

JINR Association of Young Scientists and Specialists
Conference "Alushta-2023"



Particle parameter changing due to TPC construction and materials

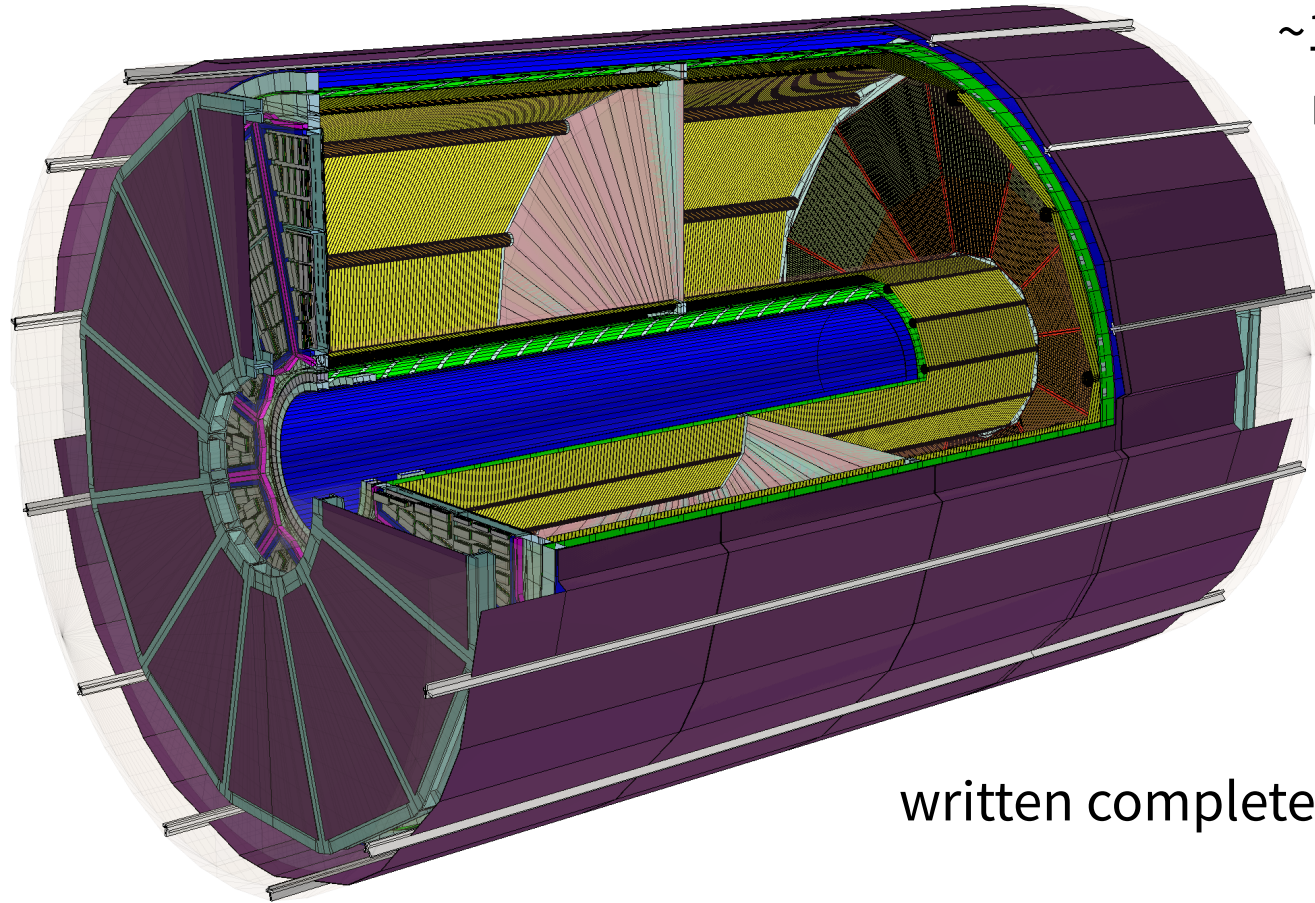
Bychkov Alexander

VB LHEP

Alushta, June 4-11, 2023



MPDRoot TPC full geometry

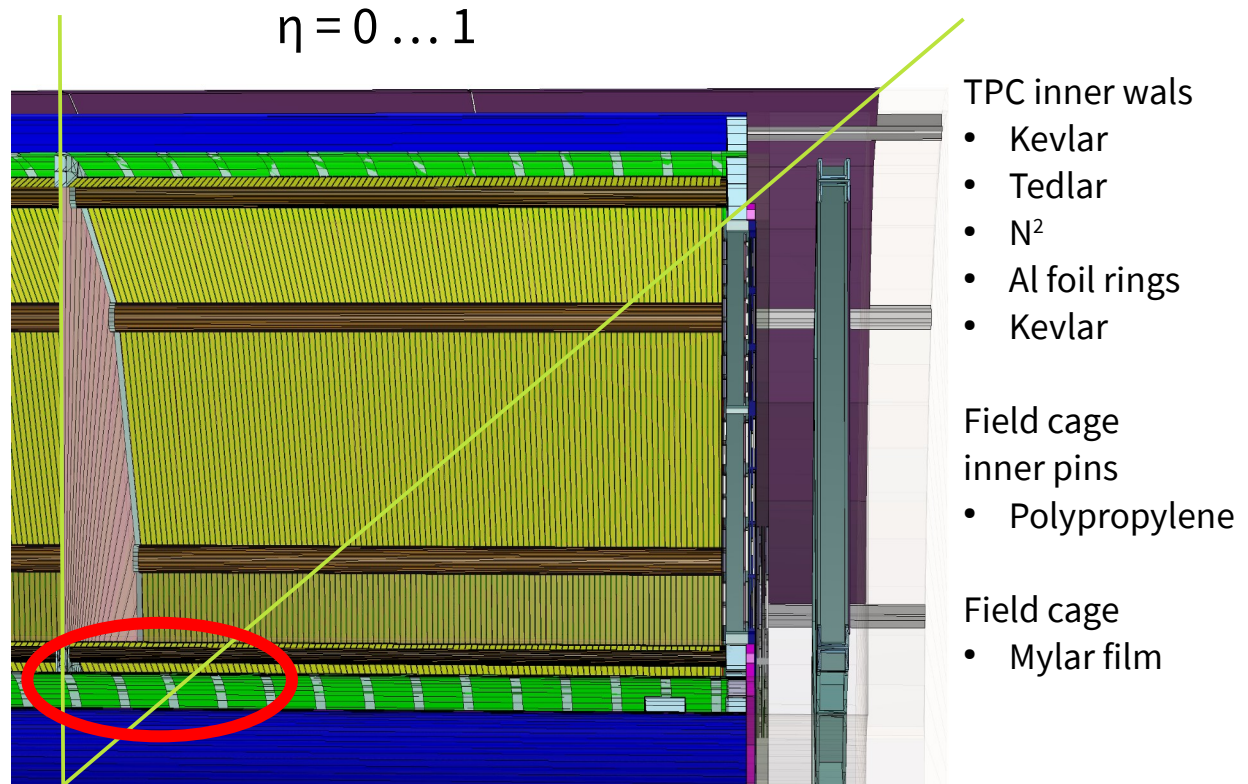


~140 000
nodes

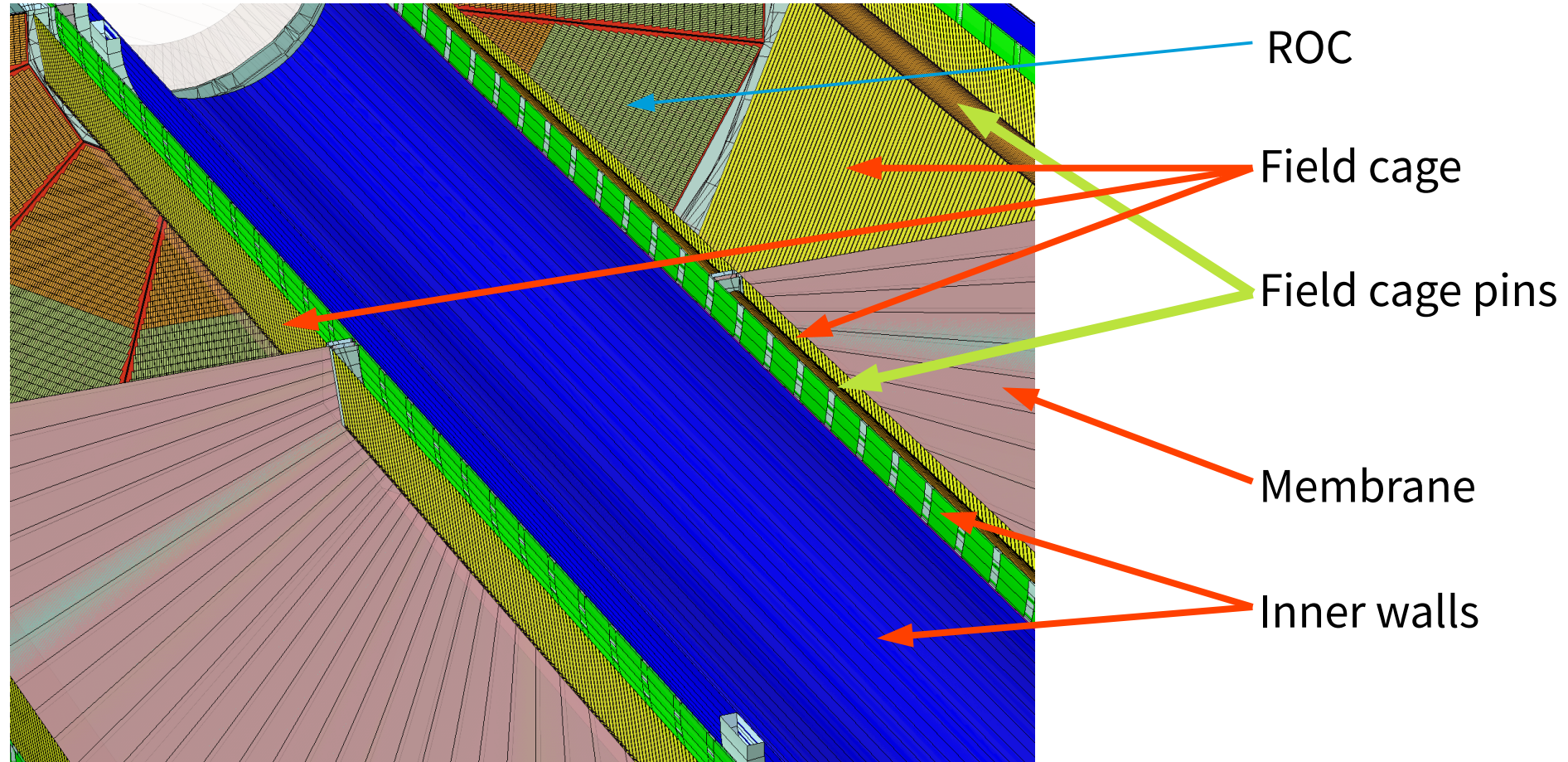
written completely in c++ code

Particle parameters changing due to crossing inner walls of TPC

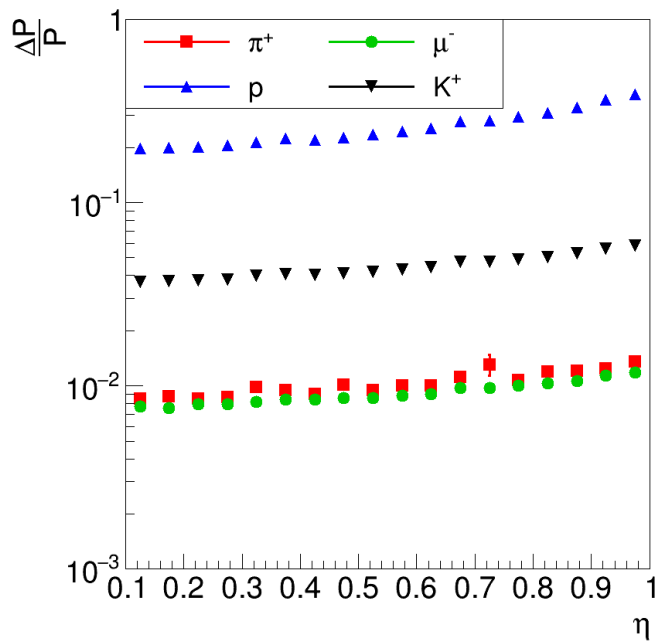
- No magnetic field
- All tracks starts from (0, 0, 0)
- Tracks: p , π^+ , μ^- , K^+
- $\Delta P = P_0 - P_{out}^{inner\ walls}$
 - P_0 – initial momentum
 - $P_{out}^{inner\ walls}$ – momentum after passing inner walls of TPC
- Material thickness depends on pseudorapidity



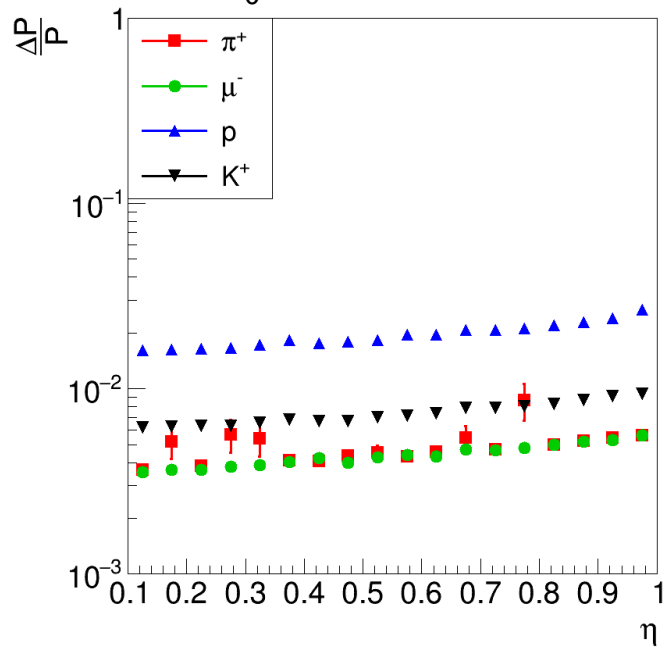
Inner walls, membrane and fieldcage



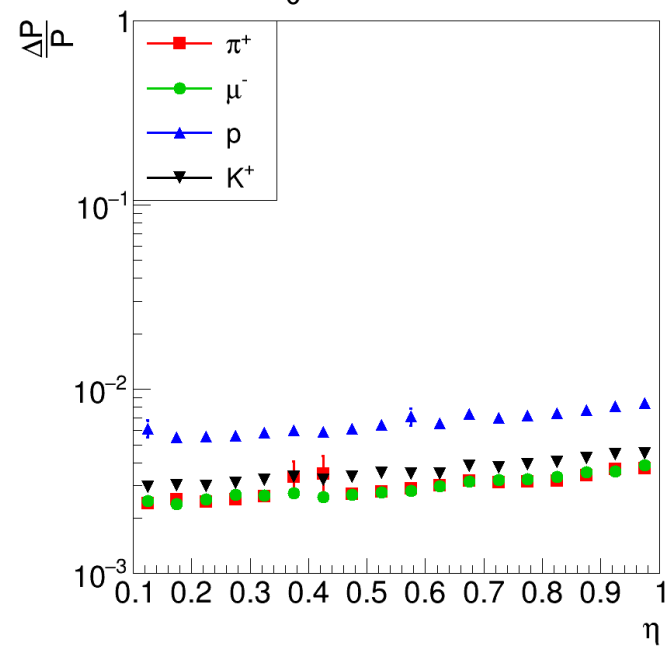
$P_0 = 300 \text{ MeV}$



$P_0 = 600 \text{ MeV}$

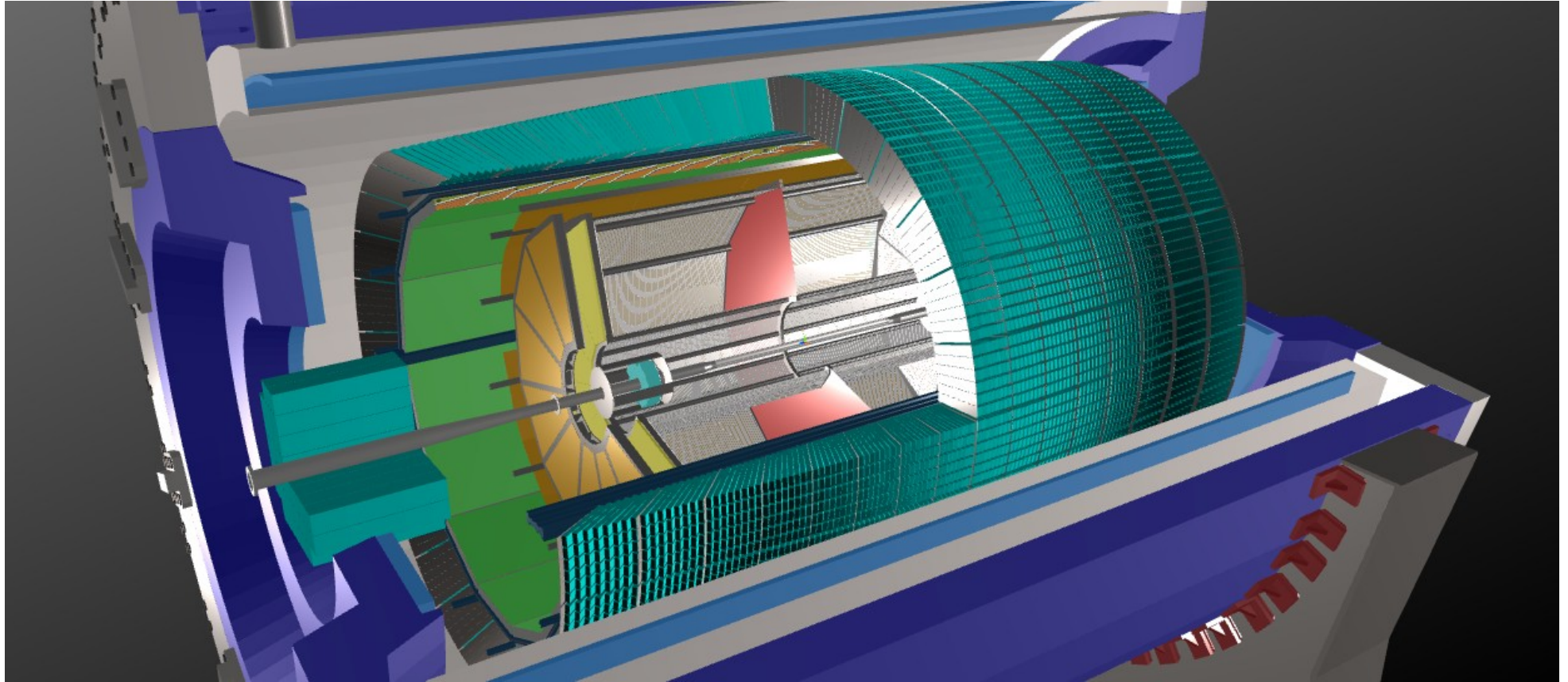


$P_0 = 900 \text{ MeV}$



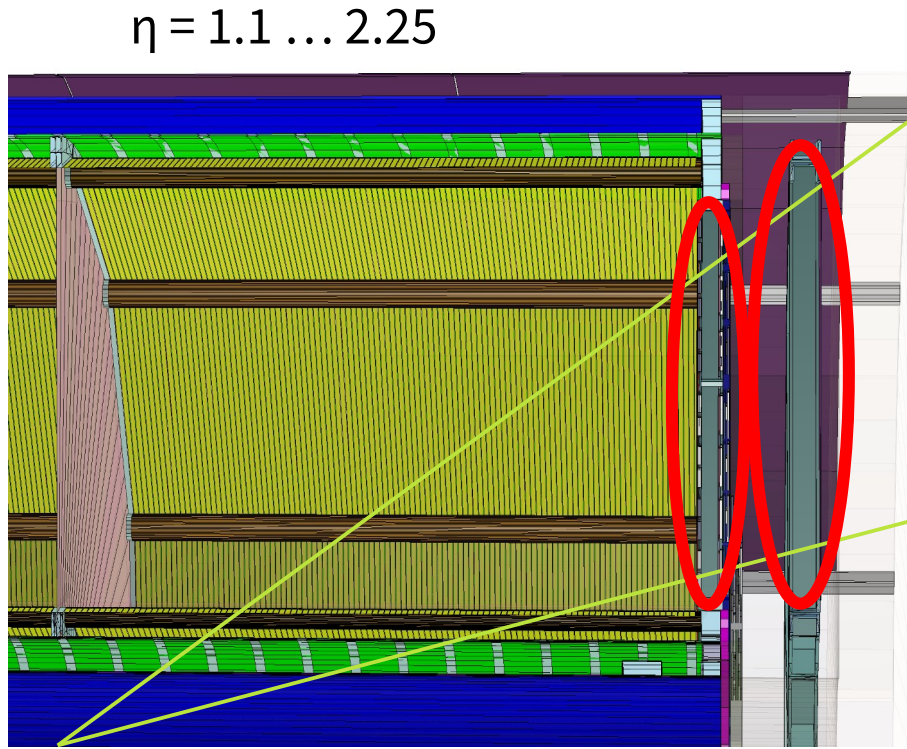
$$\Delta P = P_0 - P_{\text{out}}^{\text{inner walls}}$$

MPD layout



TPC end-caps particle parameter changing

- No magnetic field
- All tracks starts from (0, 0, 0)
- Tracks: p , π^+ , μ^- , K^+
- $\Delta P = P_{in}^{end-caps} - P_{out}^{end-caps}$
 - $P_{in}^{end-caps}$, $P_{out}^{end-caps}$ - momentum in/out TPC end-caps
- $\alpha = \overbrace{P_{in}^{end-caps}}^{\vec{P}_{in}^{end-caps}}, \vec{P}_{out}^{end-caps}$



ROC plane

- Cu
- Textolite
- Al

IO cards

- Al
- Textolite x2
- Al

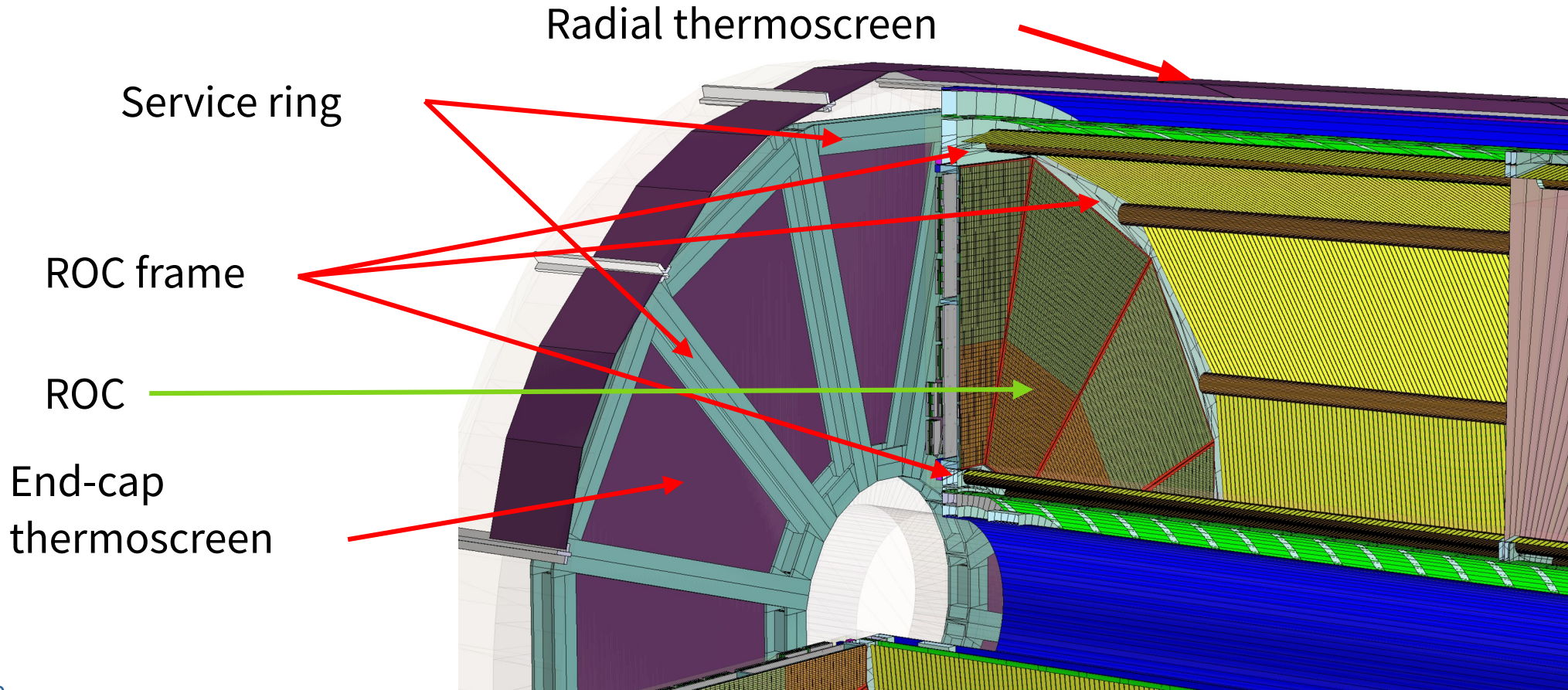
Thermoscreen

- Al

Service rings

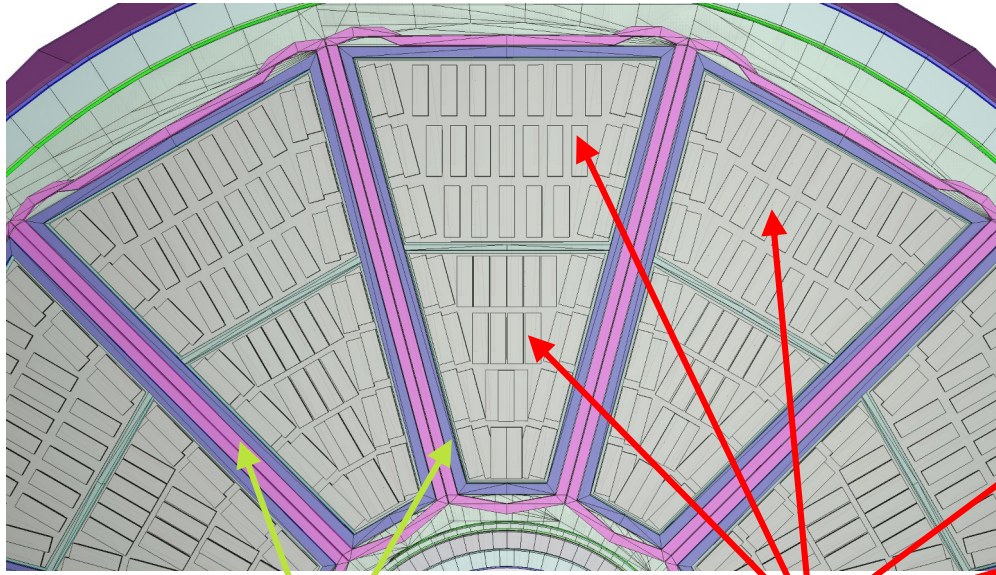
- Al

ROC frame, service rings and thermoscreen



Read-Out Chambers

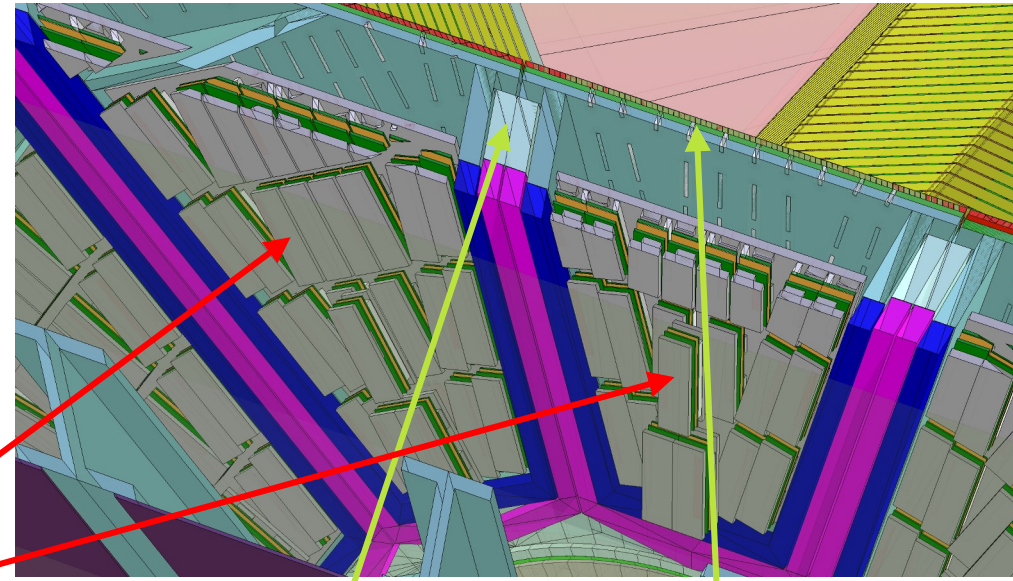
ROC outside view



ROC pressing frames
Al

IO card with cooling
Al | PCB x2 | Al

ROC cross-section

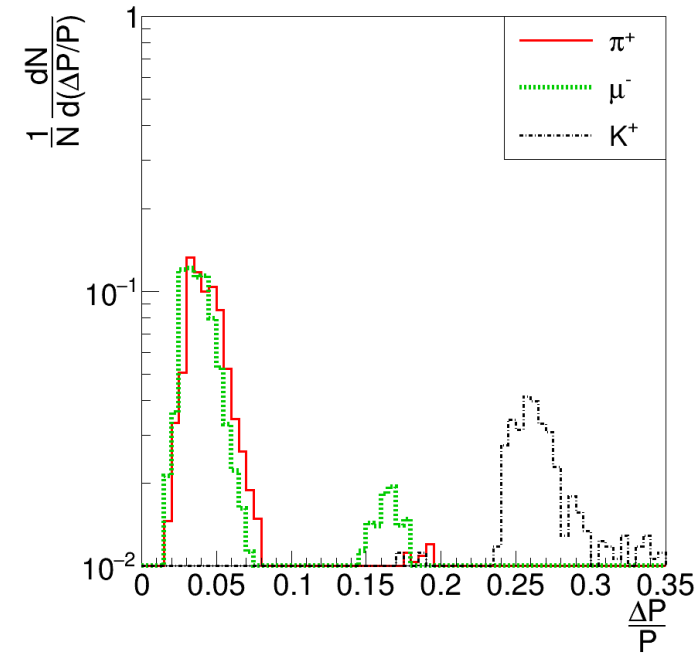


ROC frame
Al

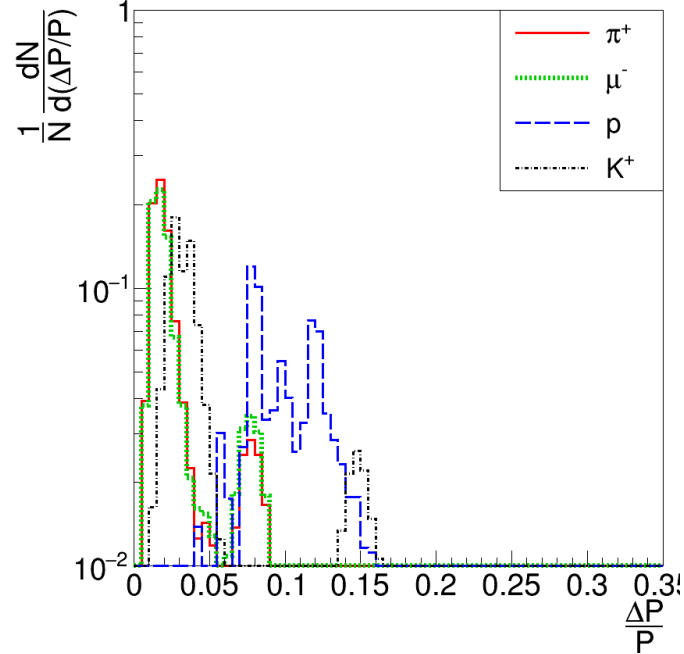
ROC plane
pads | PCBs | Al frame

Momentum losses

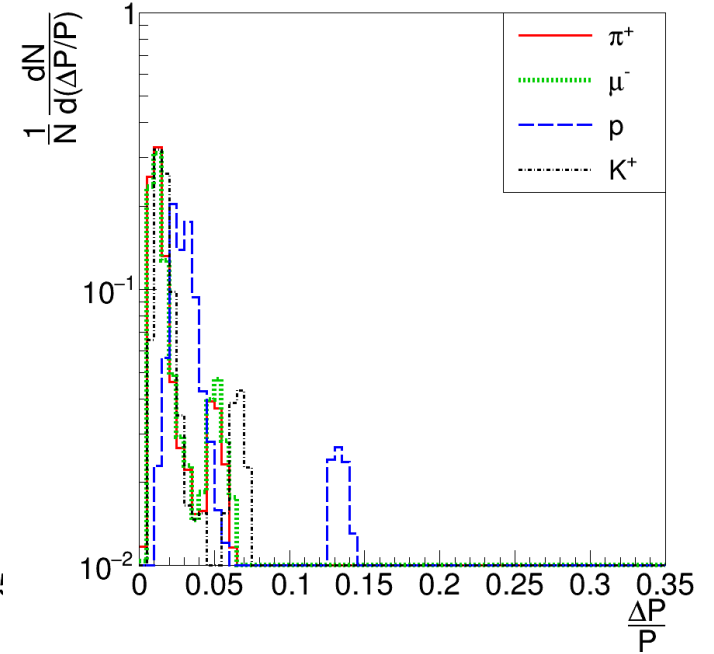
$P_0 = 300$ MeV



$P_0 = 600$ MeV

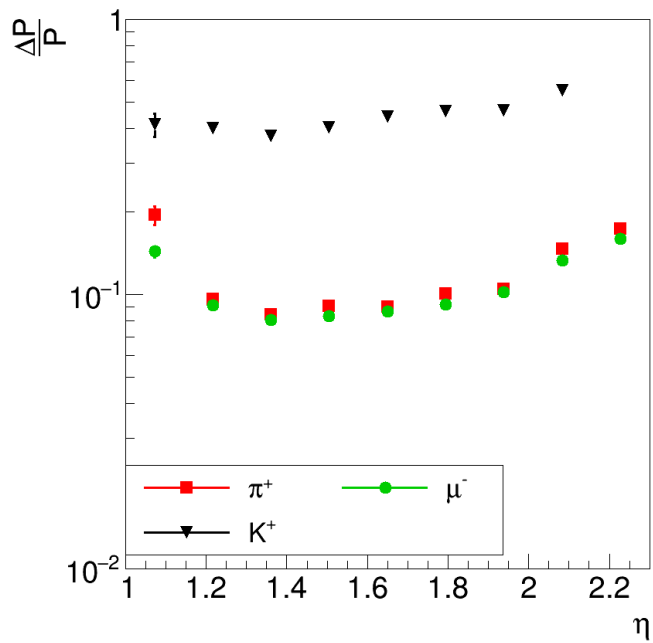


$P_0 = 900$ MeV

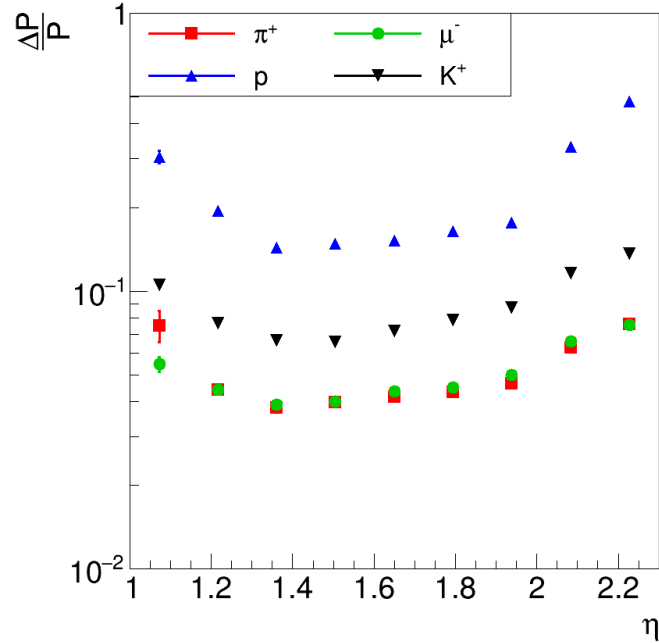


$$\Delta P = P_{\text{in}}^{\text{end-caps}} - P_{\text{out}}^{\text{end-caps}}$$

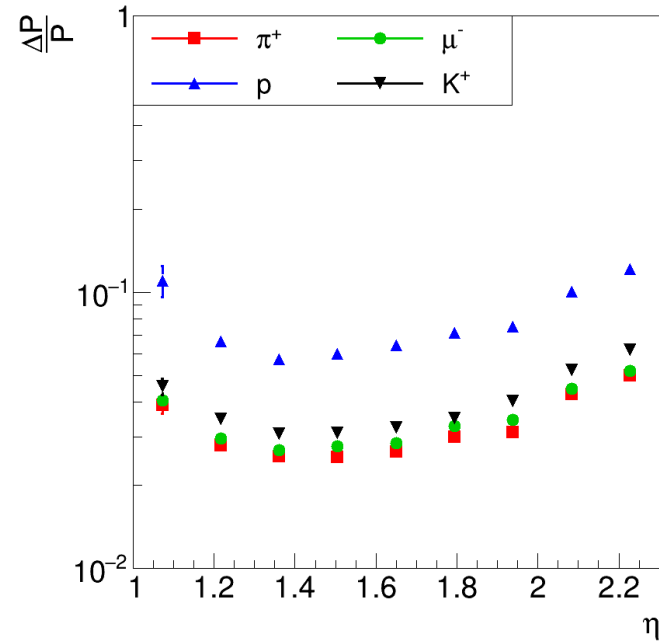
$P_0 = 300 \text{ MeV}$



$P_0 = 600 \text{ MeV}$



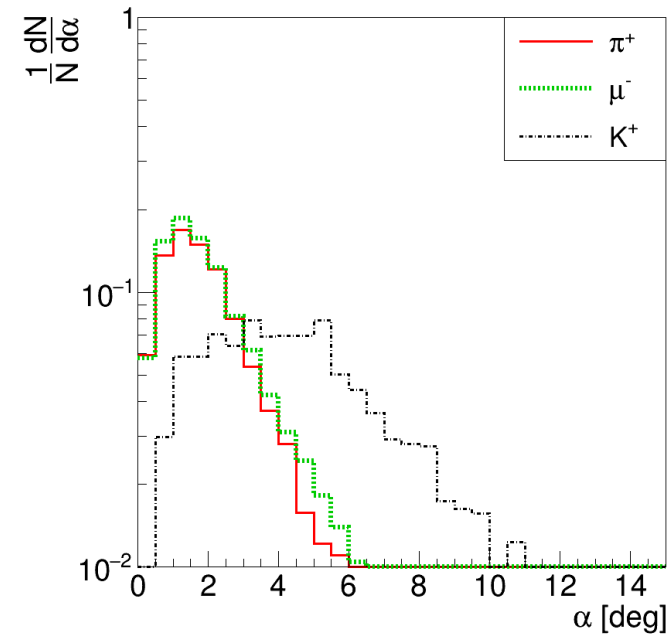
$P_0 = 900 \text{ MeV}$



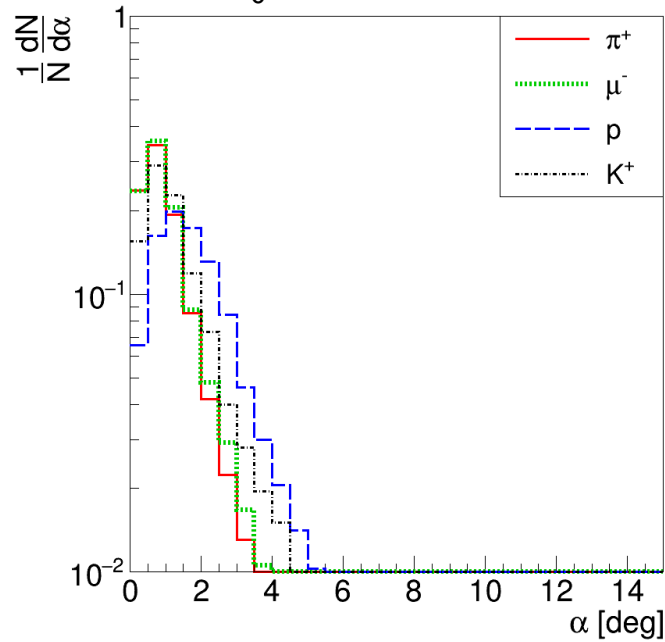
$$\Delta P = P_{\text{in}}^{\text{end-caps}} - P_{\text{out}}^{\text{end-caps}}$$

Direction changes

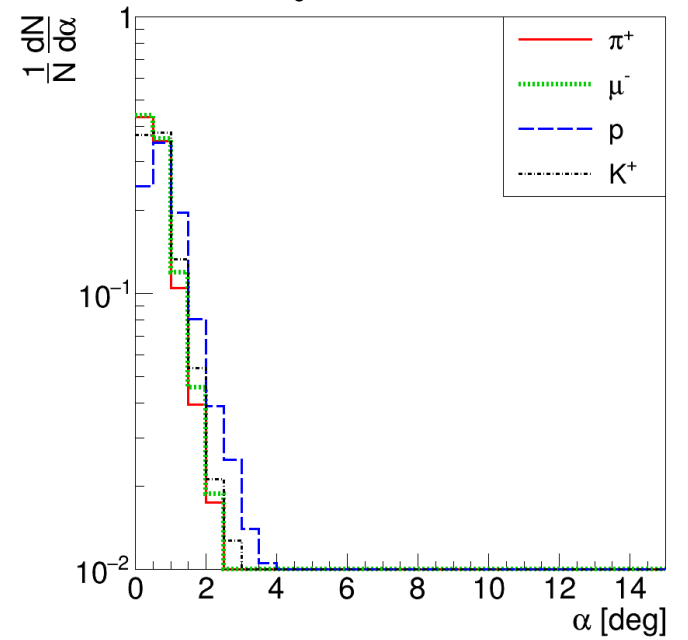
$P_0 = 300 \text{ MeV}$



$P_0 = 600 \text{ MeV}$



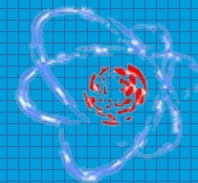
$P_0 = 900 \text{ MeV}$



$$\alpha = \overbrace{\vec{P}_{\text{in}}^{\text{end-caps}}, \vec{P}_{\text{out}}^{\text{end-caps}}}^{\text{Direction changes}}$$

Results

- MPD TPC is almost transparent for particles between event collision point and TPC sensitive volume
- There is no reason to place any detector after End-caps of MPD TPC because changes in particle parameters won't allow to add more information about tracks to a data gathered by TPC itself.



**Thank you
for attention**

Alushta
June 4-11, 2023

