

Detection efficiency of hit cluster Progress report

穴倉遼太

Sorry

- I was scheduled to present today for the WIP, but since the preparations were not ready in time, I will only be providing a progress update.

Contents

- Simple Cut
 - Au+Au simulation
 - Au+Au data
- Au+Au data Analysis for cut
- High cut
 - Au+Au data
 - Au+Au simulation

Situation

- We don't have the available data of pp zero-field now, so I analyzed AuAu data provided by Cheng-Wei.
- I also analyzed AuAu simulation provided by Cheng-Wei.
- Thank you very much, Cheng-Wei.

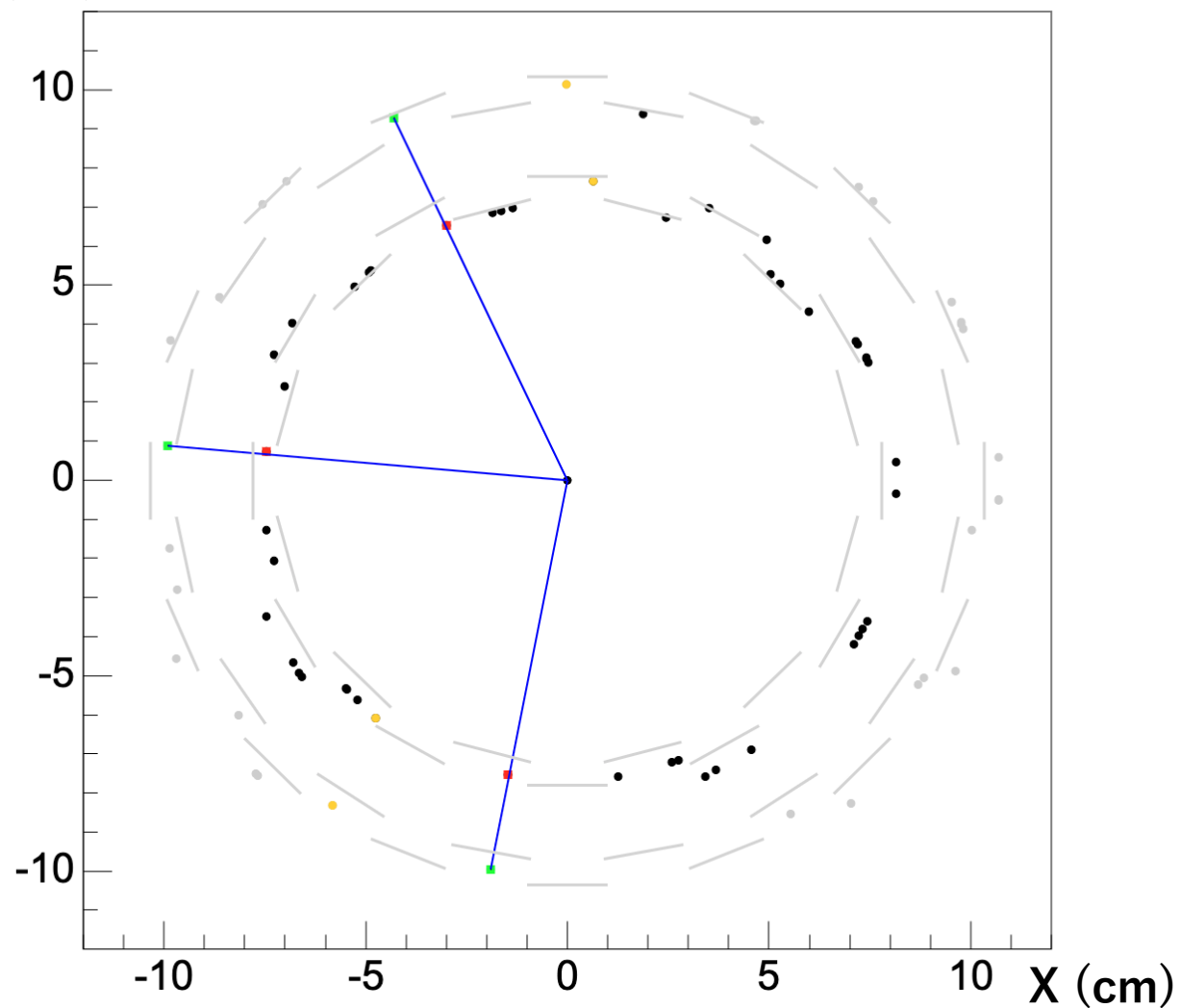
Simple cut

- Event cut
 - $15 \leq \# \text{ of cluster} \leq 150$
 - $-10 \leq \text{MBD_z_vtx} \leq 10$
- Outer cluster cut
 - Dencity cut (distance of outer clusters $< 1\text{cm}$)

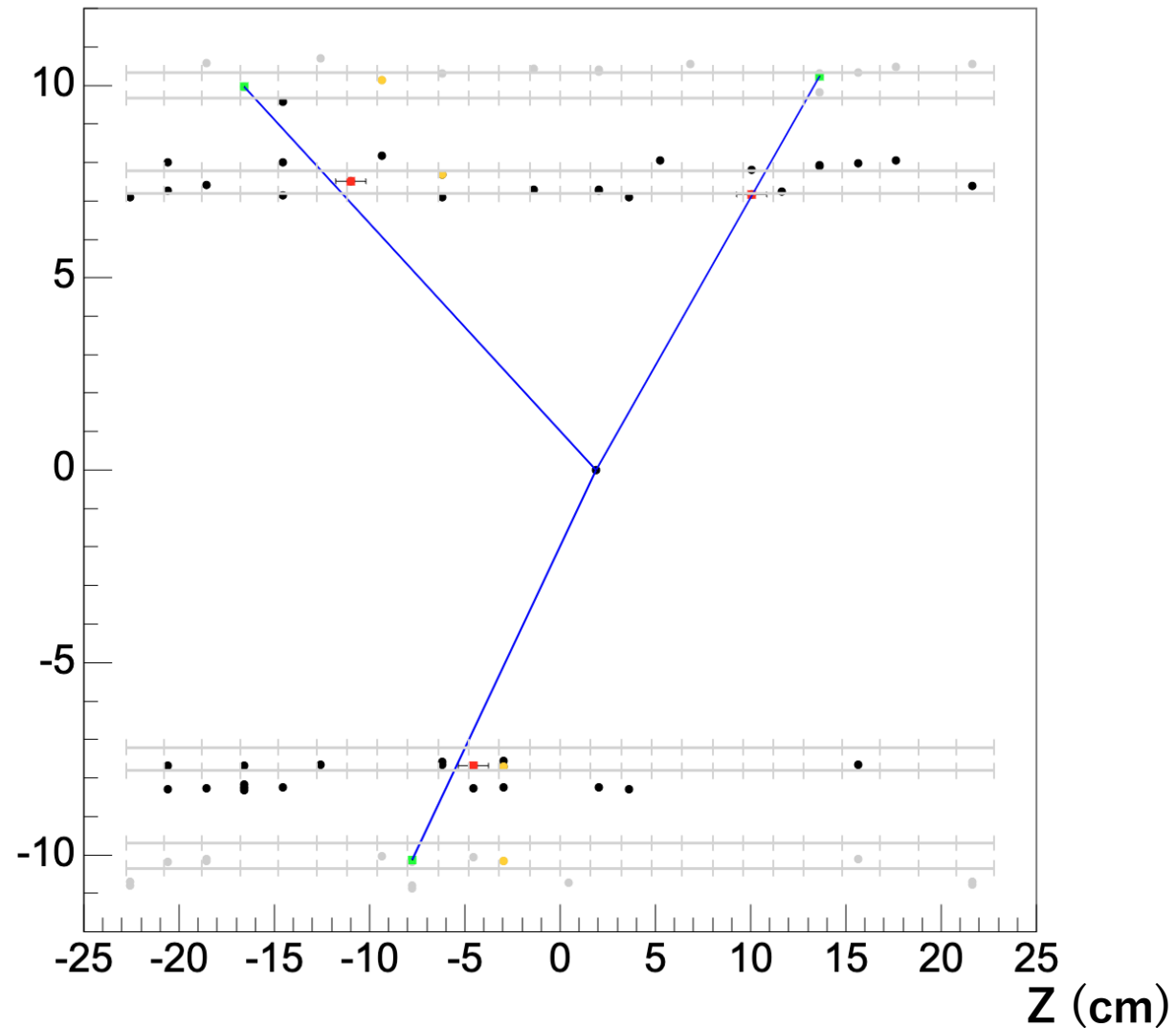
Event Display (simulation)

5/13

Y (cm)



$R = \sqrt{x^2 + y^2}$ (cm)



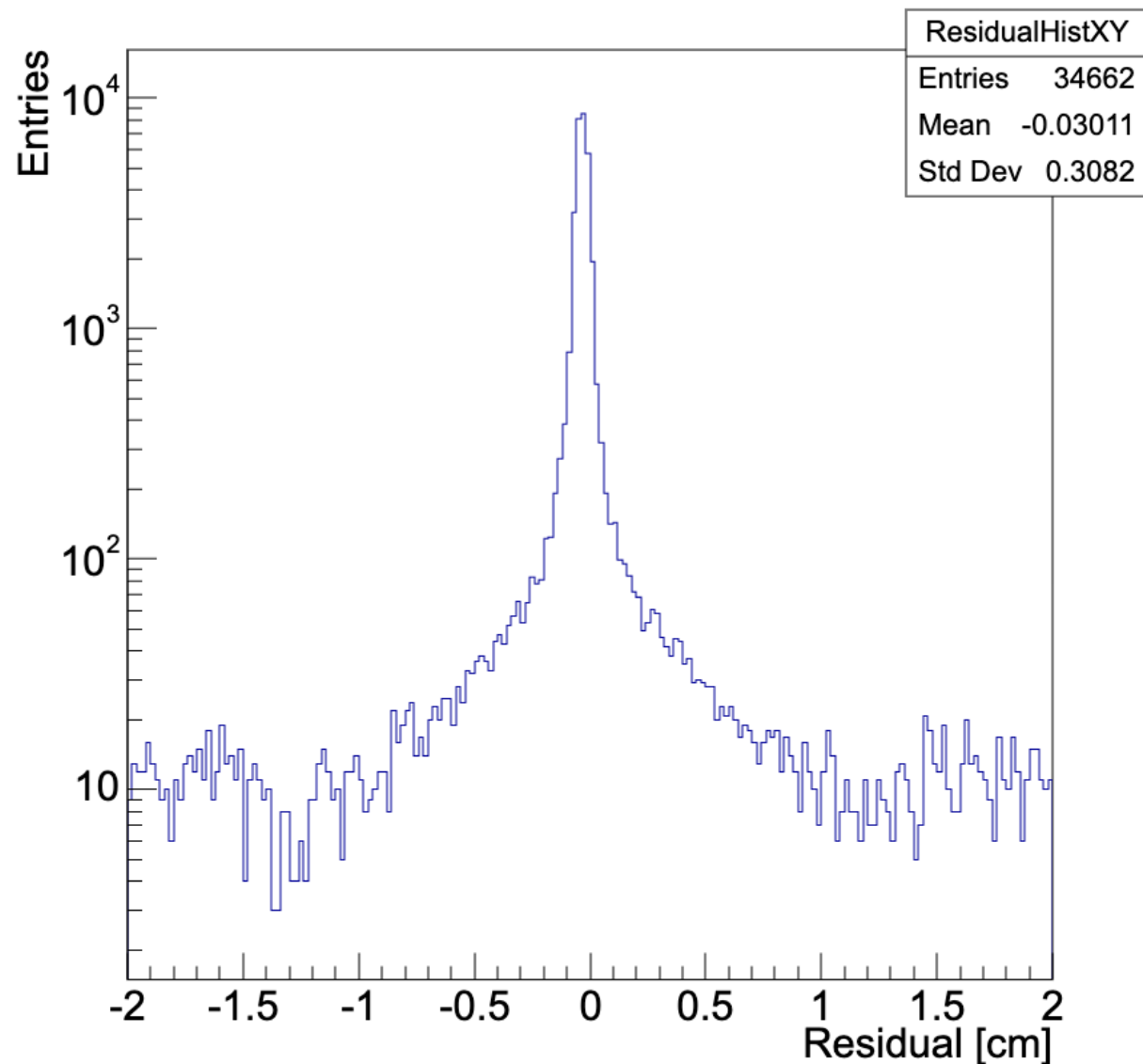
Grey: Cluster cut

Green: good pair

Orange: bad pair

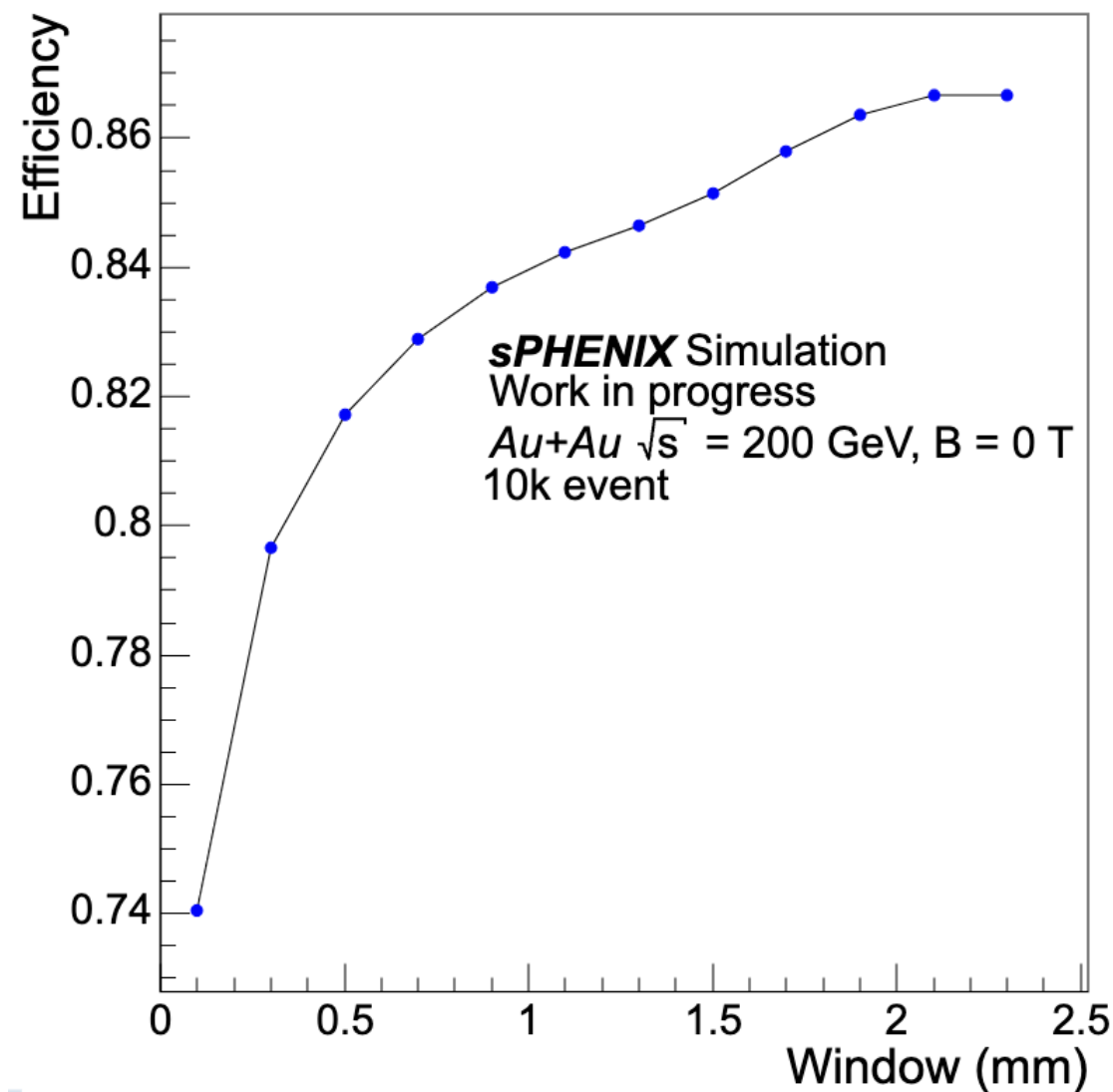
Black: No pair

Residual XY(simulation)



Efficiency (simulation)

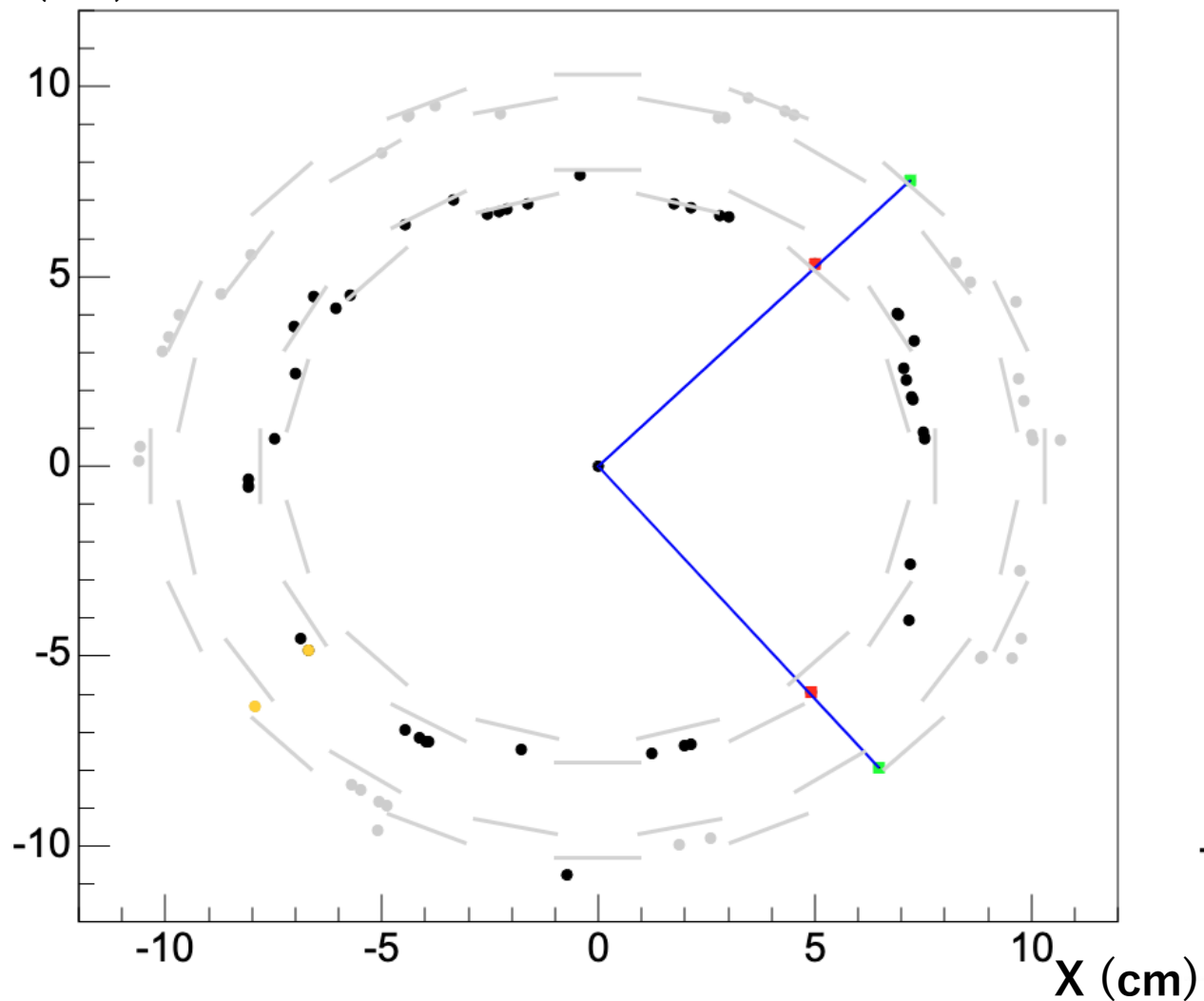
6/13



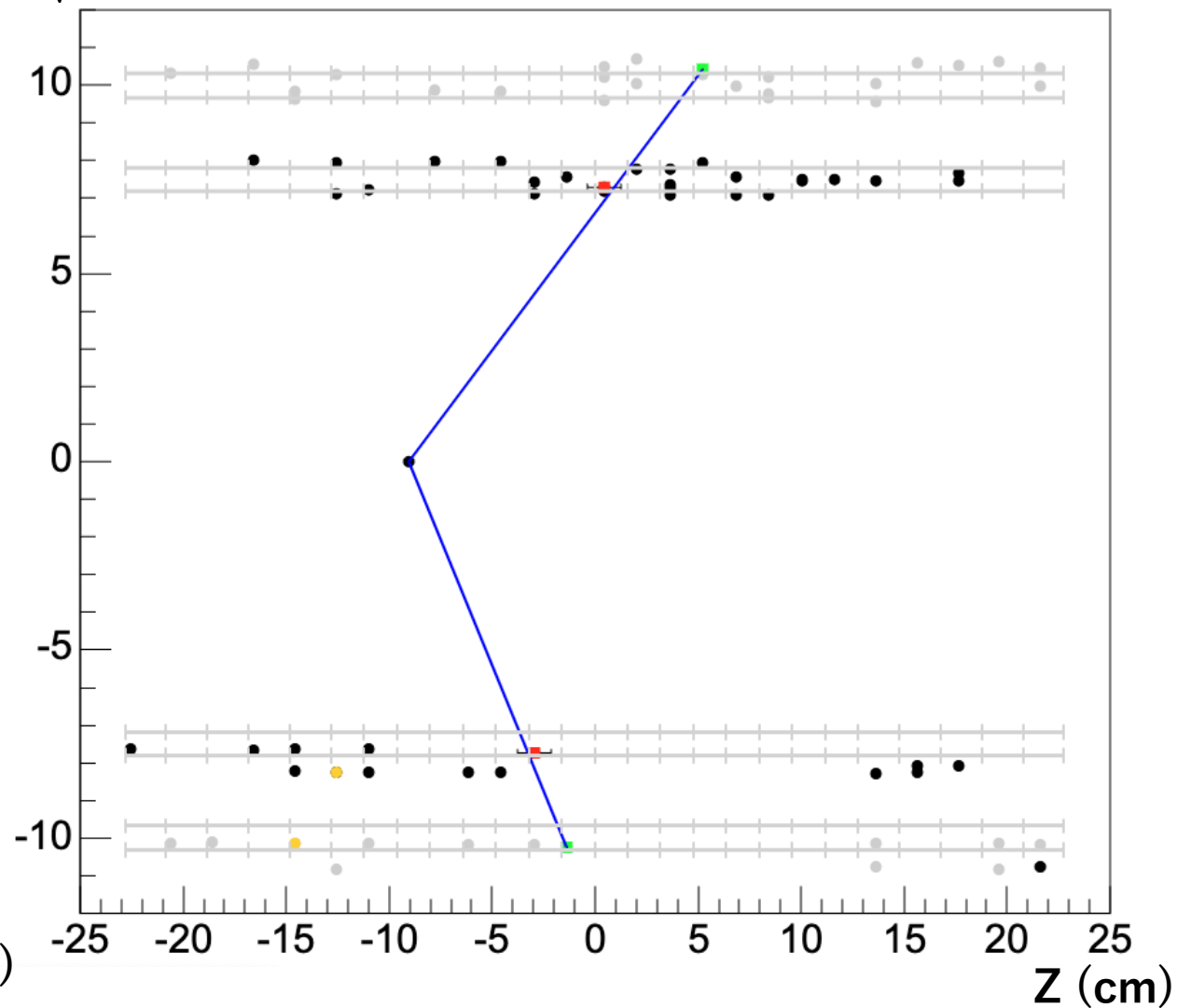
Event Display (simulation)

7/13

Y (cm)

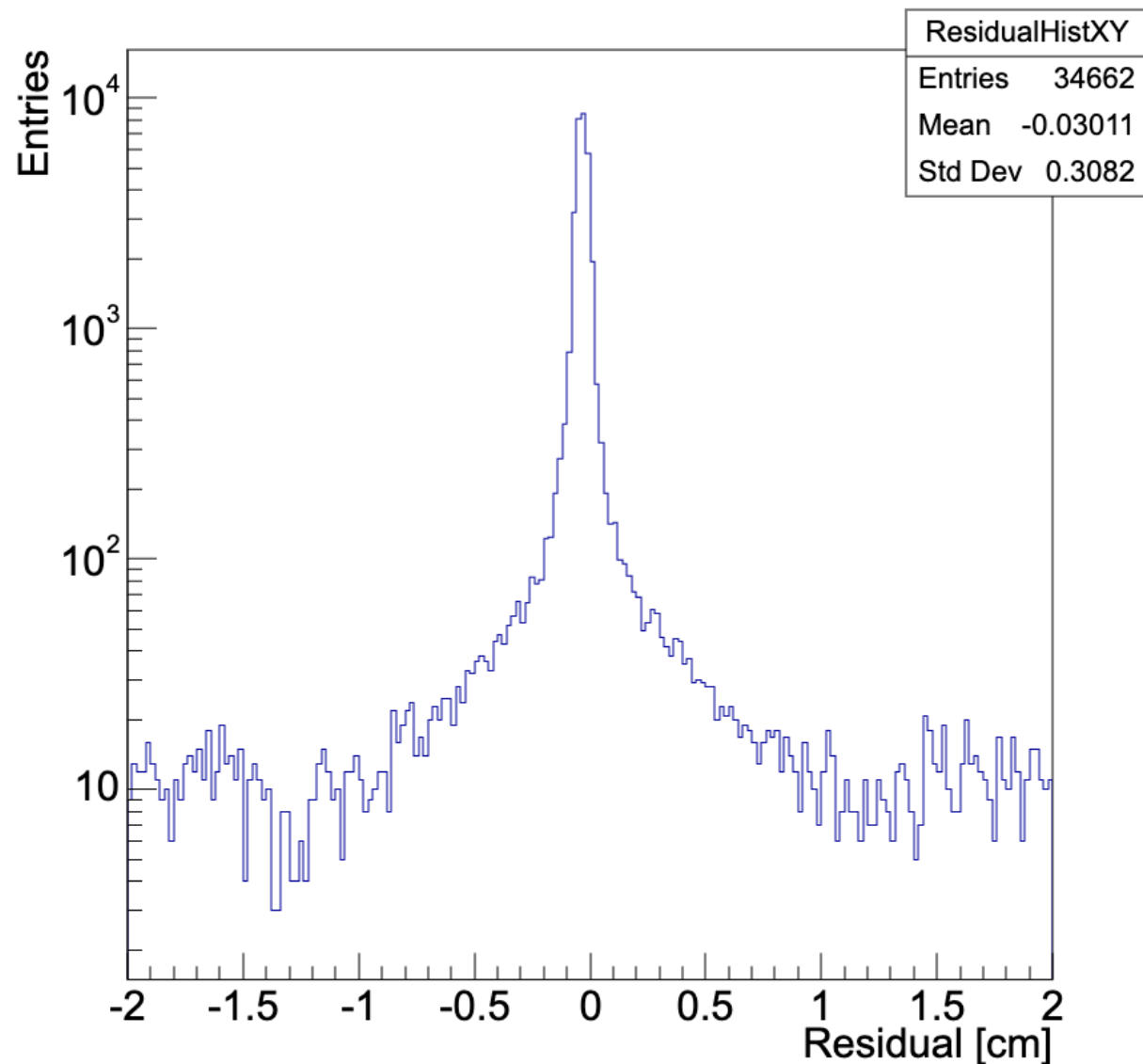


$R = \sqrt{x^2 + y^2}$ (cm)



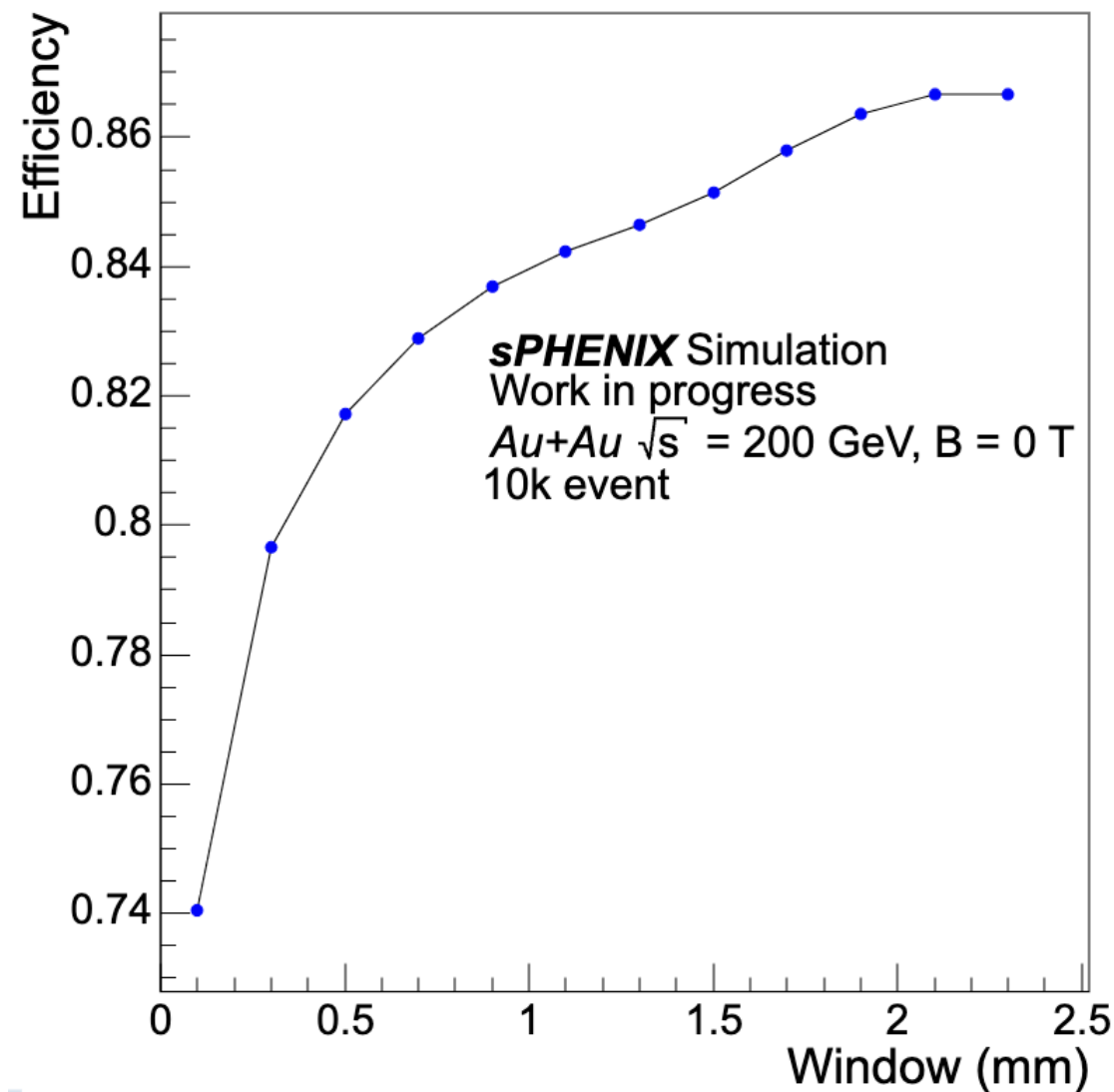
Grey: Cluster cut Green: good pair Orange: bad pair Black: No pair

Residual XY(simulation)



Efficiency (simulation)

8/13



Au+Au data Analysis for cut

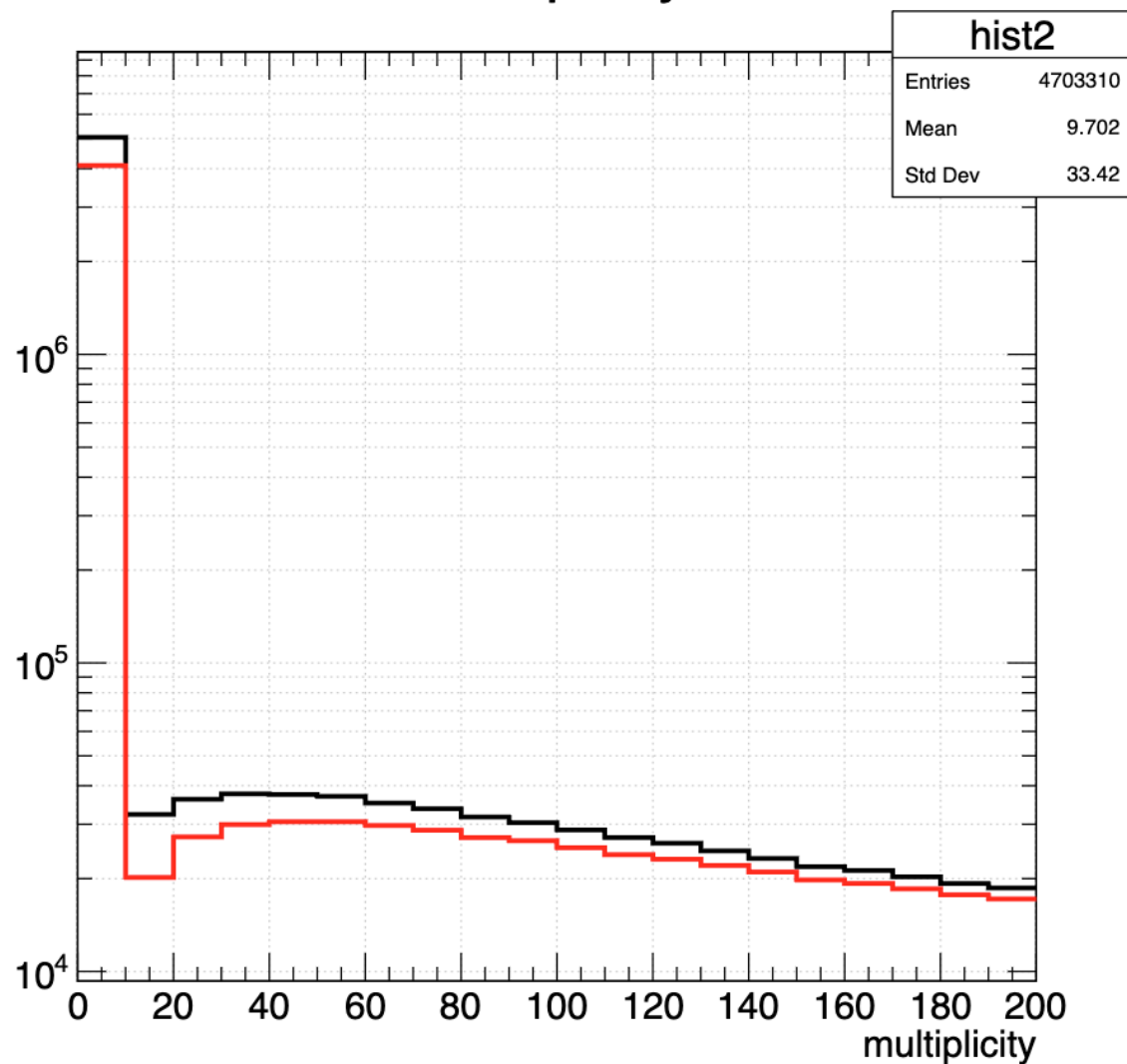
Multiplicity

Black: All outer cluster after d-cut

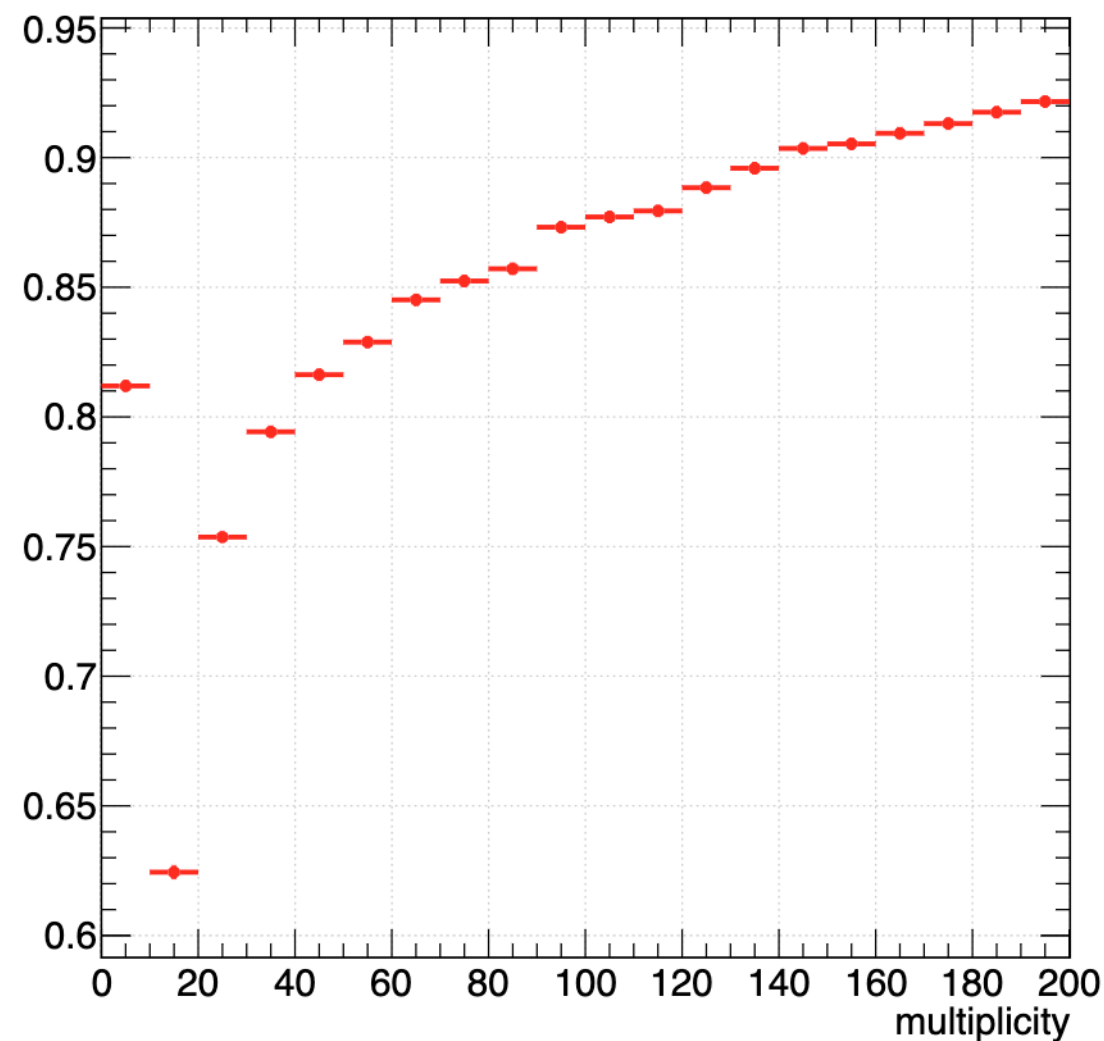
Red: outer cluster of good pair

10/13

multiplicity



Efficiency as a function of multiplicity



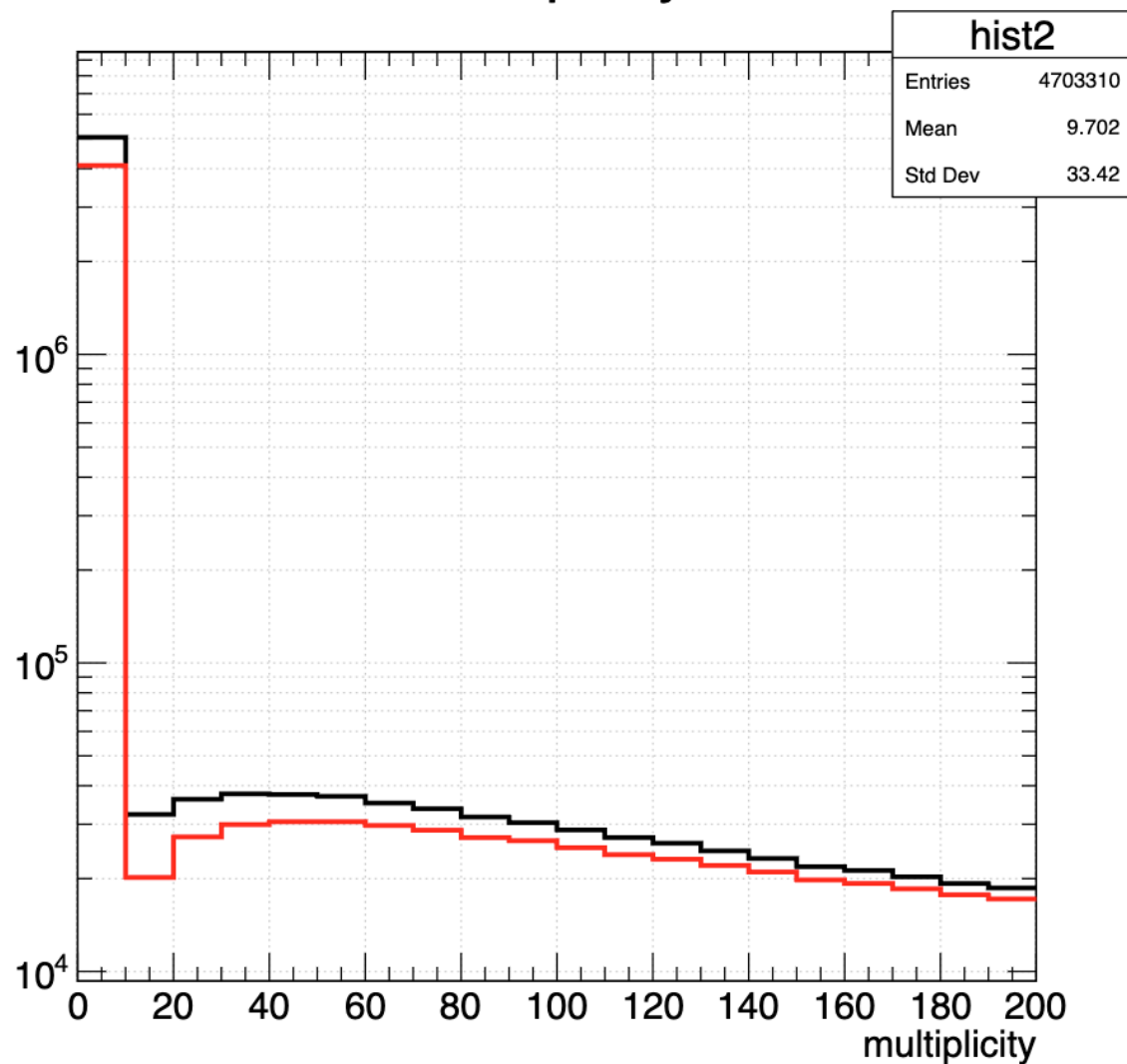
Multiplicity

Black: All outer cluster after d-cut

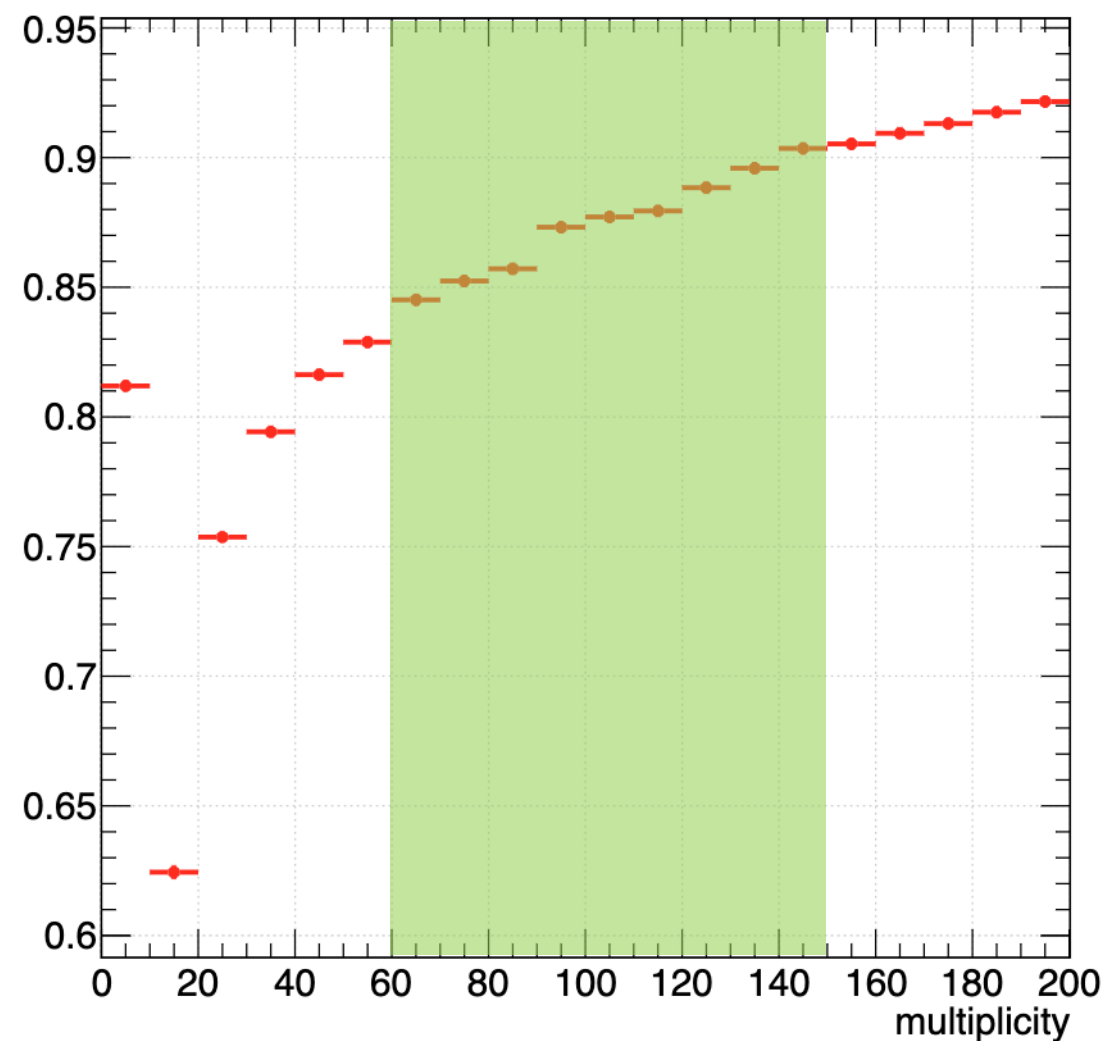
Red: outer cluster of good pair

11/13

multiplicity

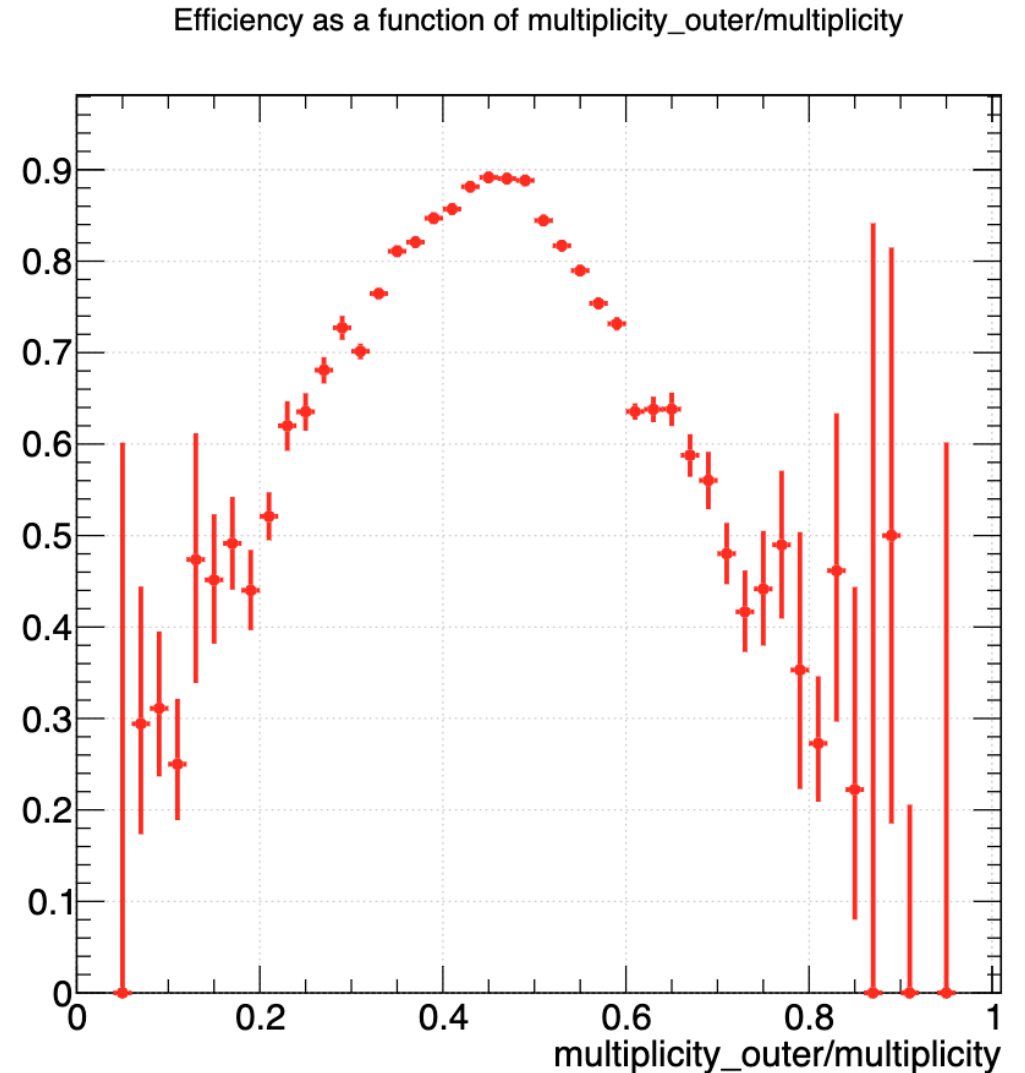
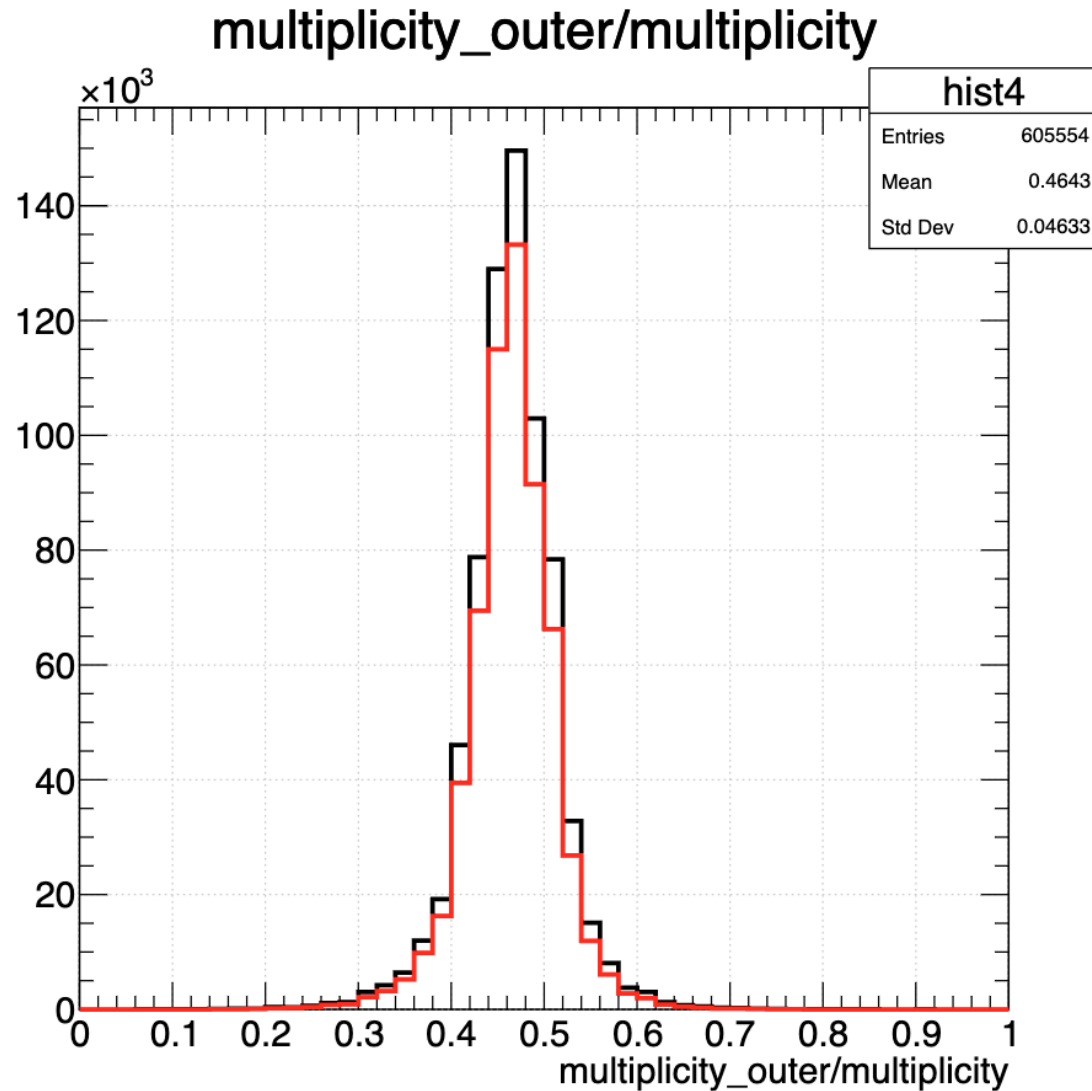


Efficiency as a function of multiplicity



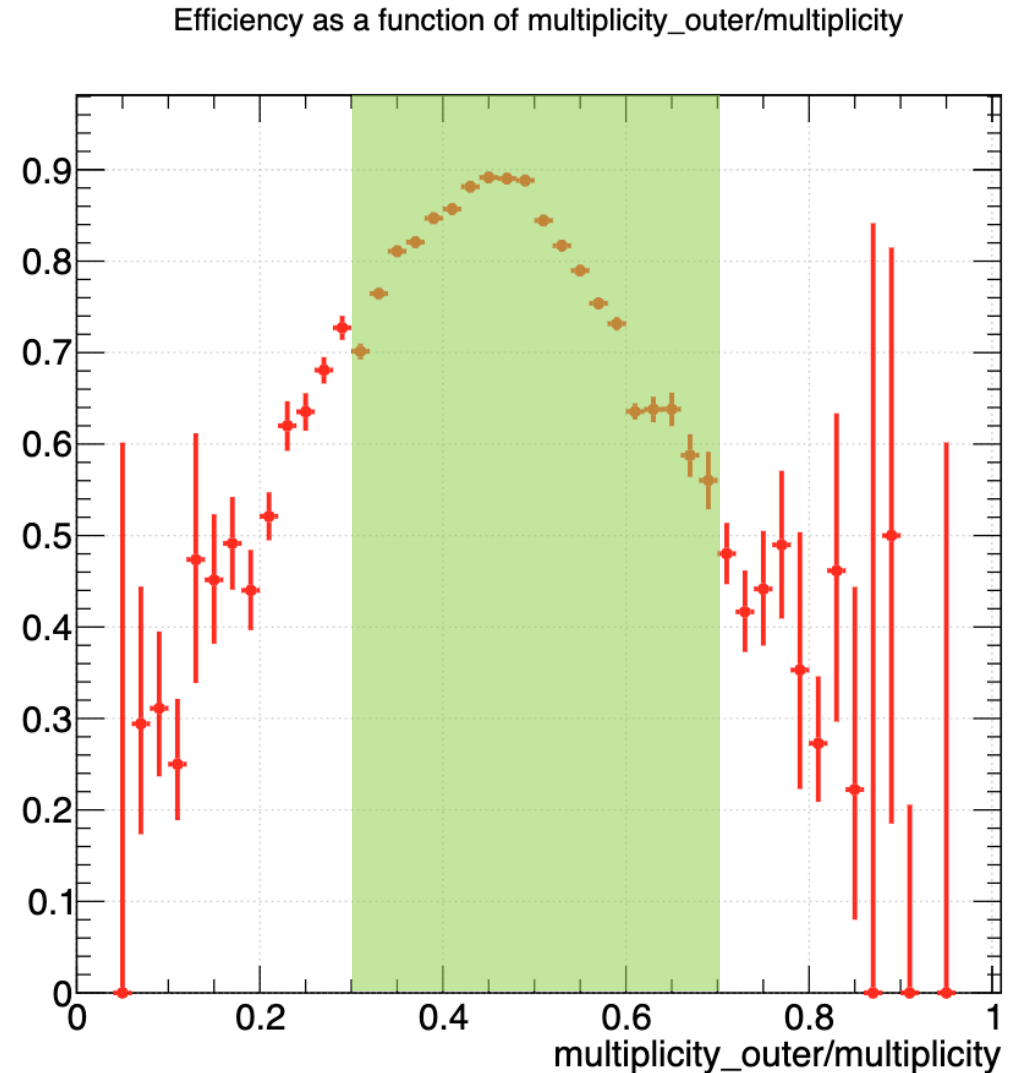
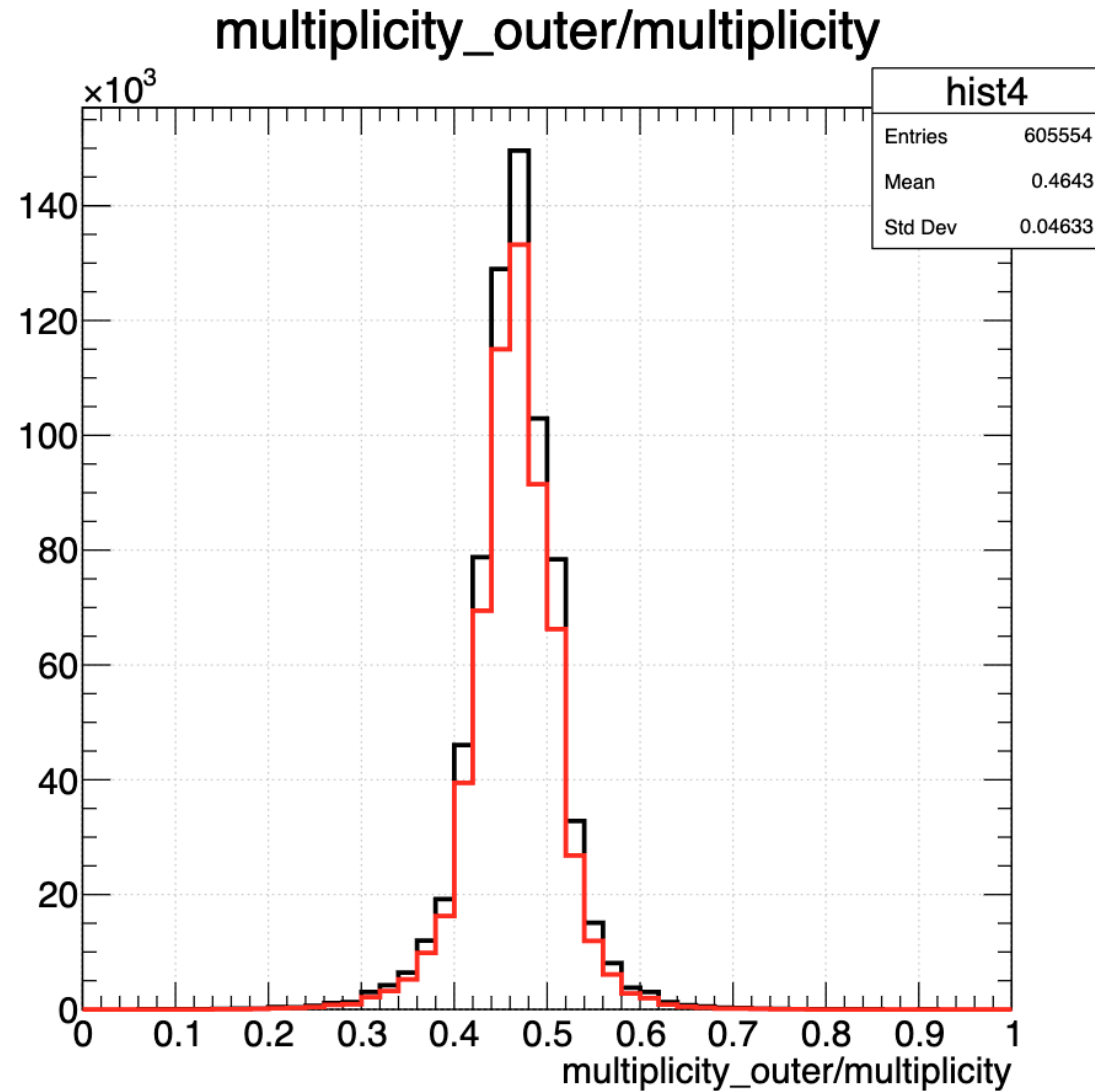
Ratio of outer/All clusters

Black: All outer cluster after d-cut 12/13
Red: outer cluster of good pair



Ratio of outer/All clusters

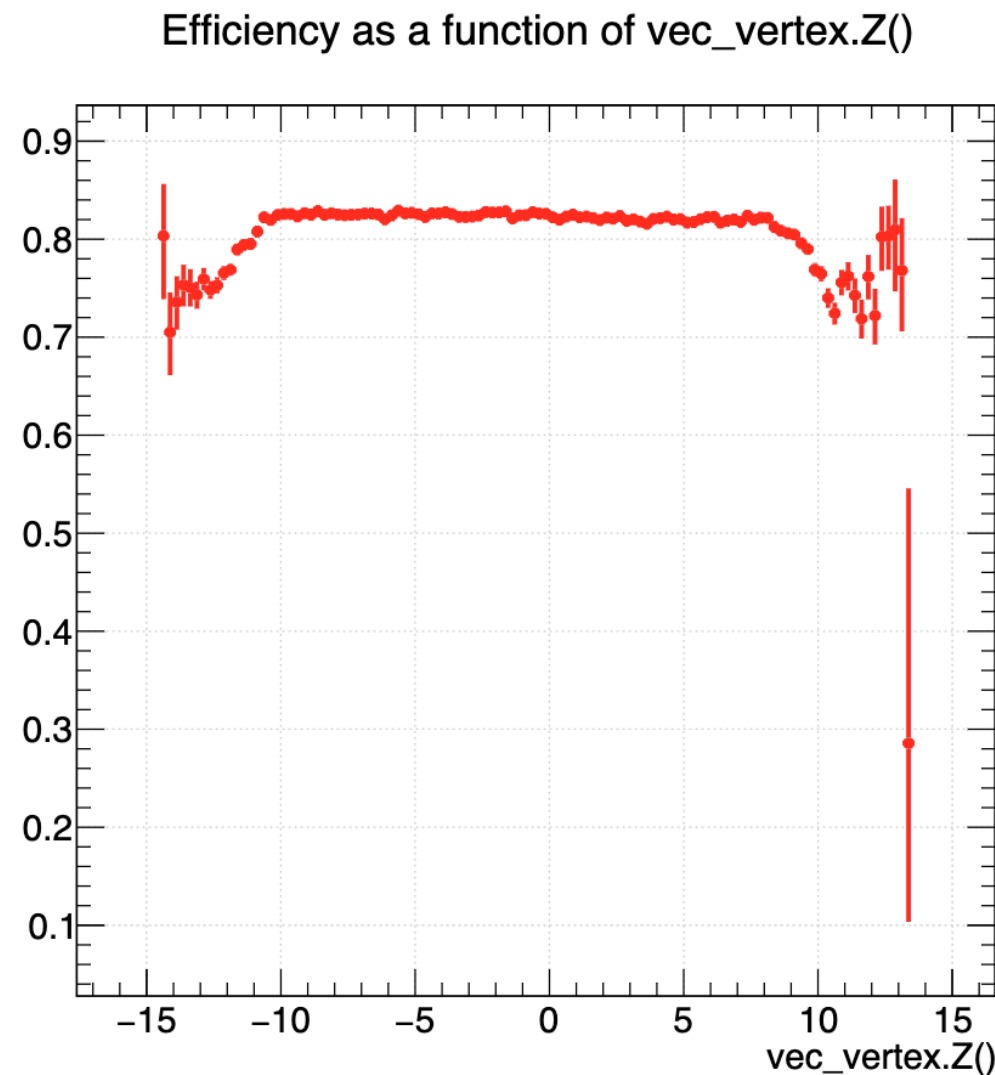
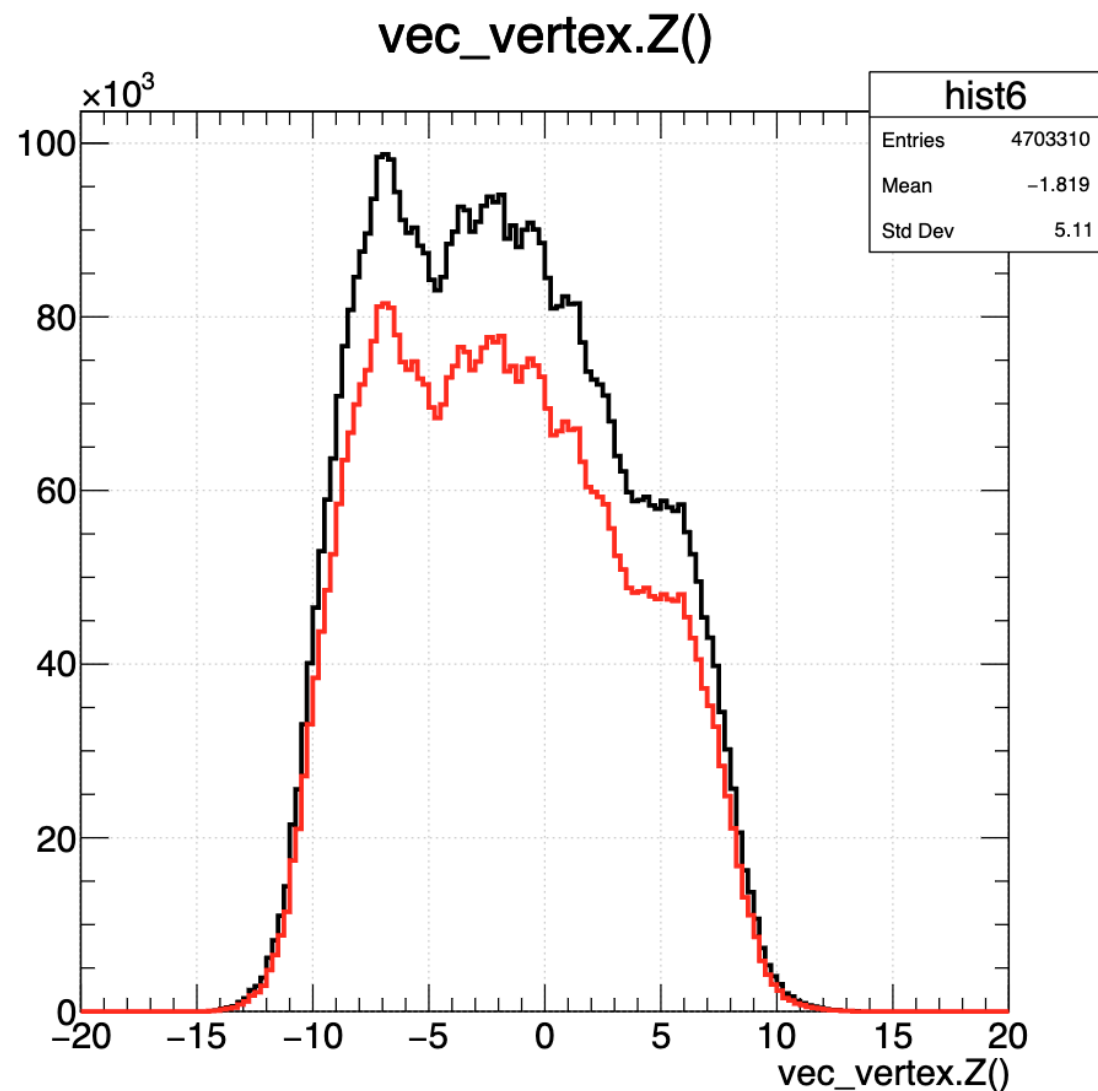
Black: All outer cluster after d-cut 13/13
Red: outer cluster of good pair



Z vertex

Black: All outer cluster after d-cut
Red: outer cluster of good pair

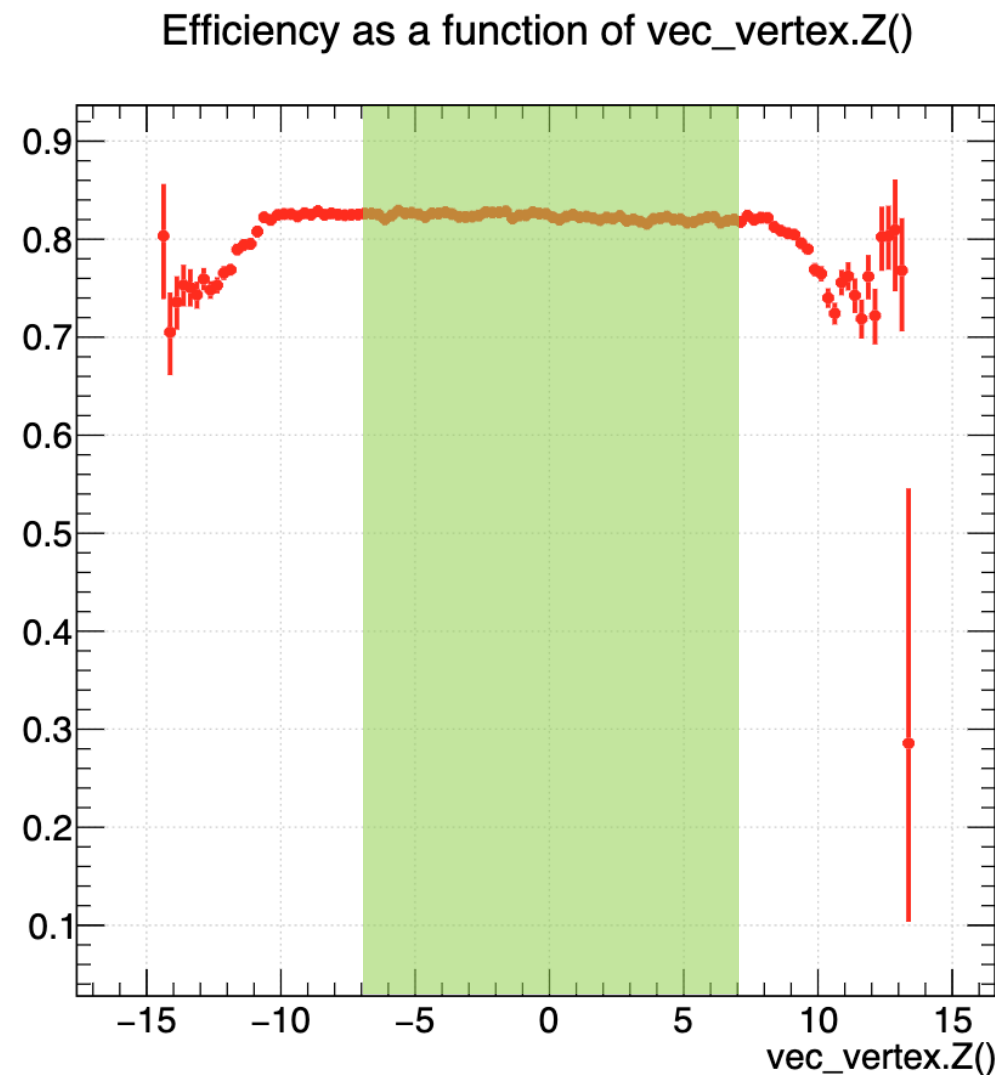
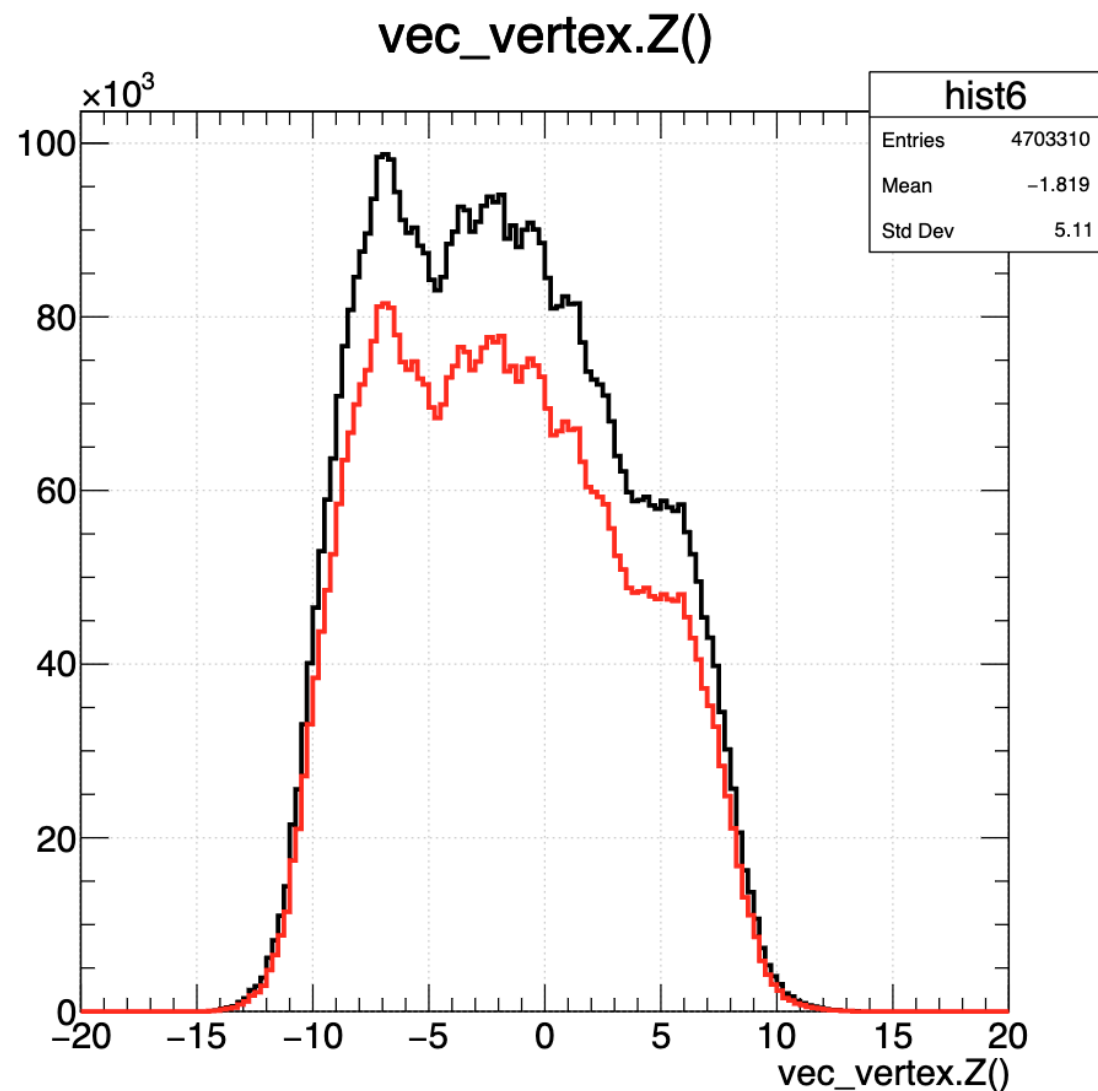
14/13



Z vertex

Black: All outer cluster after d-cut
Red: outer cluster of good pair

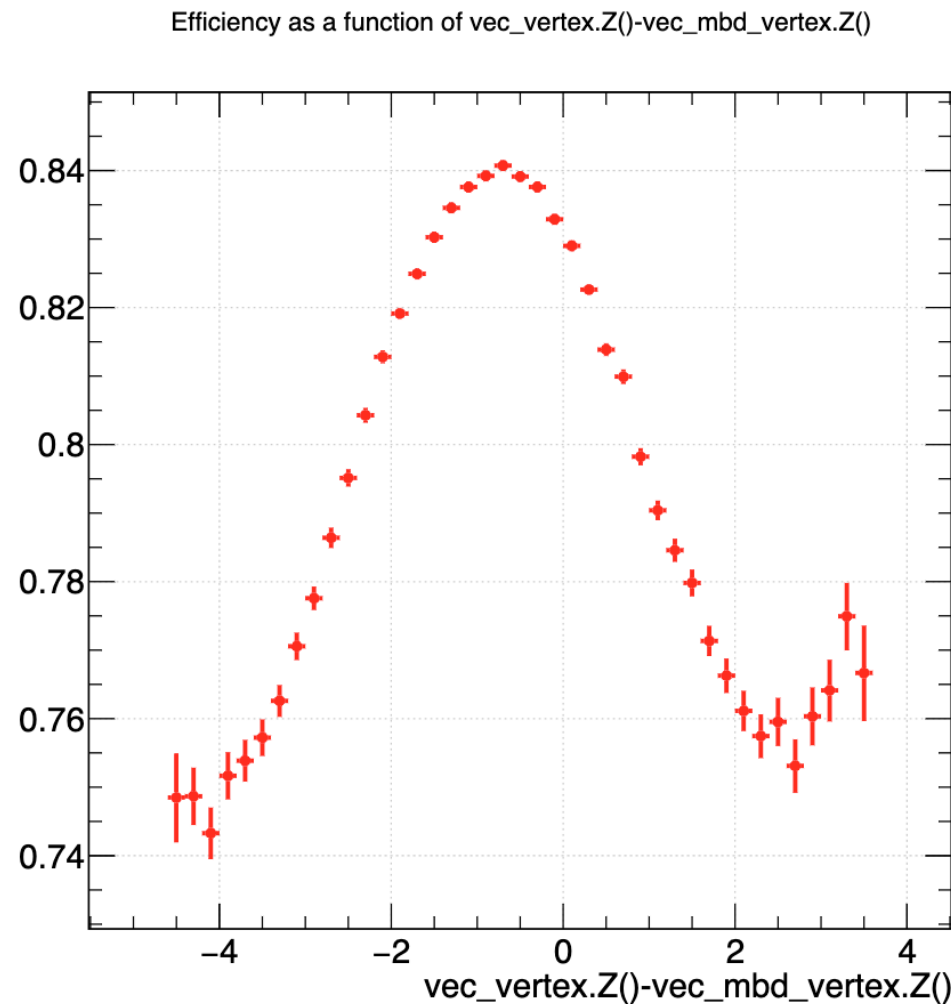
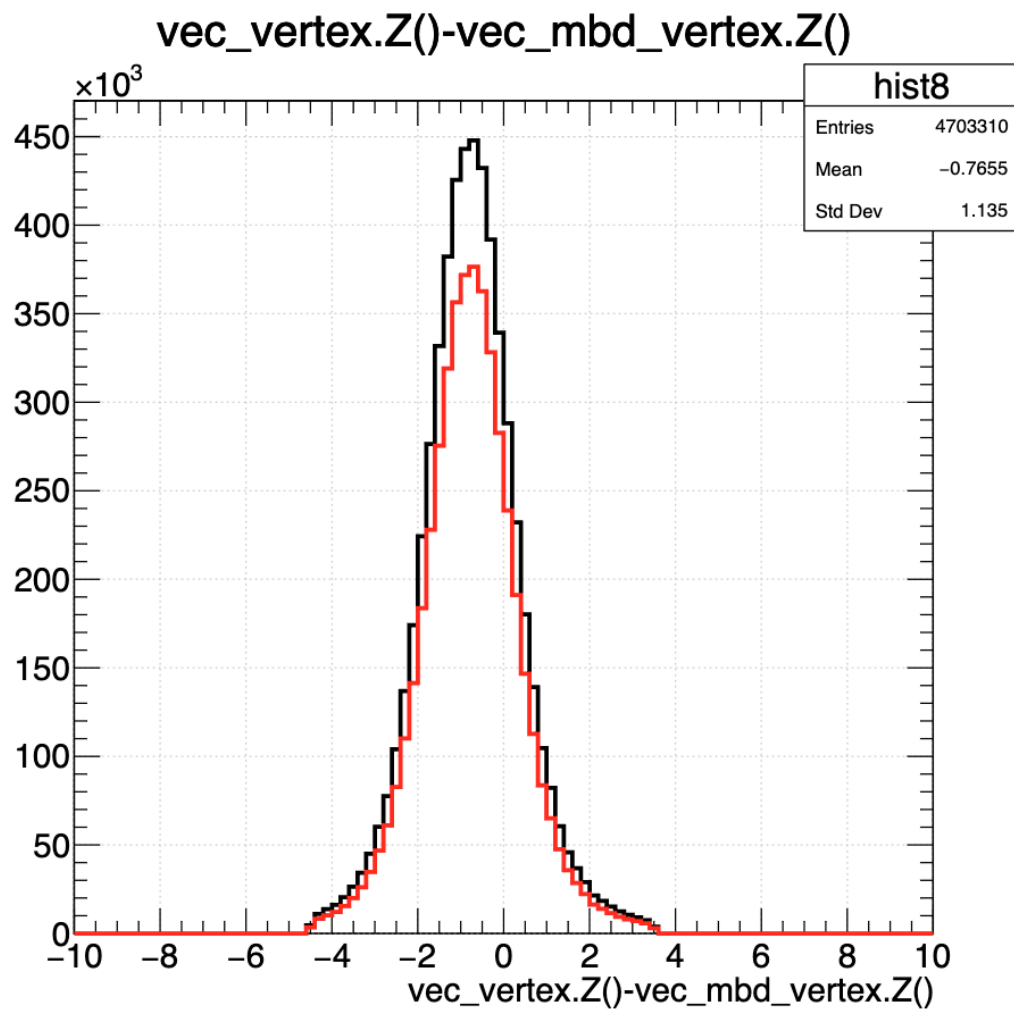
15/13



Z vertex-mbd Z vertex

Black: All outer cluster after d-cut
Red: outer cluster of good pair

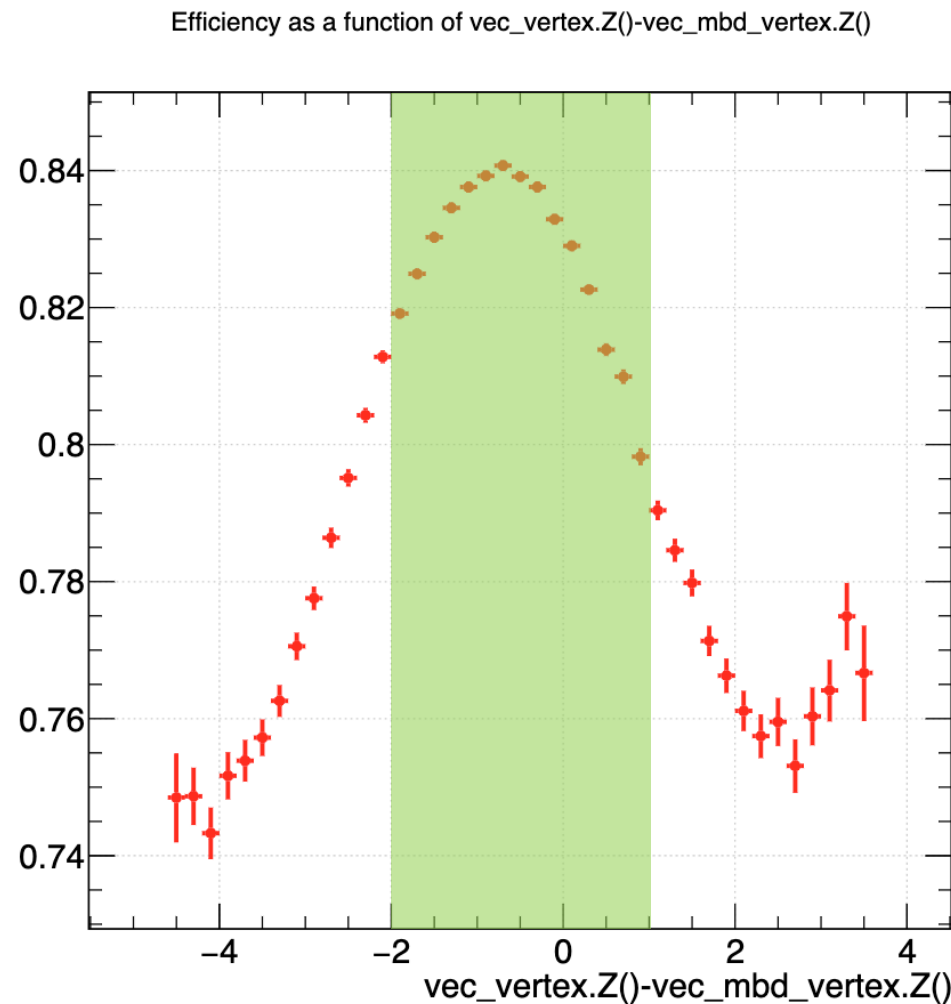
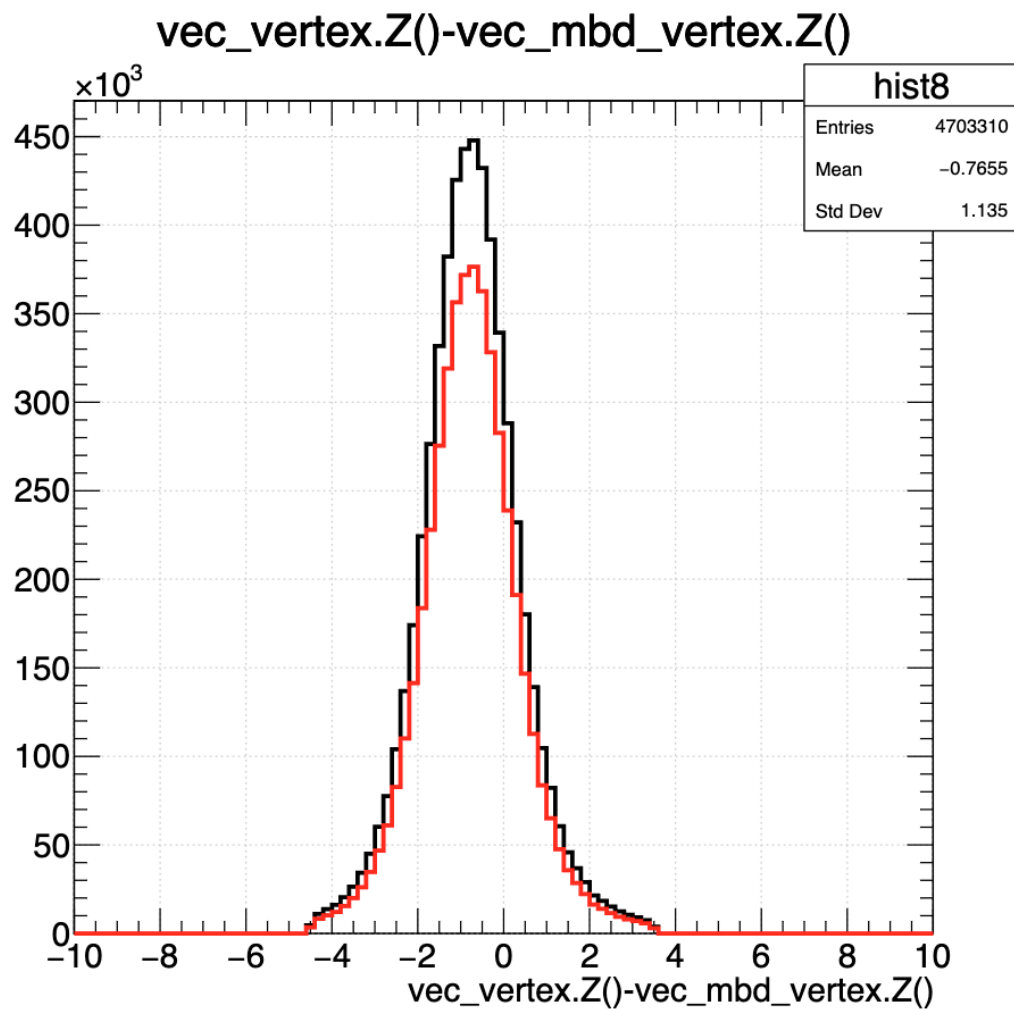
16/13



Z vertex-mbd Z vertex

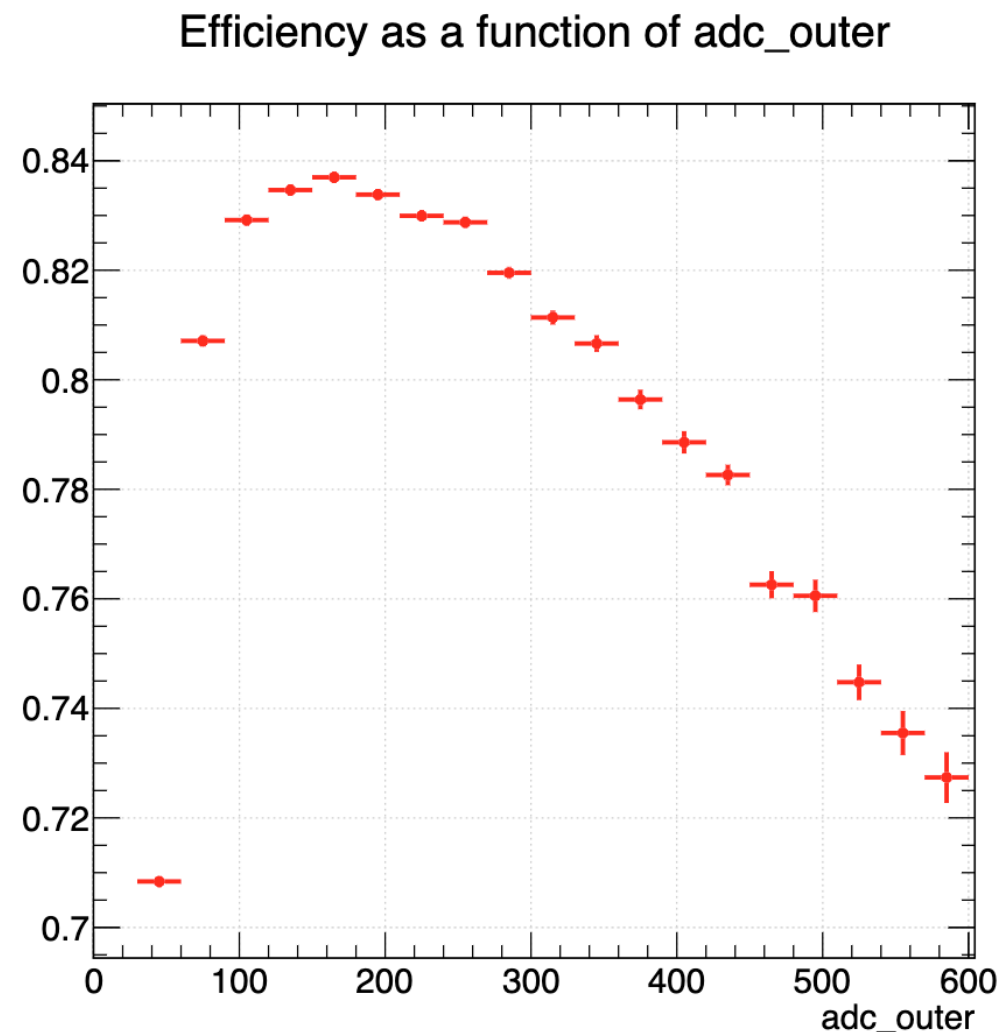
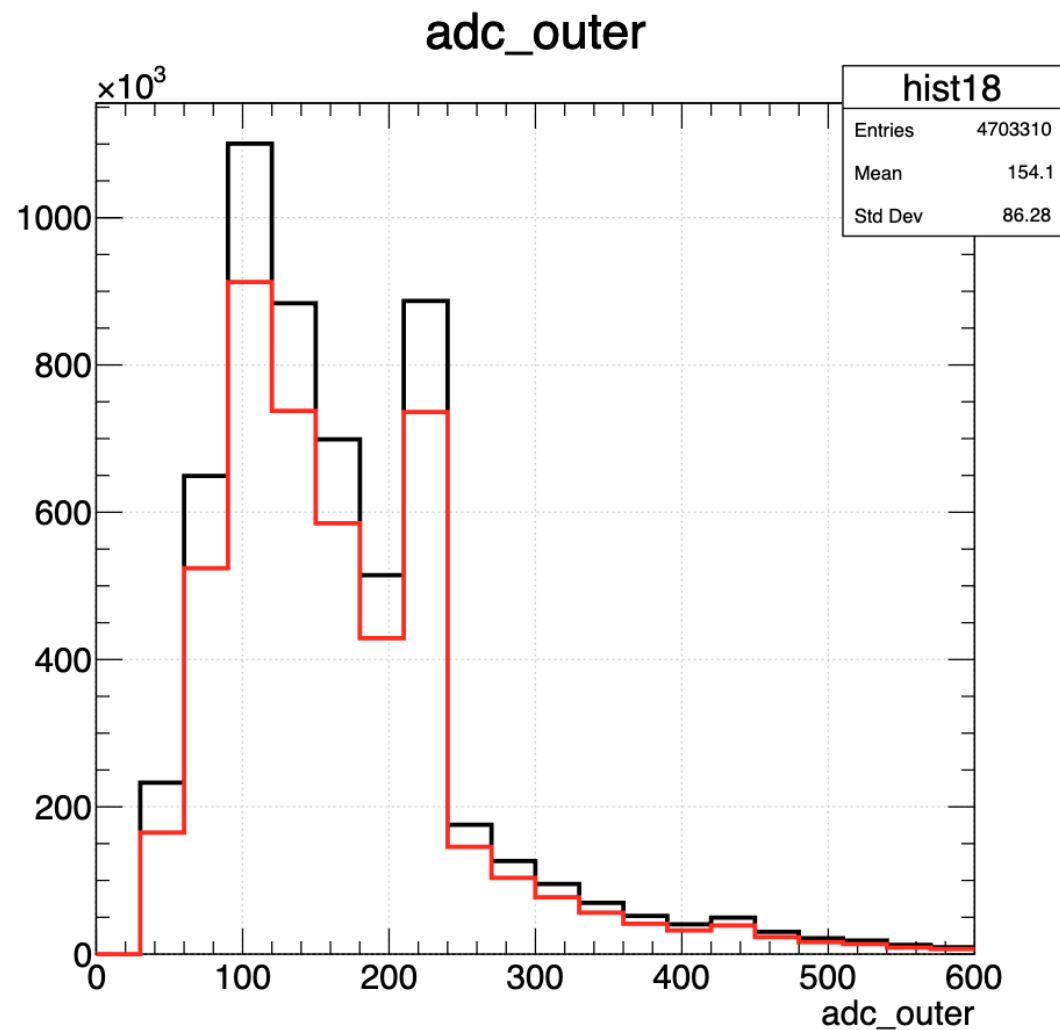
Black: All outer cluster after d-cut
Red: outer cluster of good pair

17/13



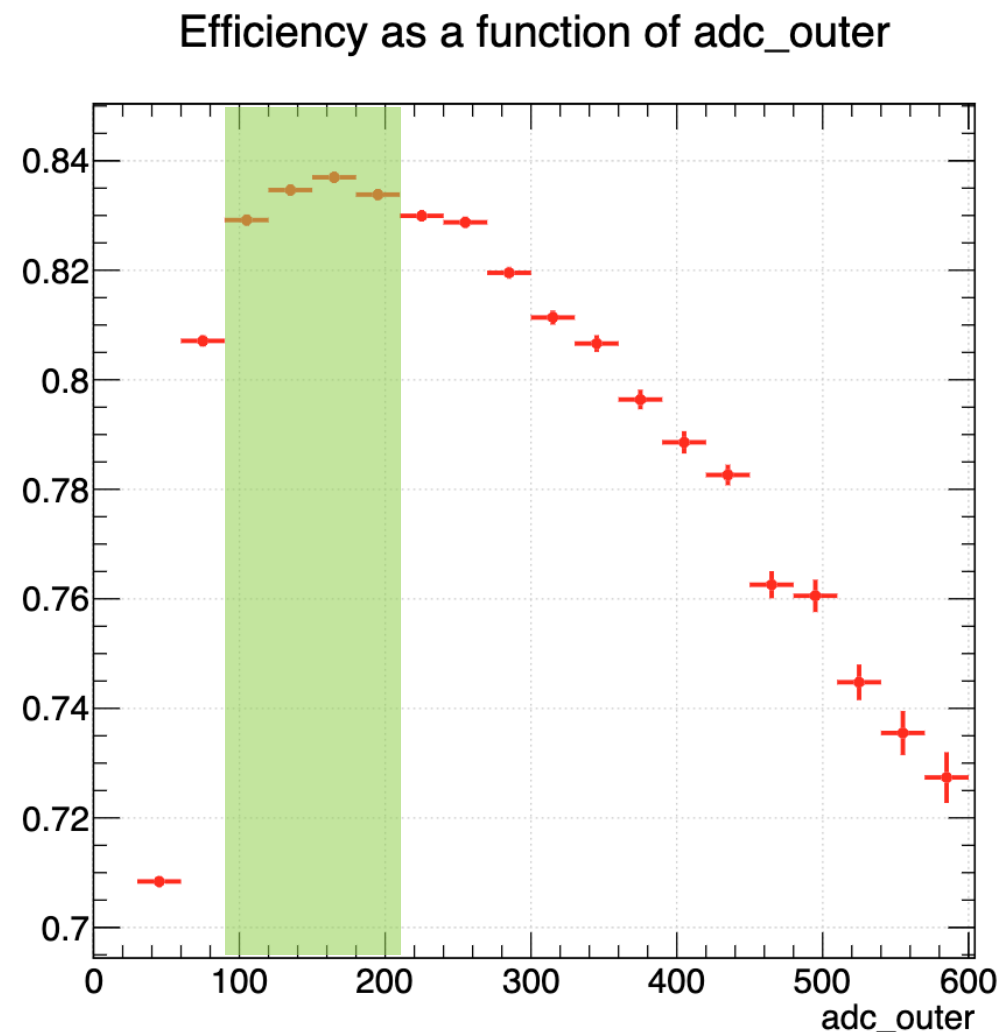
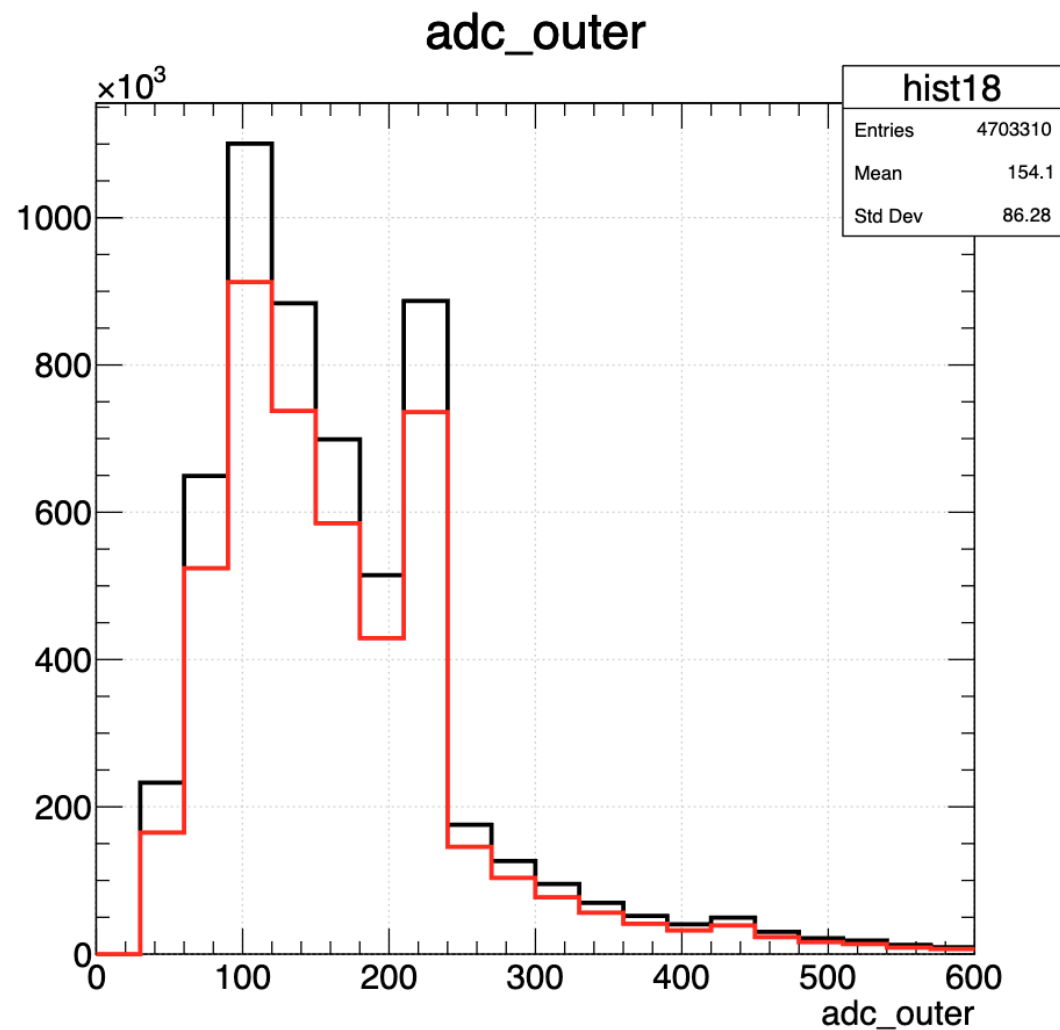
Z vertex-mbd Z vertex

Black: All outer cluster after d-cut 18/13
Red: outer cluster of good pair



Z vertex-mbd Z vertex

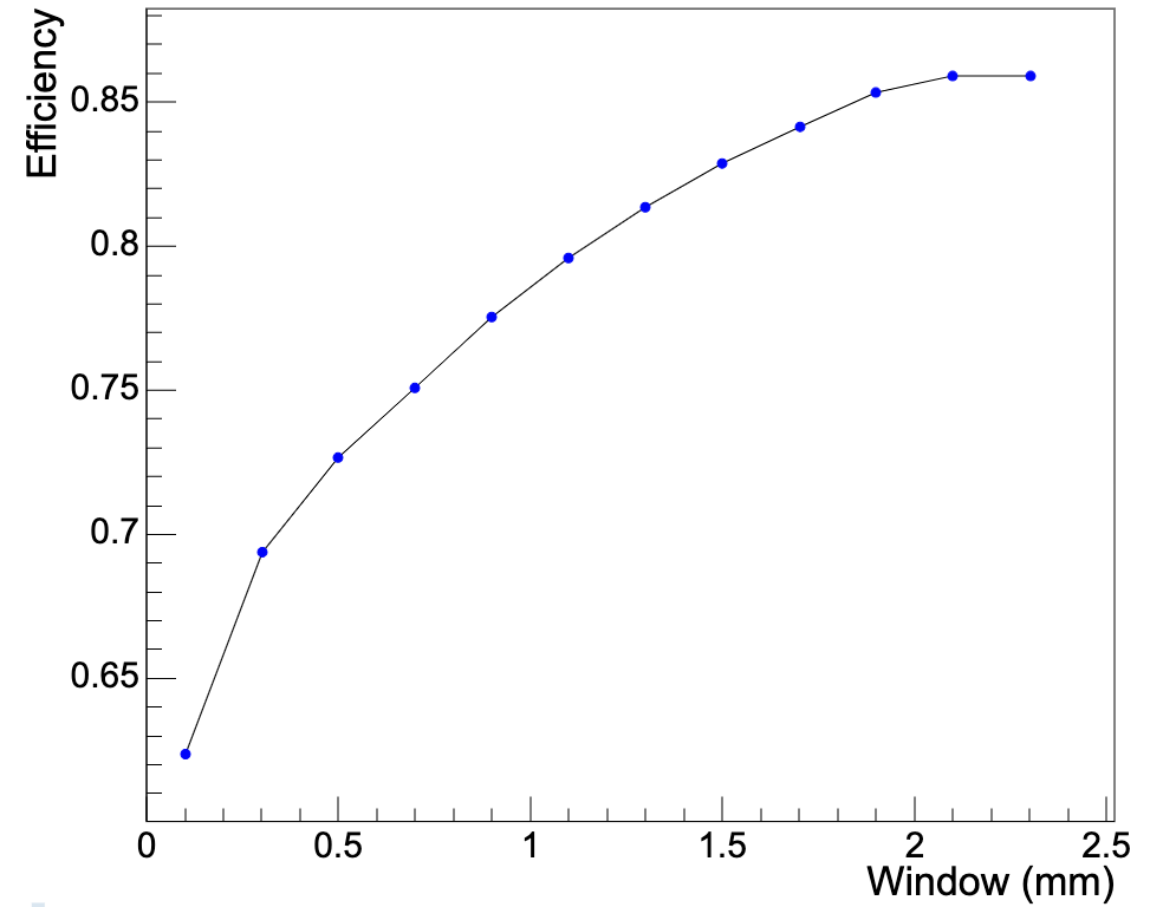
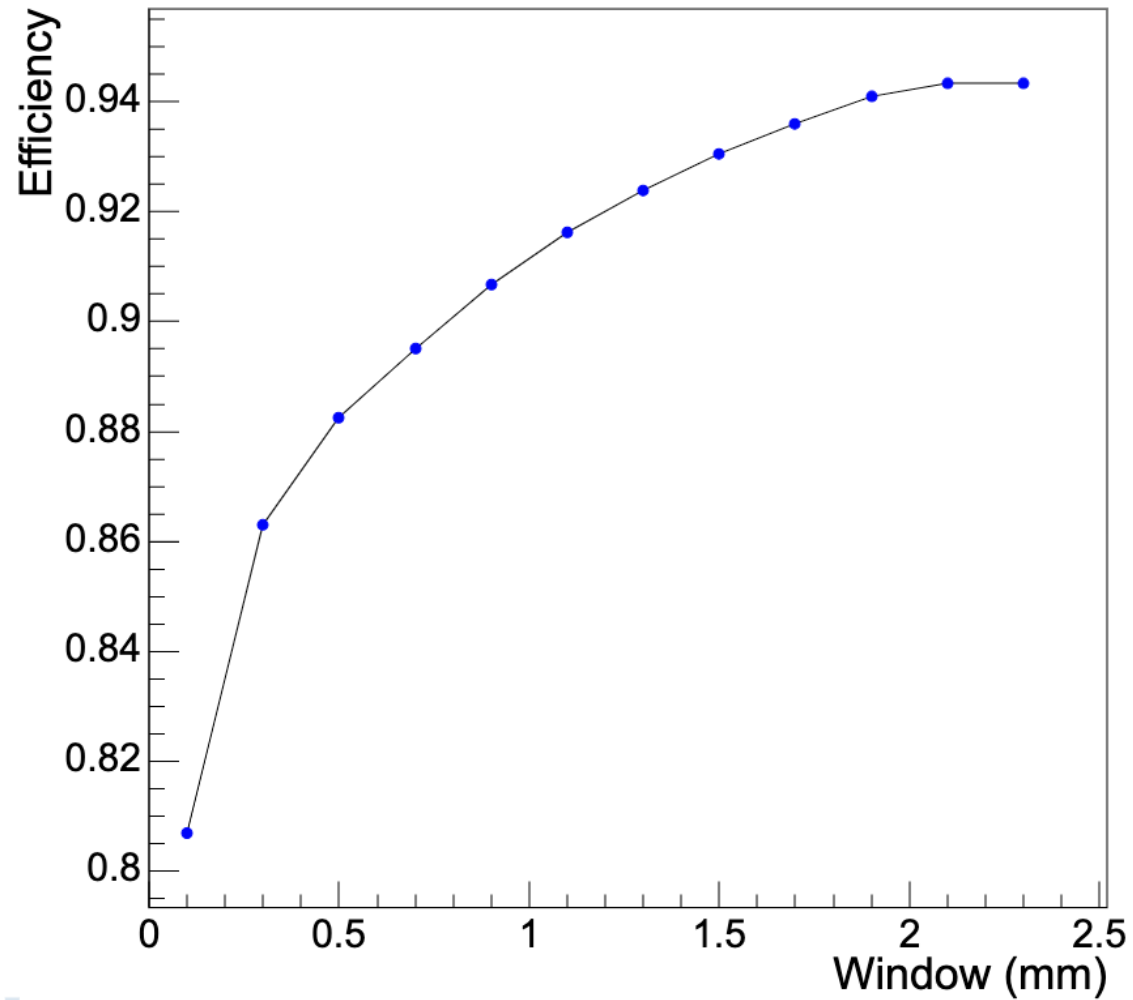
Black: All outer cluster after d-cut 19/13
Red: outer cluster of good pair



Efficiency (after cut)

20/13

simulation



backup

ADC Cut Scan (window = 2cm)

	No pair	Good pair	Efficiency
$0 \leq ADC \leq 35$	60	106	63.8%
$0 \leq ADC \leq 60$	337	981	74.4%
$60 \leq ADC \leq 90$	509	2016	79.8%
$60 \leq ADC \leq 180$	1187	4919	80.5%
$60 \leq ADC \leq 255$	1558	6324	80.2%
all	1978	7244	78.5%

Size Cut Scan (window = 2cm)

	No pair	Good pair	Efficiency
$size \leq 1$	976	4123	80.85%
$size \leq 2$	1152	4900	80.96%
$size \leq 3$	1183	4918	80.6%
all	1187	4919	80.5%

Multiplicity Cut Scan (window = 2cm)

	No pair	Good pair	Efficiency
$15 \leq N_{clus} \leq 30$	1134	2802	71.18%
$30 \leq N_{clus} \leq 60$	1292	4629	78.17%
$60 \leq N_{clus} \leq 90$	1346	5731	80.98%
$90 \leq N_{clus} \leq 120$	1087	5572	83.67%
$120 \leq N_{clus} \leq 150$	1152	4900	86.7%
all	1978	7244	80.96%

Multiplicity Cut Scan

window = 1mm

	Efficiency
$15 \leq N_{clus} \leq 30$	52.89%
$60 \leq N_{clus} \leq 90$	57.27%
$120 \leq N_{clus} \leq 150$	58.76%
all	57.00%

window = 5mm

	Efficiency
$15 \leq N_{clus} \leq 30$	62.70%
$60 \leq N_{clus} \leq 90$	67.85%
$120 \leq N_{clus} \leq 150$	69.24%
all	67.10%

検出効率の定義

$$\varepsilon = \frac{\textit{outer cluster of good pair}}{\textit{all outer cluster}^{\times}}$$

※ *bad pair* + *No pair* + *good pair*

ペア条件

|residual XY| < 2cm && |residual RZ| < 4cm

悪いクラスターがペアを作らないようにするため

現在考えている外層クラスターカット

- クラスター密度カット (現在: クラスター間距離 $d > 1\text{cm}$)
- ADC カット (現在: $60 \leq \text{ADC} \leq 255$)
- クラスターsizeカット (現在: $\phi \text{ size} \leq 3$)

導入予定

- MultiPlicity カット
- Φ カット (バレル接合部エリアのカット)