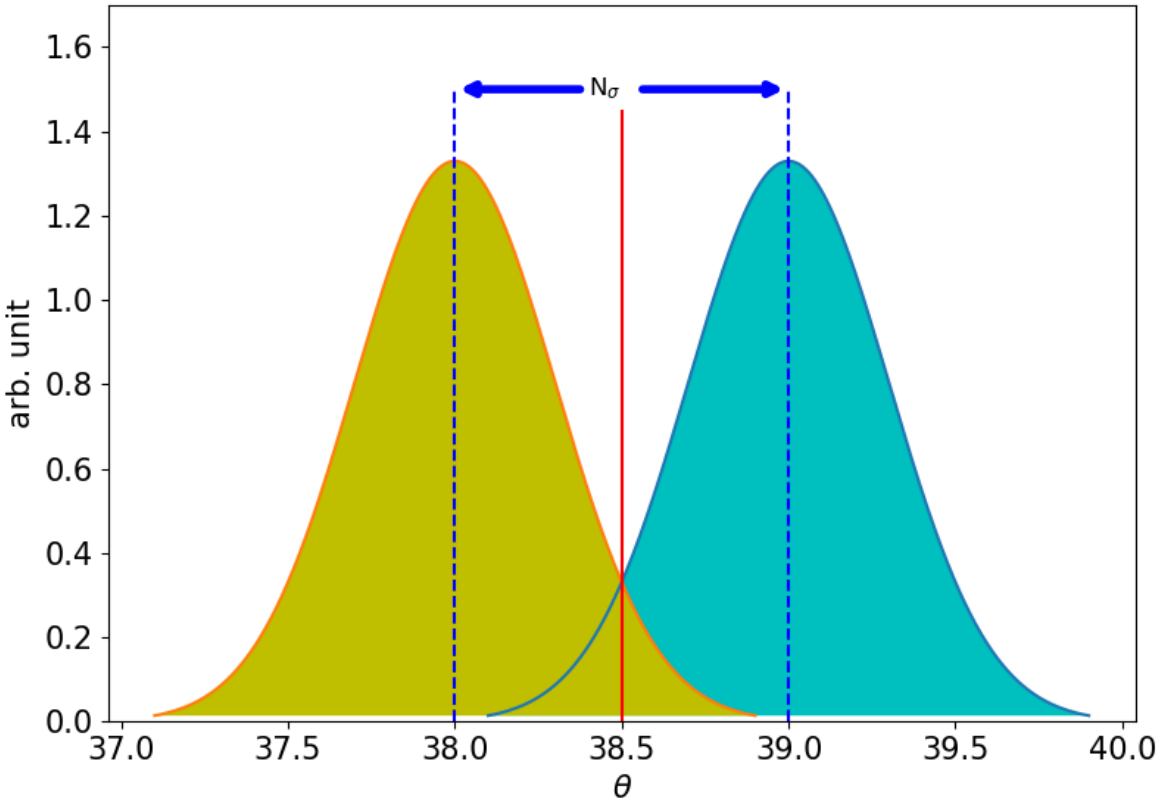
Probabilities will depend on which mass hypothesis are added!

For cases where RICH is asked to identify electrons: pion identification probability drops in high momentum!

To know

- Old aerogel
- Nominal dRICH geometry
- No noise
- Only 3 eta Bins
- No azimuth
- One file for each radiator with e/h and one file for pi/K/P
- 4 files in total
- **Time consuming!! We are using full ePIC chain**
- Thanks to Brian we are using delphes (modified version) to create LUT

DELPHES Computation



- Sigma values are estimated from simulation.
- Refractive index is computed from simulation.
- Central values are estimated by *DELPHES* to apply a separation cut in the middle.

Expected fraction within:

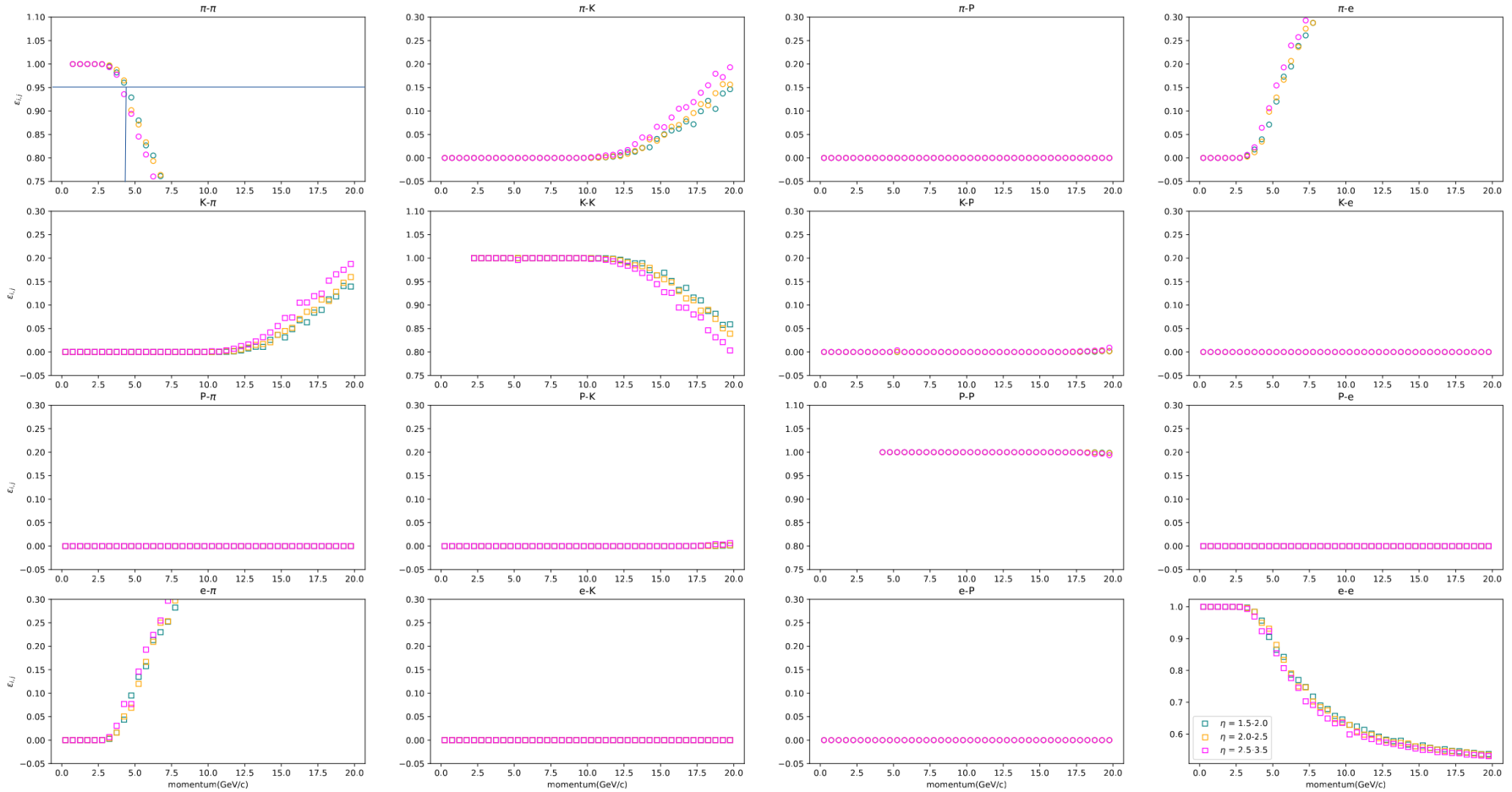
$$\mu \pm x\sigma = erf(\frac{x}{\sqrt{2}}) \quad (1)$$

Expected fraction outside:

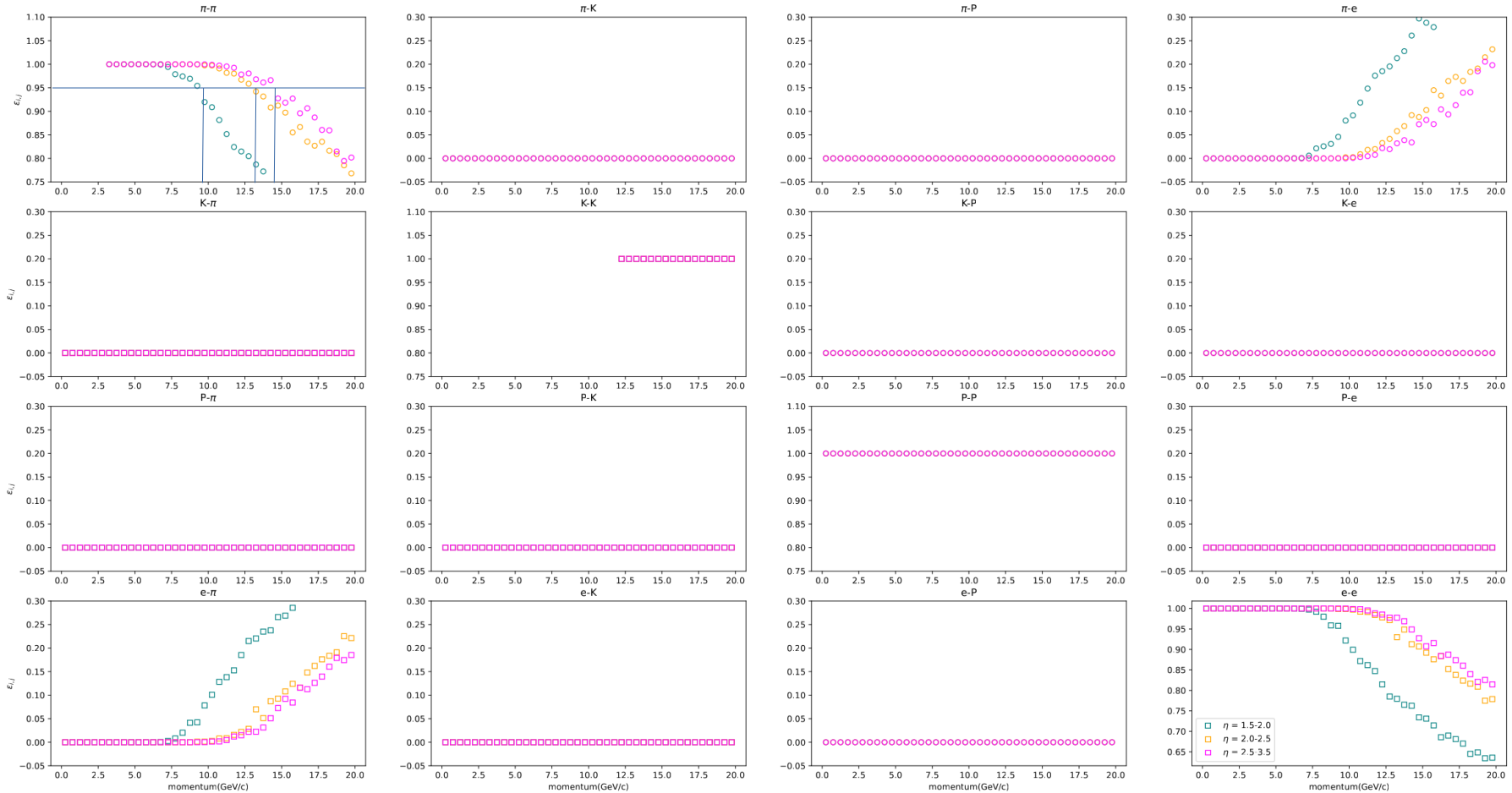
$$\mu \pm x\sigma = 1 - erf(\frac{x}{\sqrt{2}}) = erfc(\frac{x}{\sqrt{2}}) \quad (2)$$

Pion to pion identification with 95% efficiency corresponds to $erfc = 0.1$.
Roughly, $x = 1.64$**.**

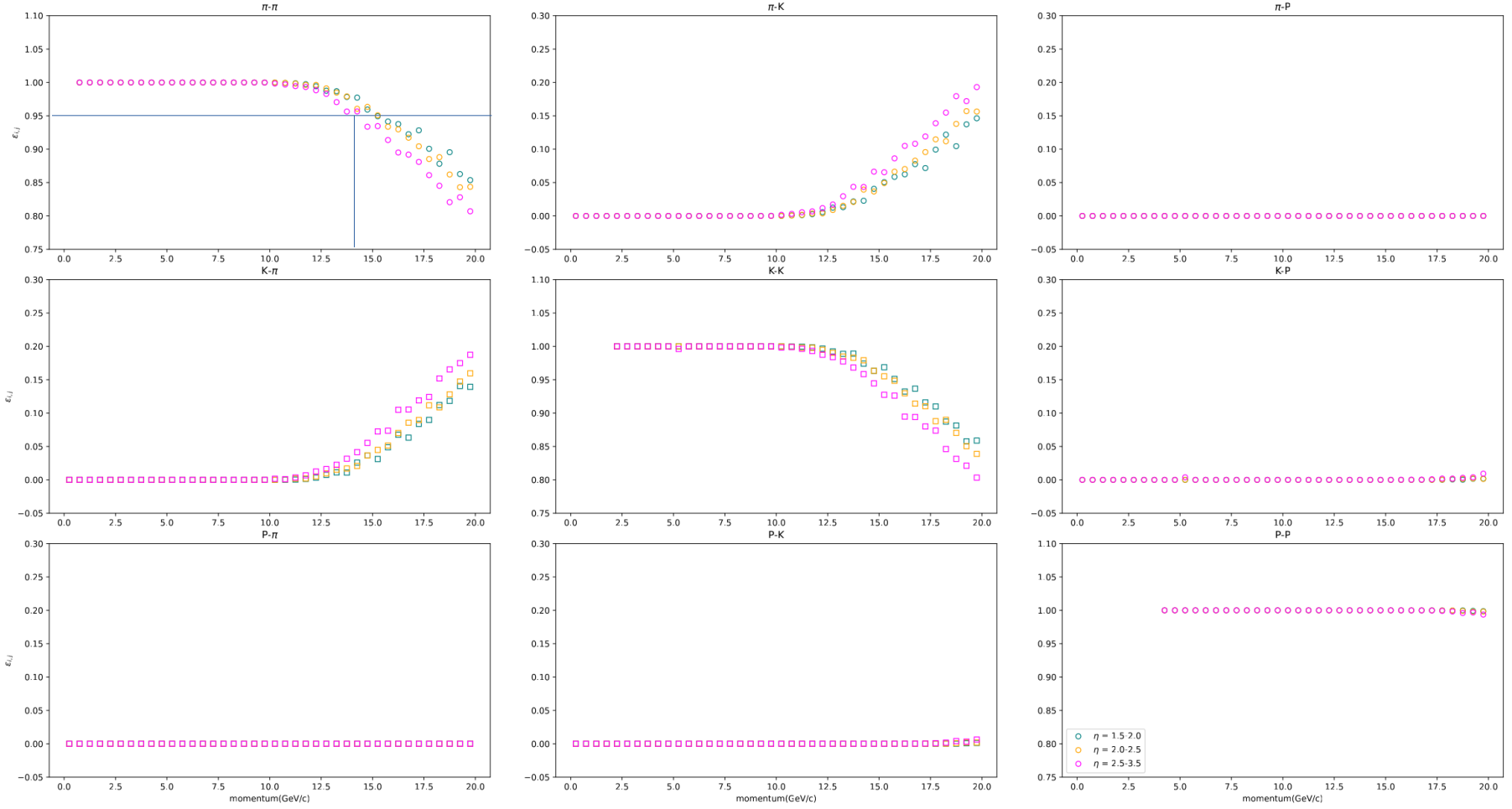
Aerogel e/h


π-π
π-K
π-P
π-e
K-π
K-K
K-P
K-e
P-π
P-K
P-P
P-e
e-π
e-K
e-P
e-e
ε_{ij}
momentum(GeV/c)
η = 1.5-2.0
η = 2.0-2.5
η = 2.5-3.5

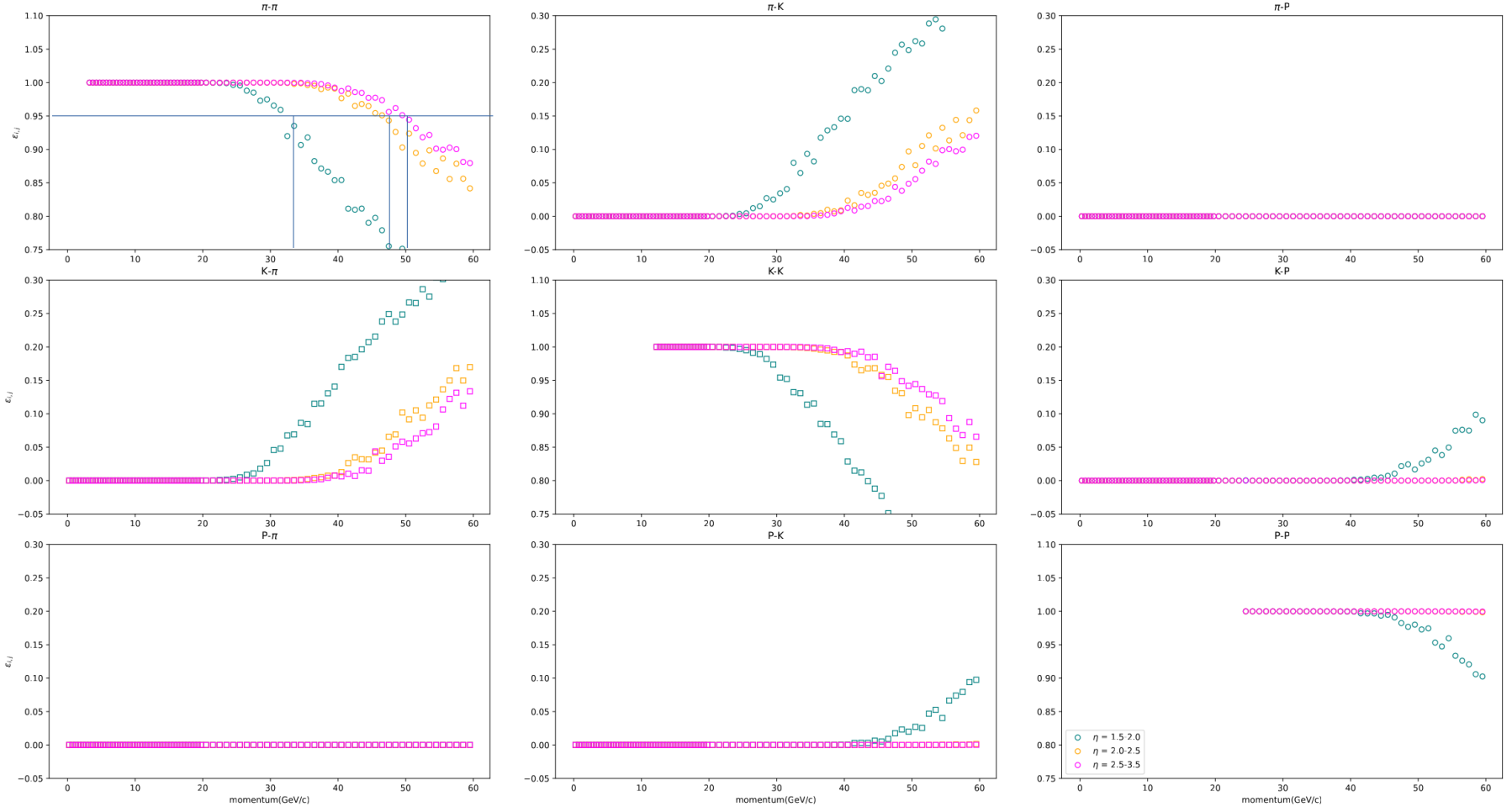
gas e/h


π-π
π-K
π-P
π-e
K-π
K-K
K-P
K-e
P-π
P-K
P-P
P-e
e-π
e-K
e-P
e-e
$\epsilon_{i,j}$
momentum(GeV/c)
η = 1.5-2.0
η = 2.0-2.5
η = 2.5 3.5

aerogel pi/K/P



gas pi/K/P


π-π
π-K
π-P
K-π
K-K
K-P
P-π
P-K
P-P
$\varepsilon_{i,j}$
momentum(GeV/c)
η = 1.5-2.0
η = 2.0-2.5
η = 2.5-3.5

Consistency with Nsigma separation