The correlation of INTT # of clusters vs. MBD Q

Hinako Tsujibata NWU
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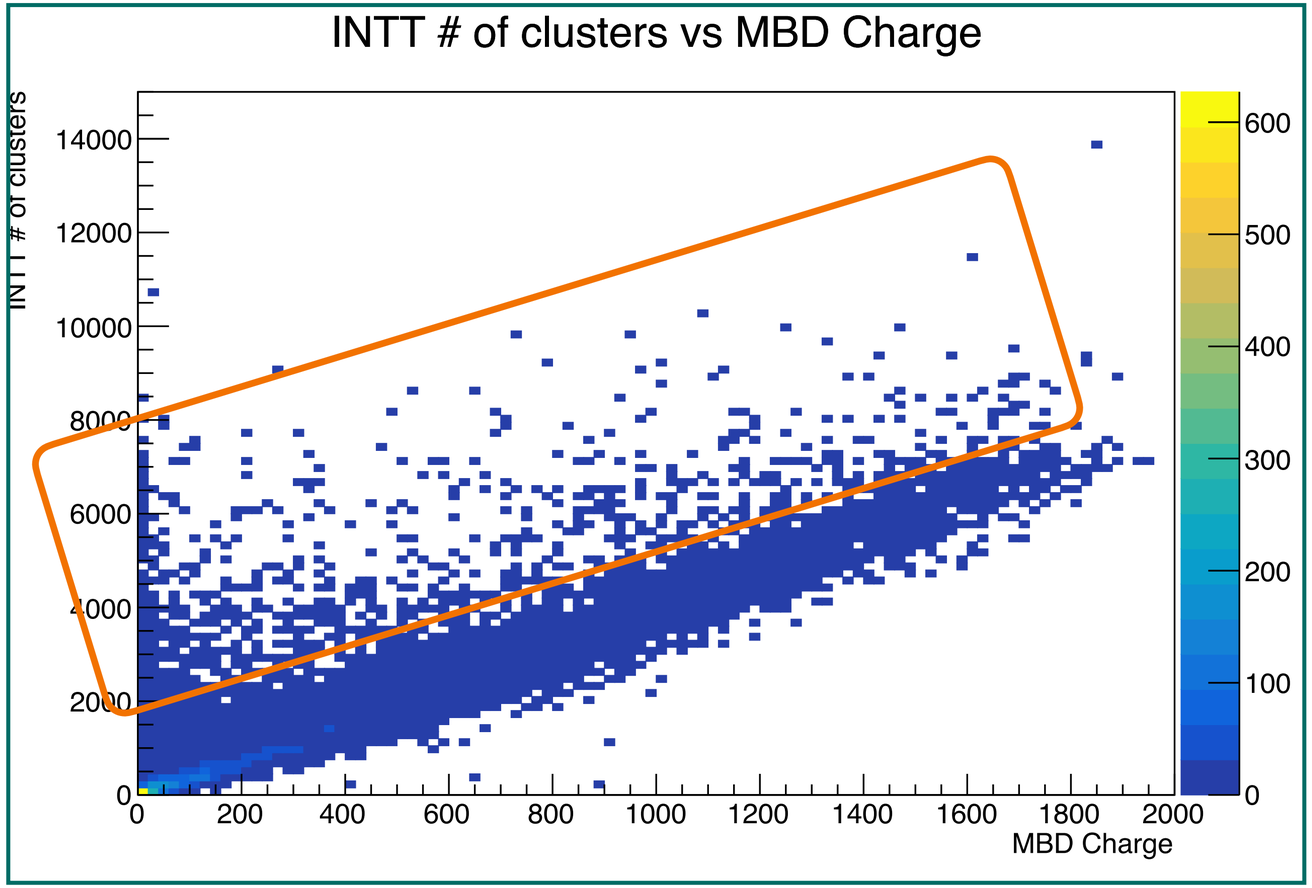
OUTLINE

- The correlation of INTT # of clusters vs. MBD Q
  - The correlation between the noise and MBD z-vertex
  - The correlation between the noise rate and MBD Q
  - The correlation between the noise and bco

1. The correlation between the noise and MBD z-vertex

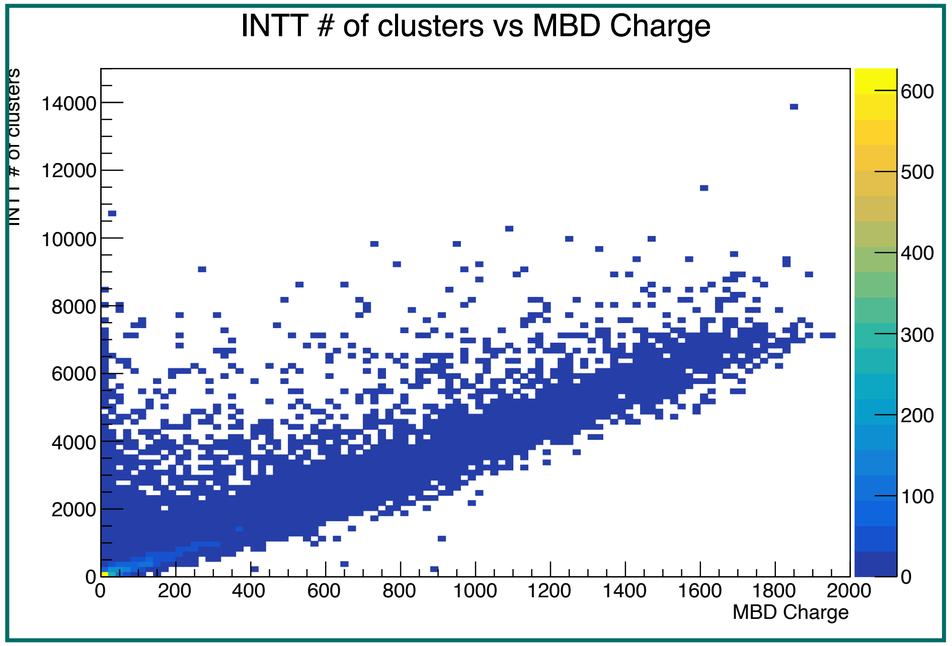


In the INTT # of clusters vs. MBD Q plot, there is noise at upper left of the distribution.

<Hypothesis>
The MBD z-vertex distribution in the noise area is different from the other area.

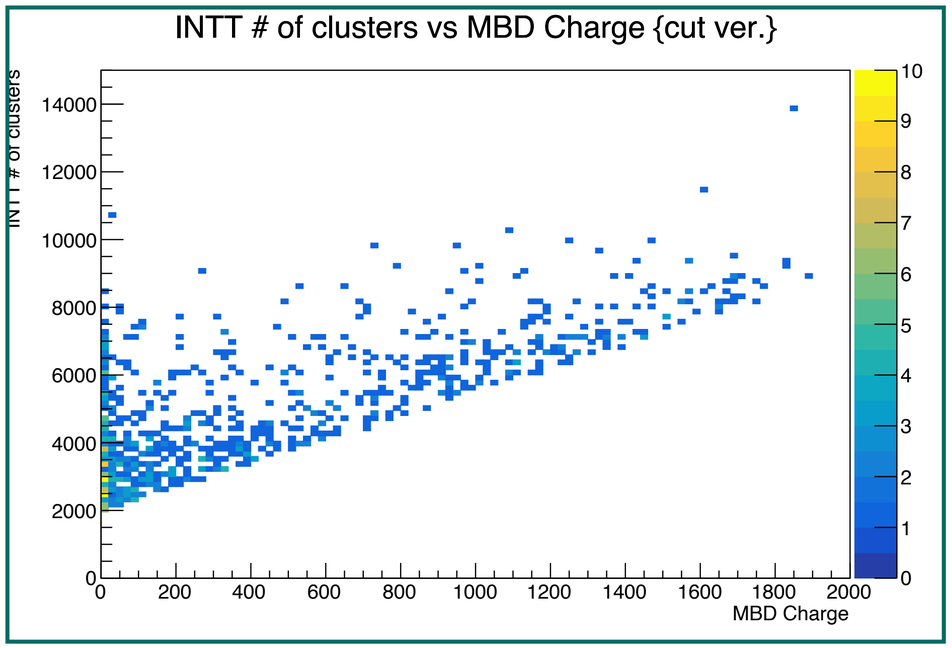
<Method>
Checking the MBD z-vertex distributions of the whole area and the noise area.

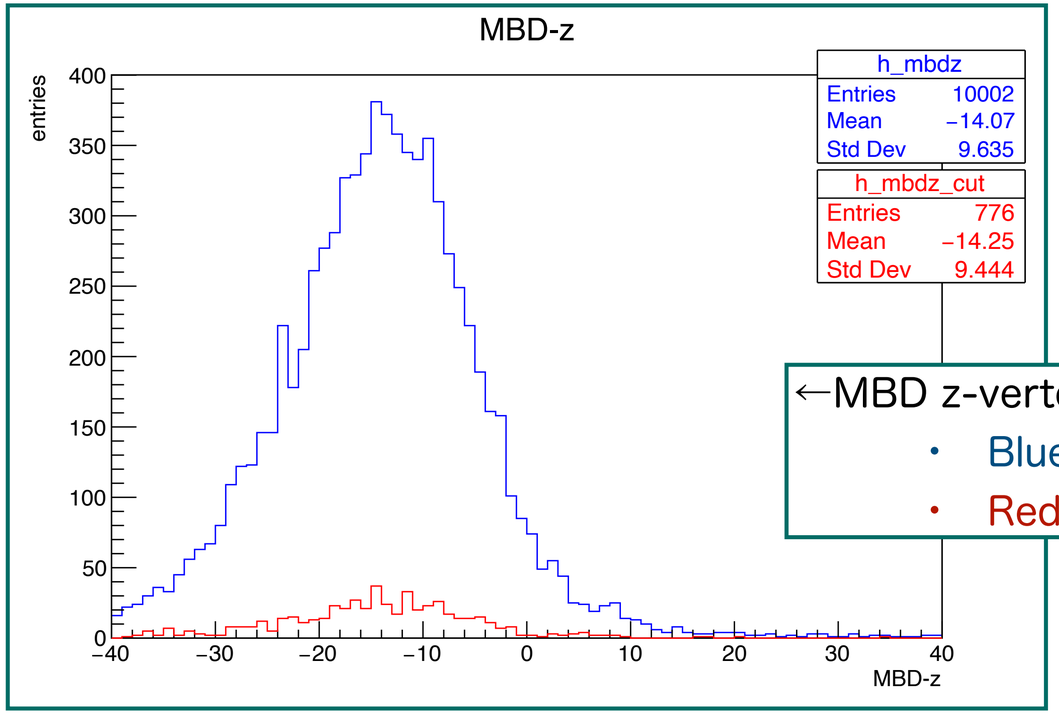
Noise and MBD z-vertex



↑① INTT # of clusters vs. MBD Q

↓② INTT # of clusters vs. MBD Q (noise area)





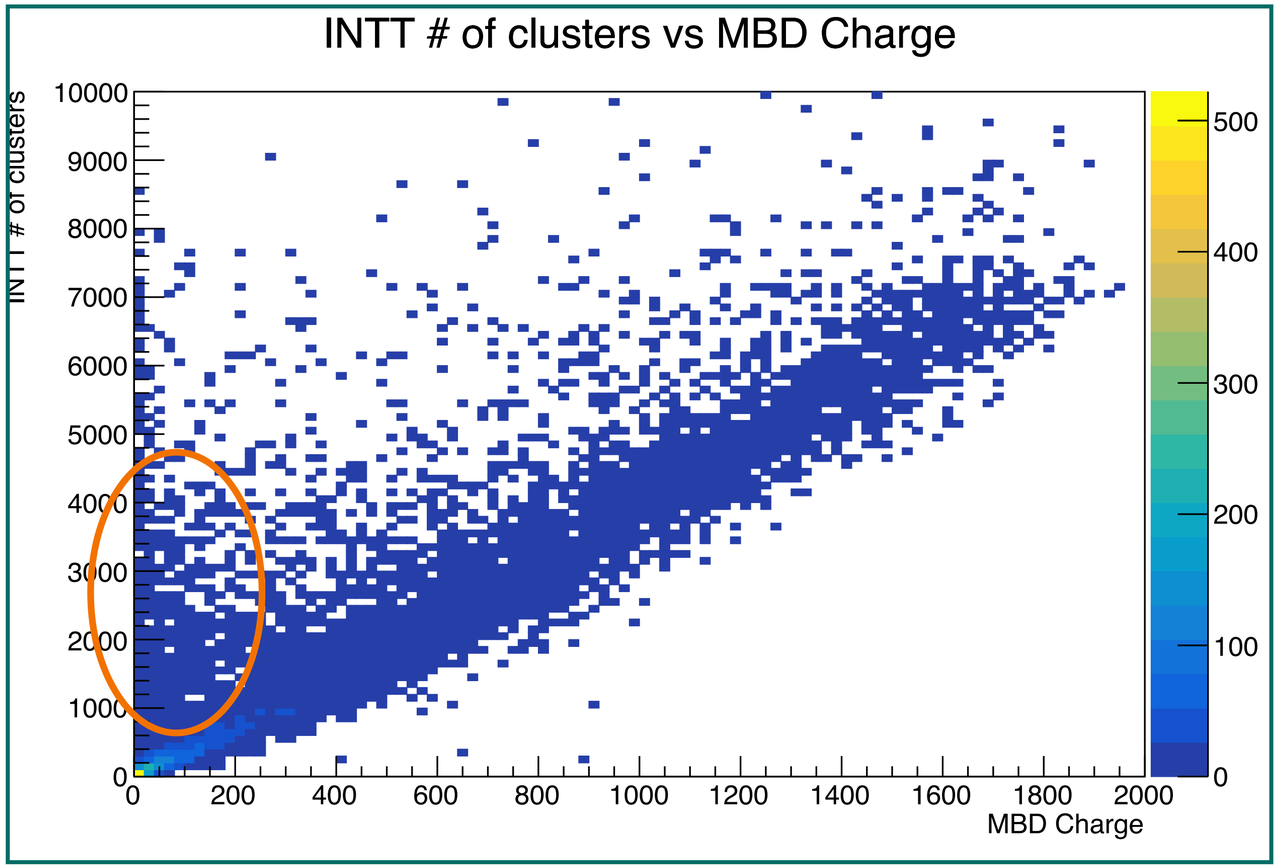
←MBD z-vertex distribution

- Blue : whole area (①)
- Red : noise area (②)

Data : #20708, 10K / 63K event

- The noise area is defined by eye (the left figure).
- MBD z-vertex distribution of the noise area is same as that of the whole area.
- <u>The noise does not depend on MBD z-vertex.</u>

2. The correlation between the noise rate and MBD Q



The noise in the INTT # of clusters vs. MBD Q plot is biased toward the smaller MBD charge (upper left of the distribution).

<Hypothesis>

Overall entries in left side of the distribution are more than in the right side.

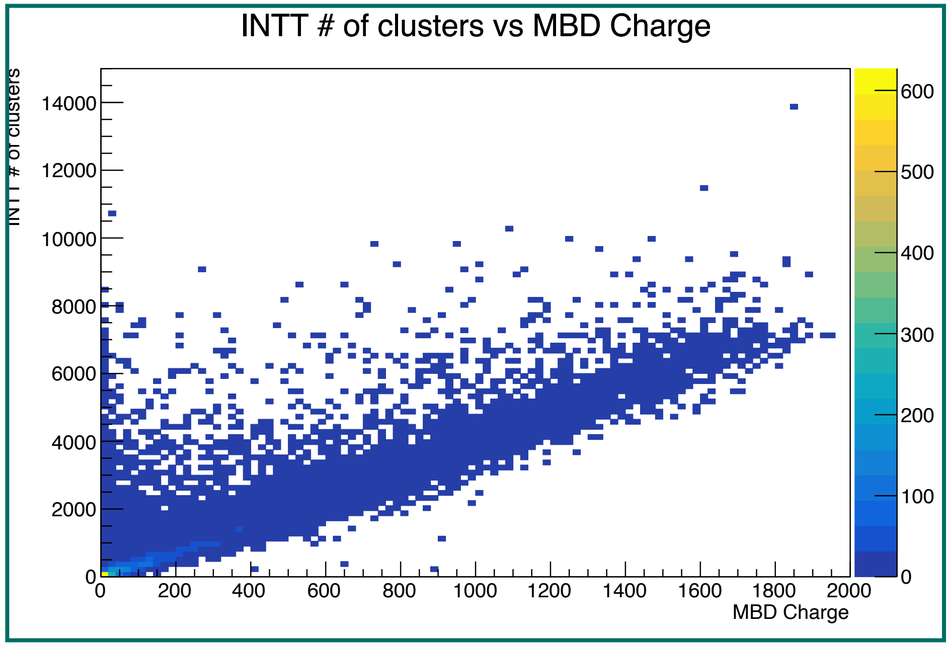
→The noise is just appeared to be biased ?

<Method>

①Dividing x-axis (MBD Q) into 10 bins.

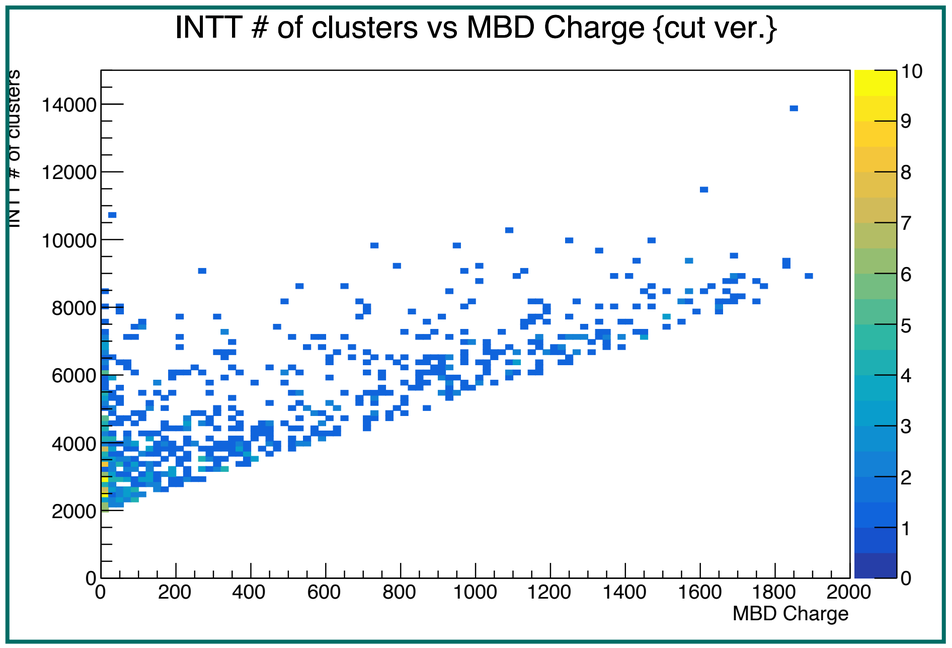
②Checking noise rates of the bins.

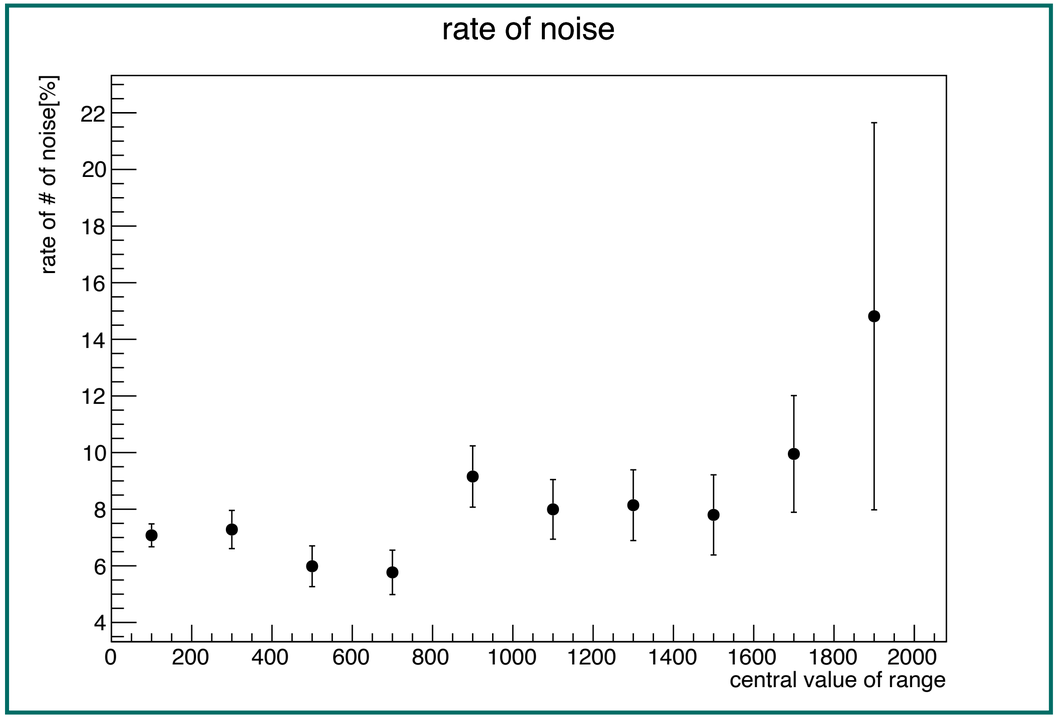
Noise rate and MBD Q



↑① INTT # of clusters vs. MBD Q

↓② INTT # of clusters vs. MBD Q （noise area）



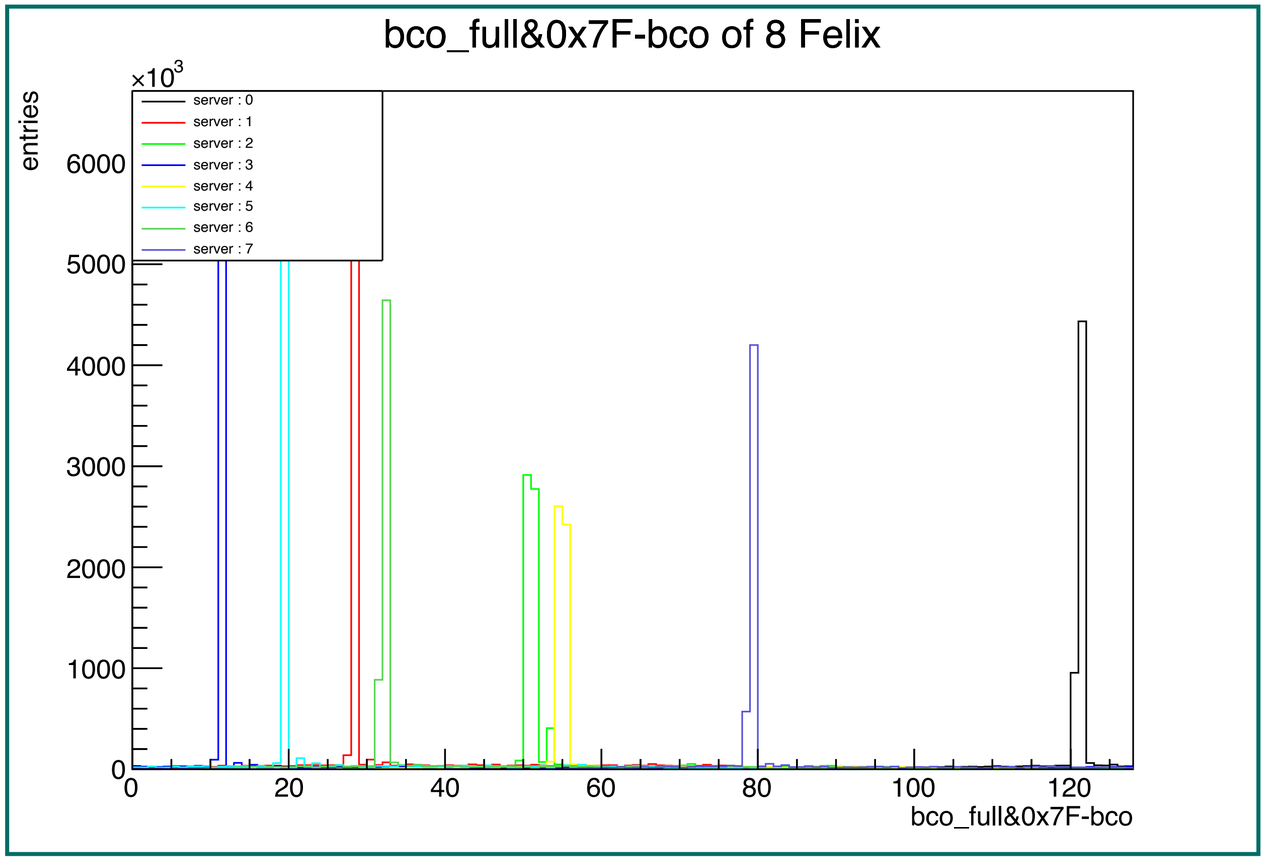


↑Noise rate in bin [%] （x-axis : central value of bin, y-axis : noise rate [%]）

Data：#20708, 10K / 63K event

- The noise rates are about 8% in any range.
- <u>The noise rate is constant and does not depend on MBD Q.</u>

3. The correlation between the noise and bco



The bco_full&0x7F - bco distribution has peaks for every Felix.

<Hypothesis>

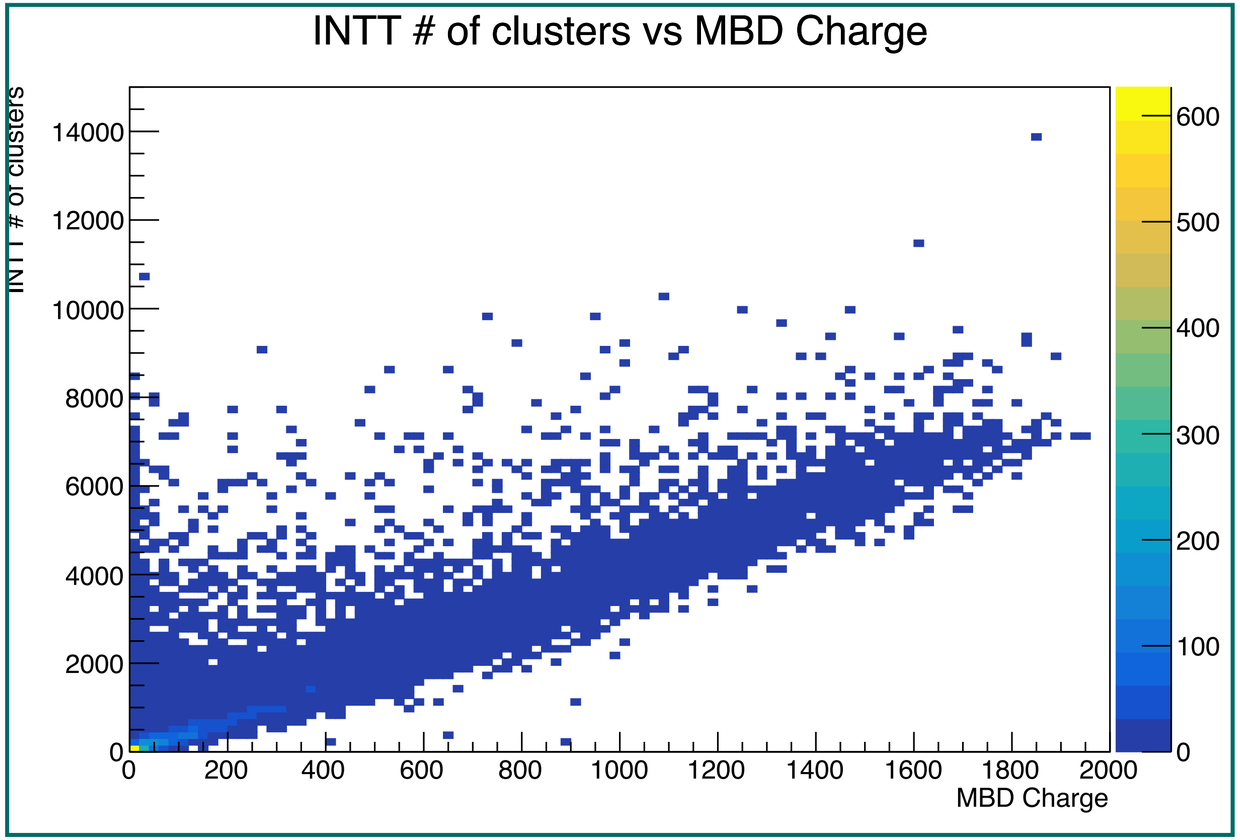
The noise of the INTT # of clusters vs. MBD Q plot is made by non-peak hits of the bco_full&0x7F - bco distribution.

<Method>

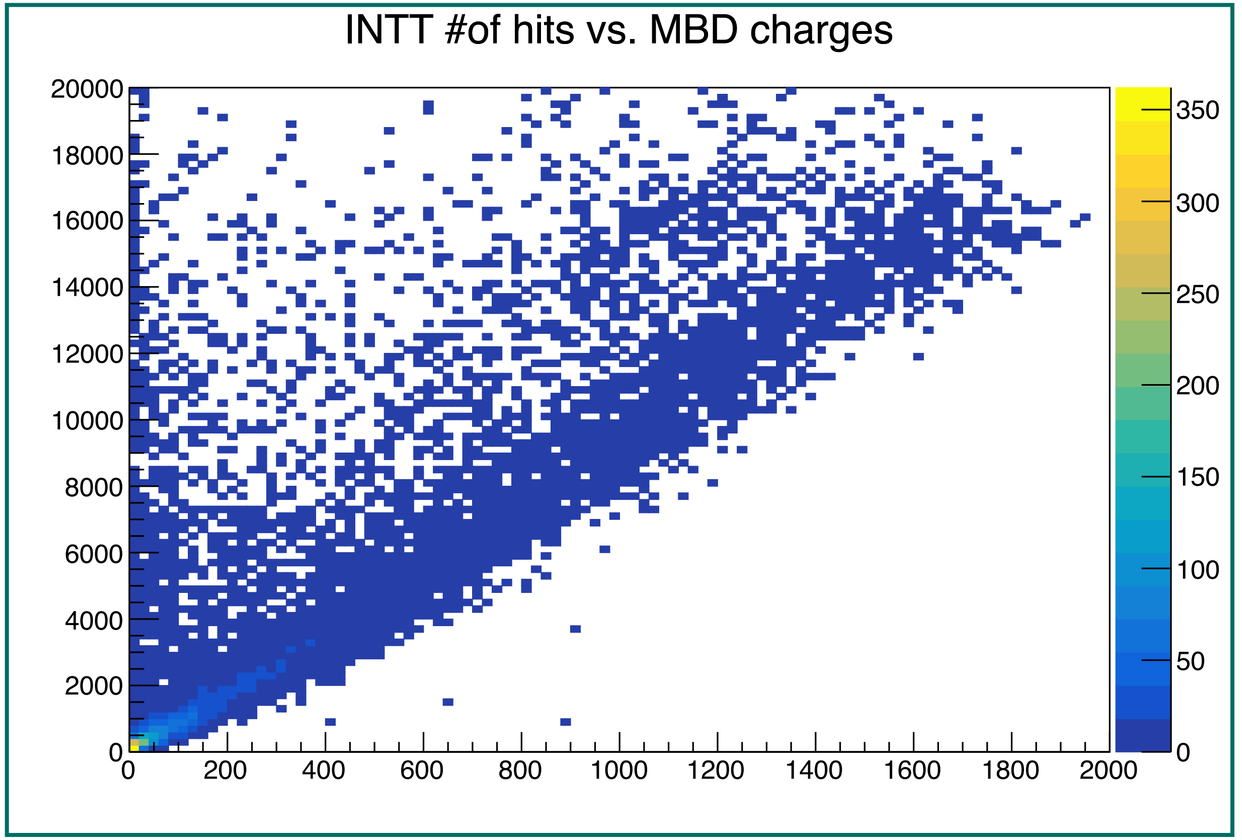
Applying the timing cut which selects only the peaks of bco_full&0x7F - bco distribution.

Check : Clusters and hits

INTT # of CLUSTERS vs. MBD Q



INTT # of HITS vs. MBD Q

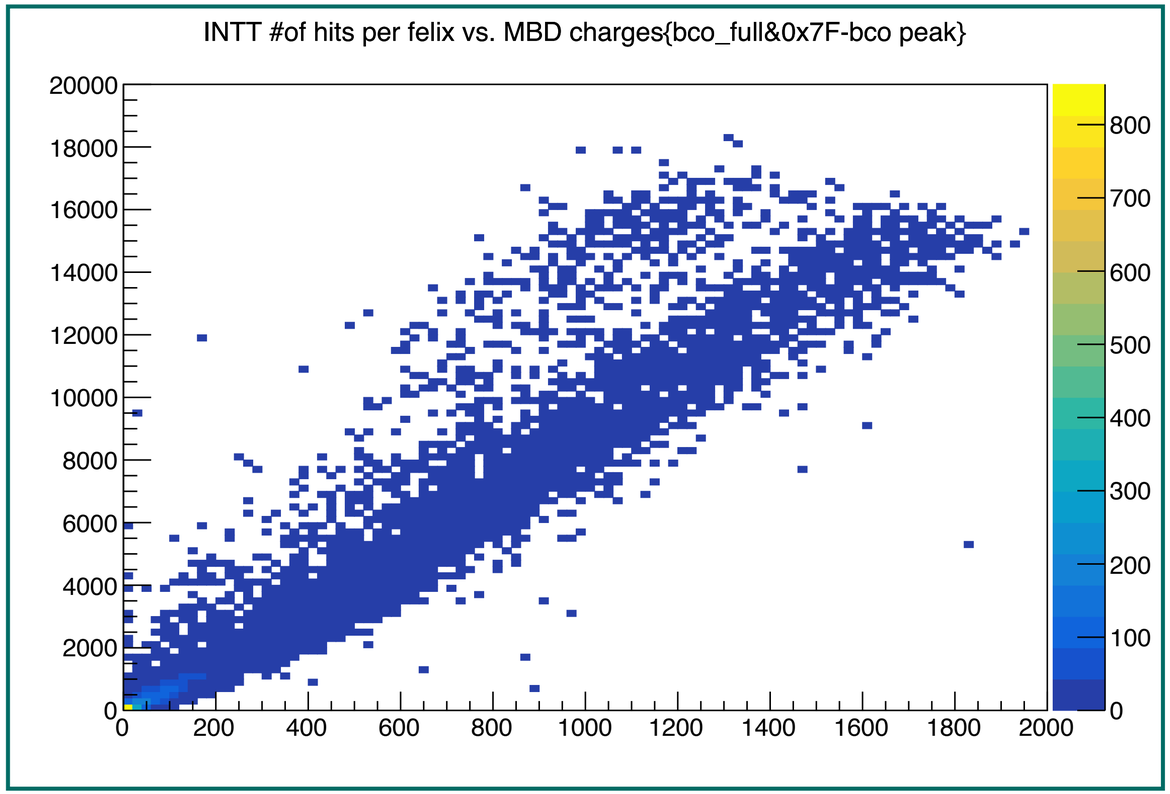


- In the INTT # of hits vs. MBD Q plot, There is also noise in upper left of the distribution as in the case of clusters.

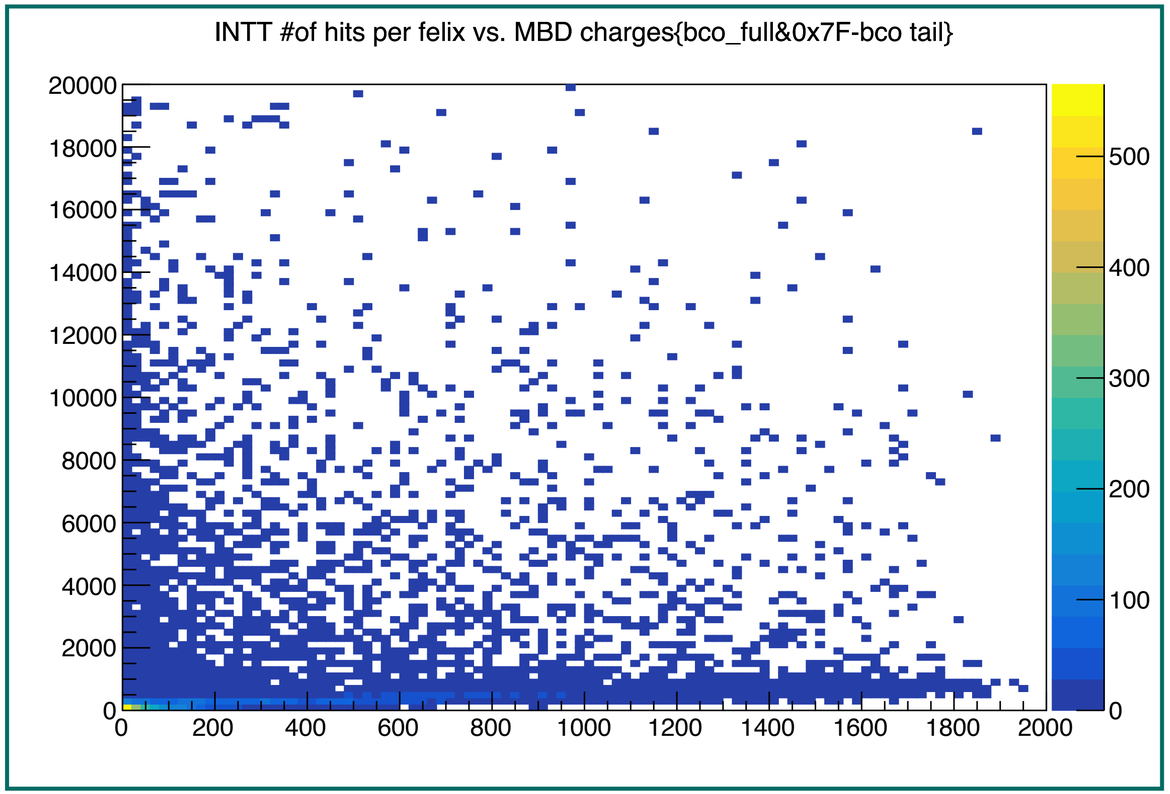
With the timing cut

- The left plot shows the correlation selecting only peaks of bco distribution.
- The right plot shows the correlation with non-peaks selection.

INTT # of hits vs. MBD Q (peaks)



INTT # of hits vs. MBD Q (non-peaks)

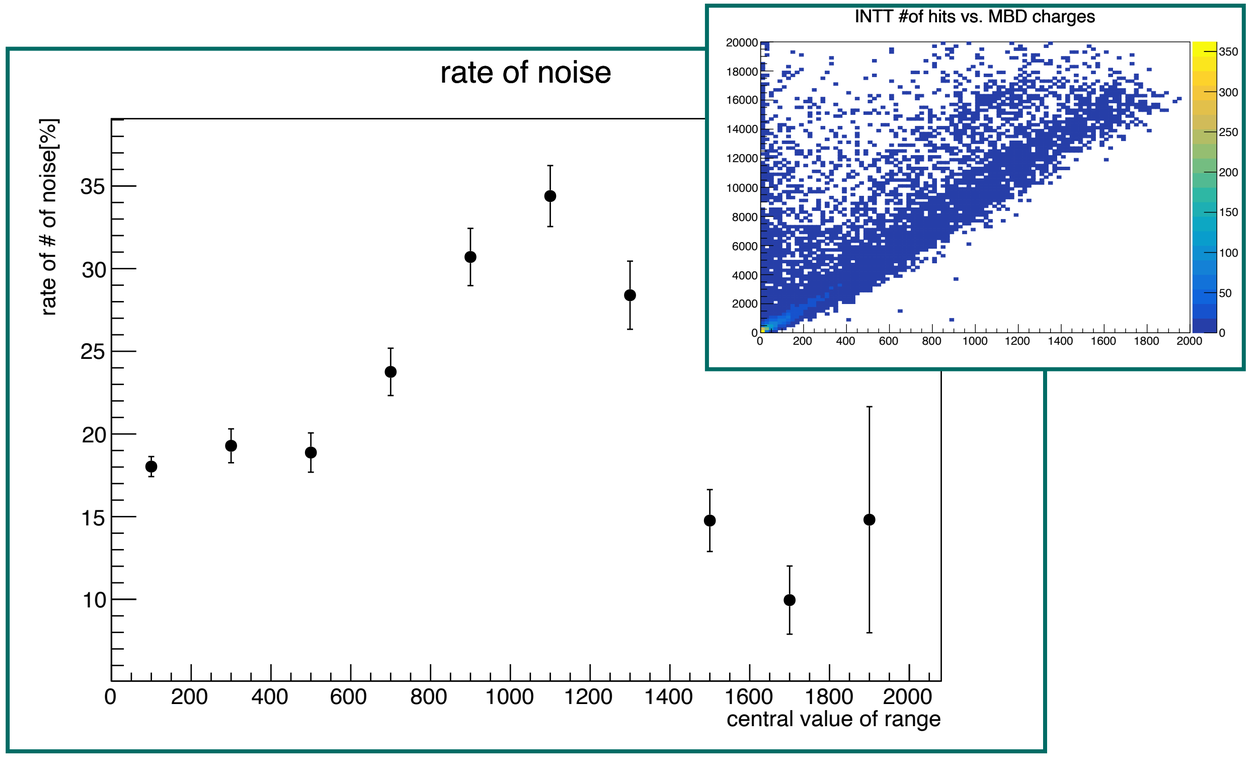


- <u>The noise part and the correlation part is shown separately.</u>

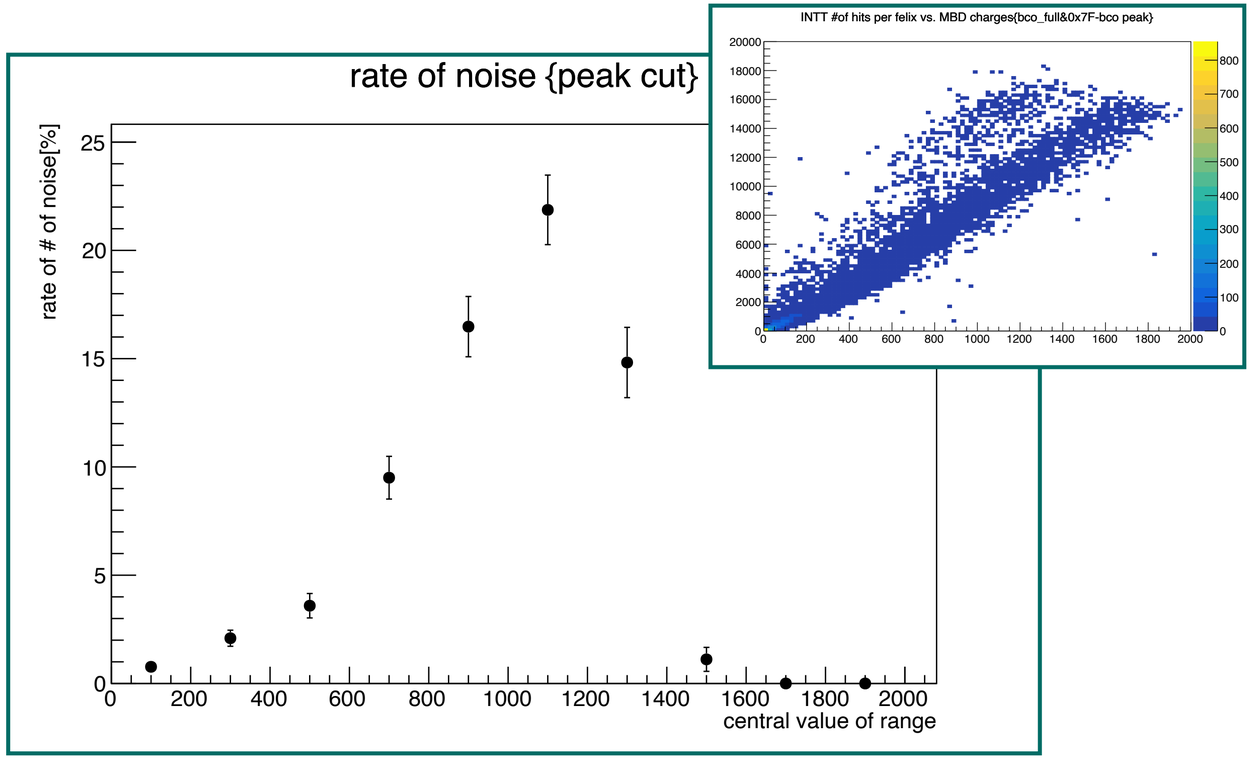
The noise rate with the timing cut

- The noise rate in bins [%] (x-axis : central value of bin, y-axis : The noise rate [%])

INTT # of hits vs. MBD Q



INTT # of hits vs. MBD Q with timing cut

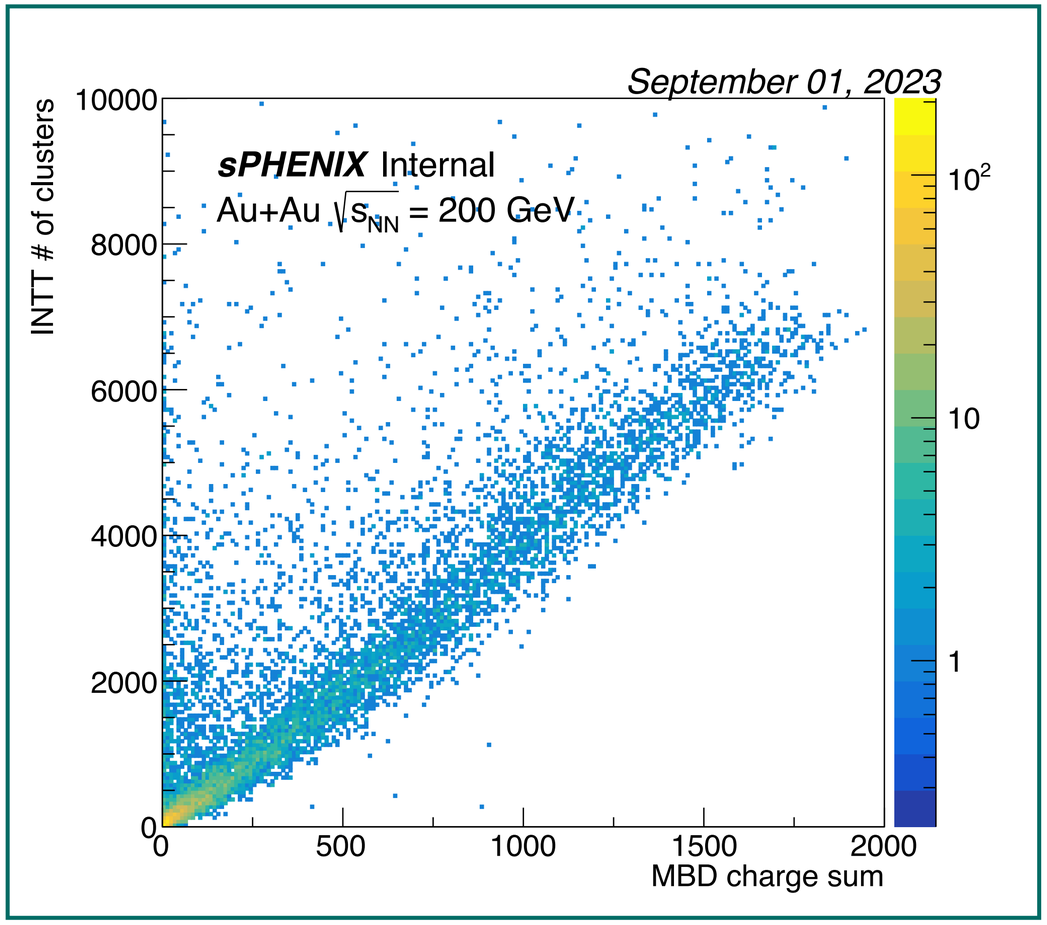


- <u>After the timing cut, the noise rate decrease.</u>

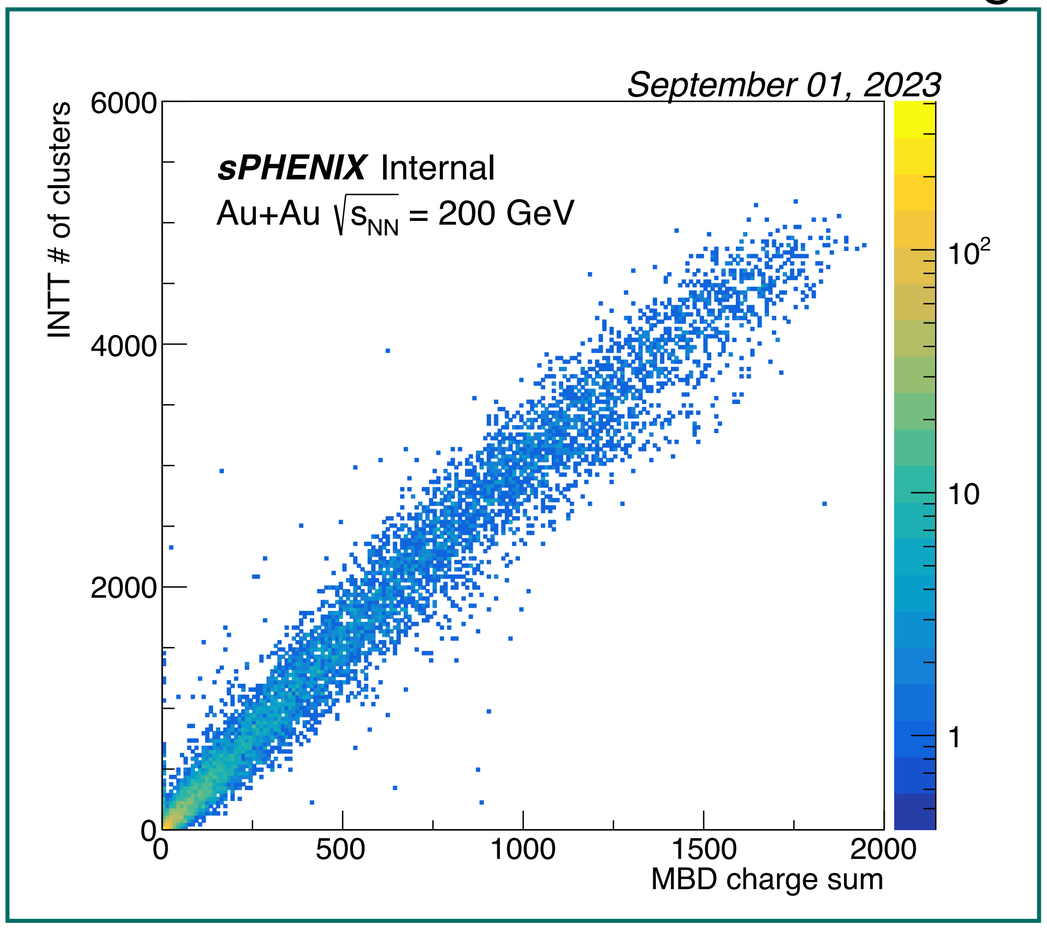
With the timing cut & clustering

- Data : #20708, 10K / 63K event
- After the timing cut, the remaining event is applied clustering.

INTT # of clusters vs. MBD Q



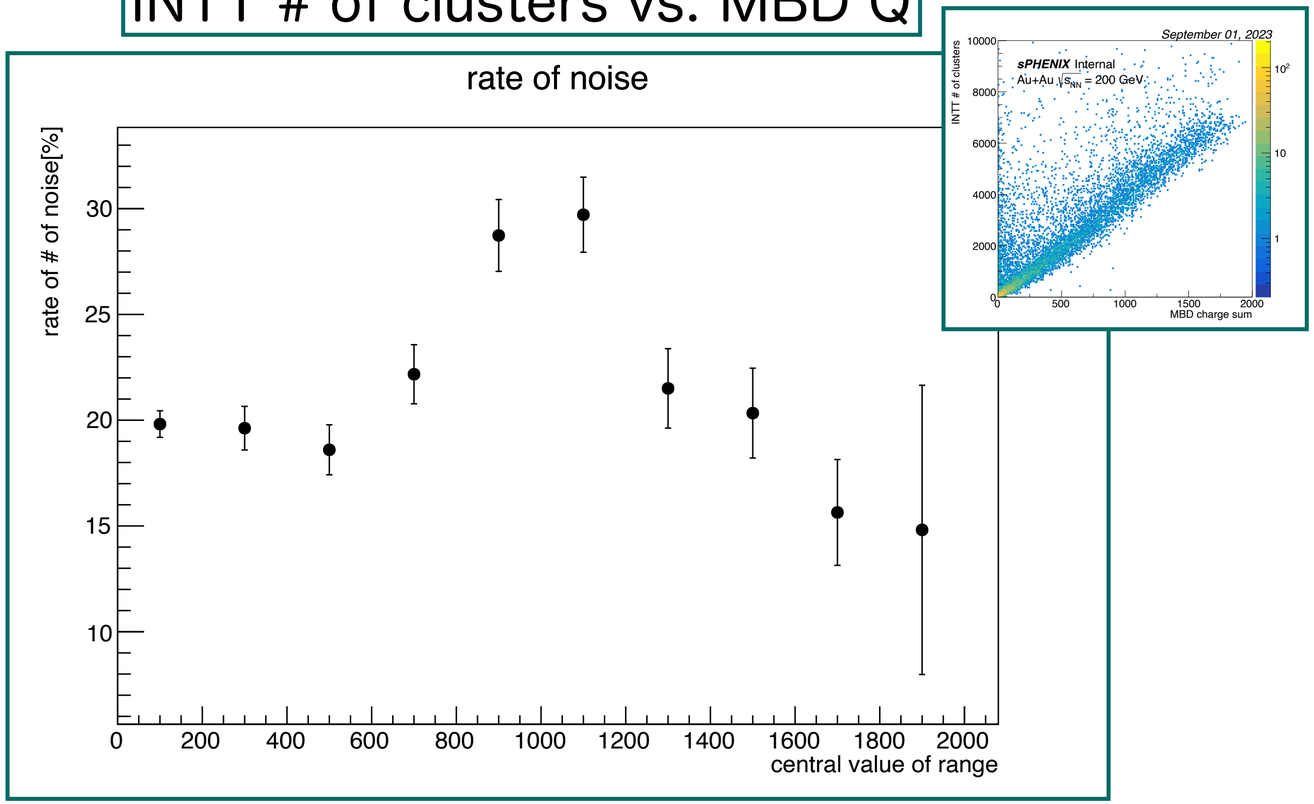
INTT # of clusters vs. MBD Q with timing cut



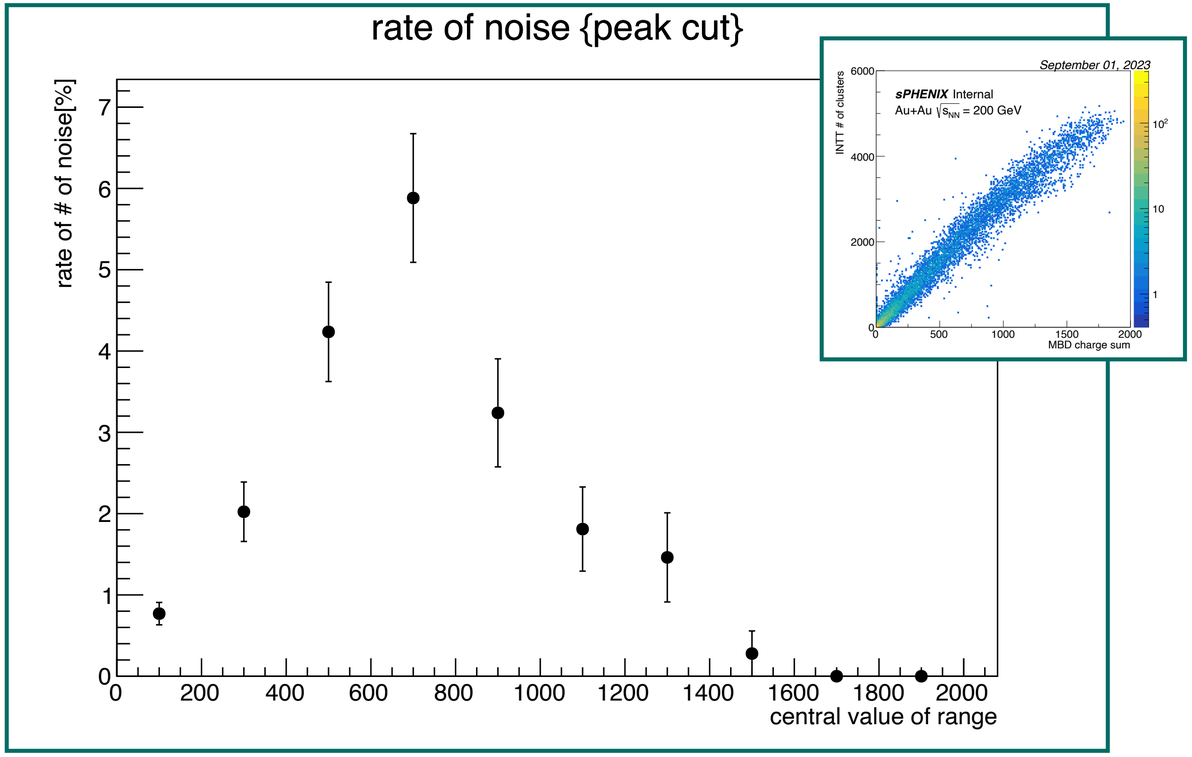
The noise rate with the timing cut & clustering

- The noise rate in bins [%] (x-axis : central value of bin, y-axis : The noise rate [%])

INTT # of clusters vs. MBD Q



INTT #of clusters vs. MBD Q with the timing cut & clustering



- <u>After the timing cut and clustering, the noise rate decreased.</u>

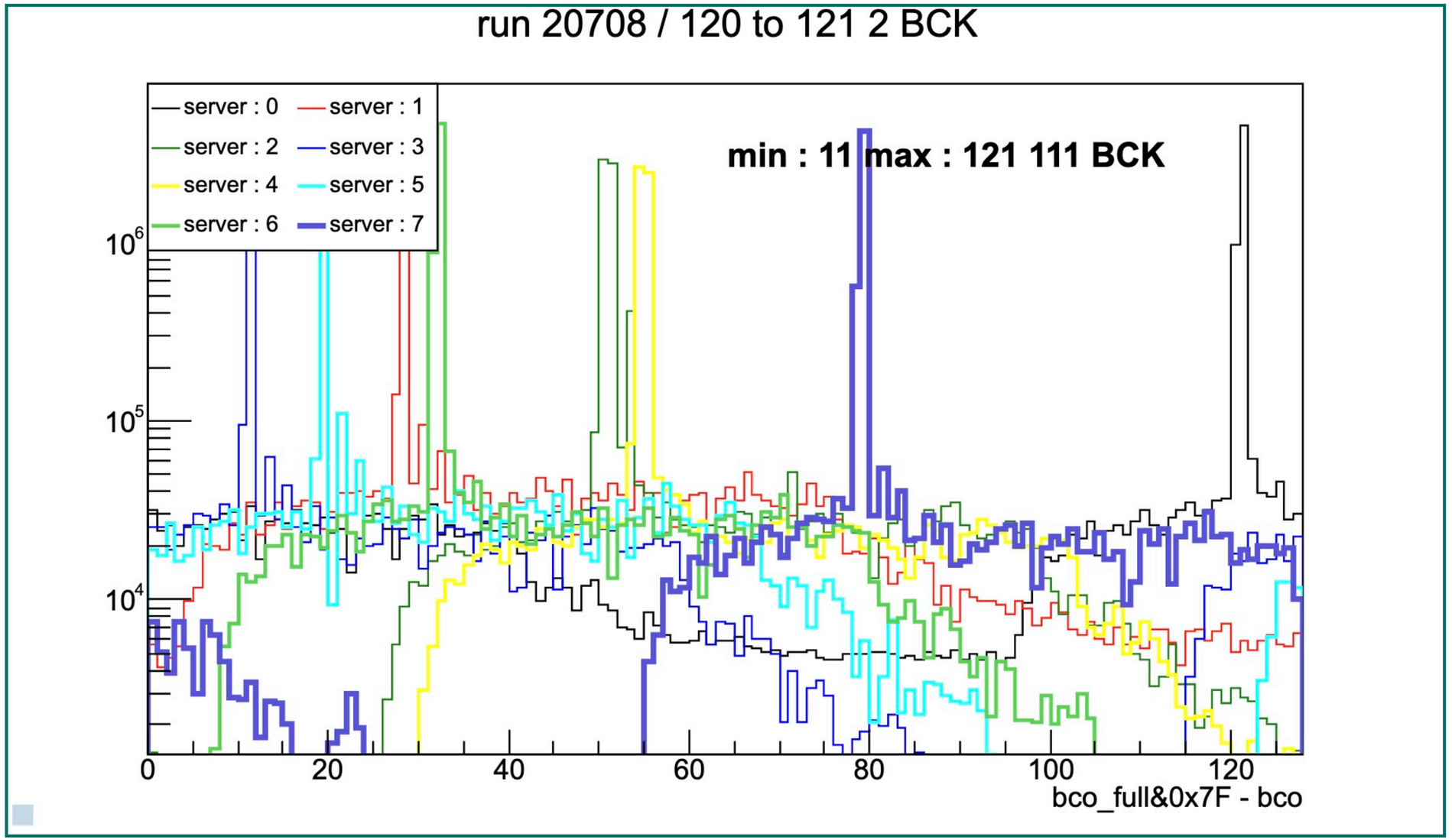
SUMMARY

- INTT # of clusters vs. MBD Q
  - The noise does not depend on MBD z-vertex.
  - The noise rate does not depend on MBD charge.

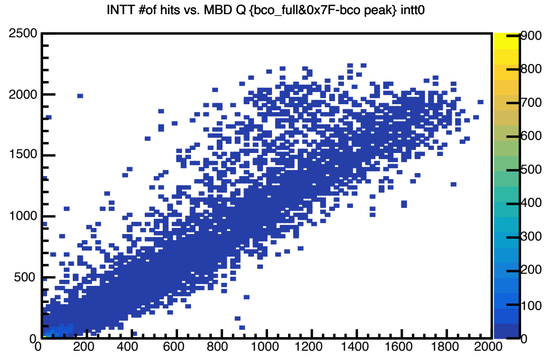
  - The timing cut is applied. It selects only peaks of bco_full&0x7F - bco distribution. → The noise decrease.
  - After the timing cut, clustering is applied. →The noise disappear.

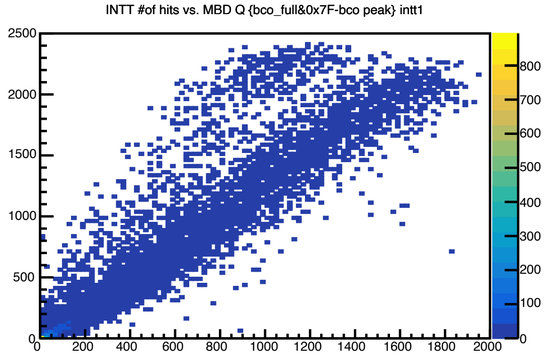
BACK UP

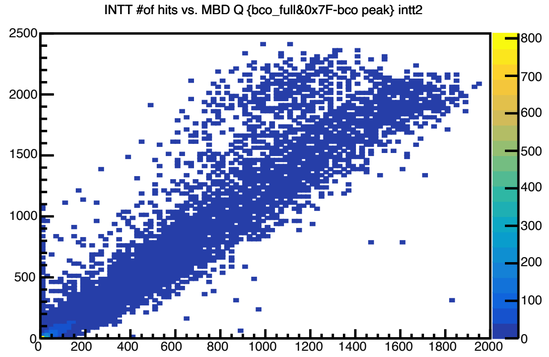
bco_full&0x7F - bco (Logy)

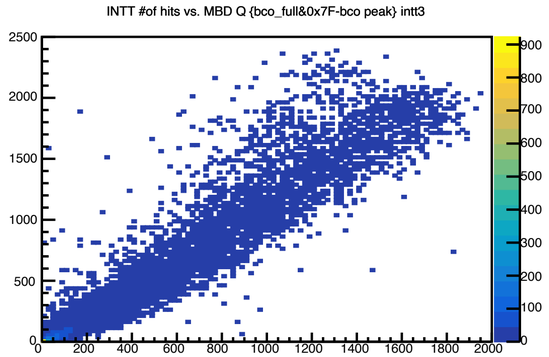


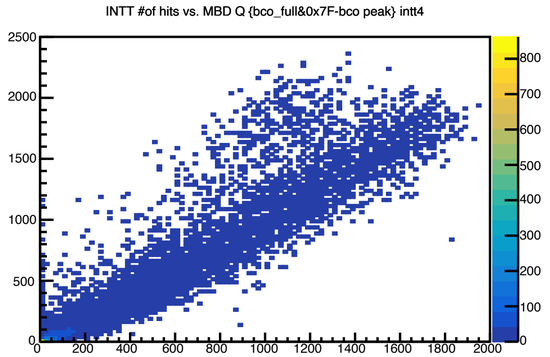
INTT # of hits vs. MBD Q (peak)

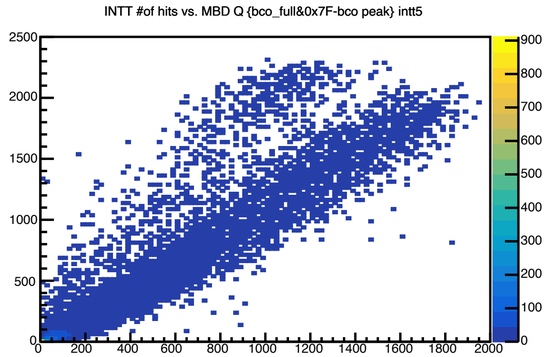


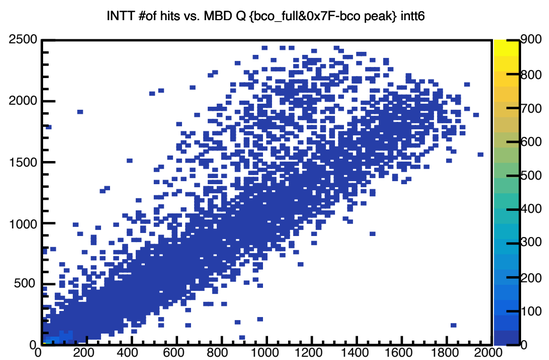


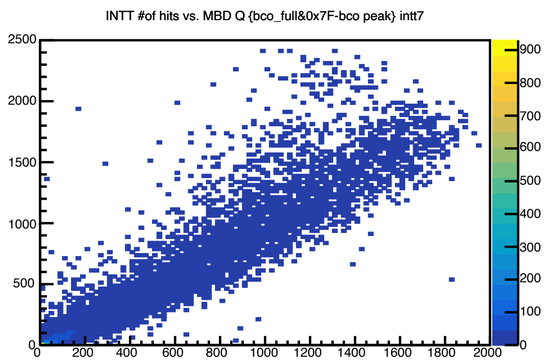




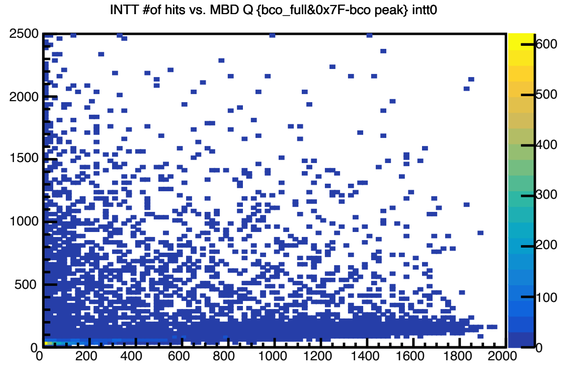


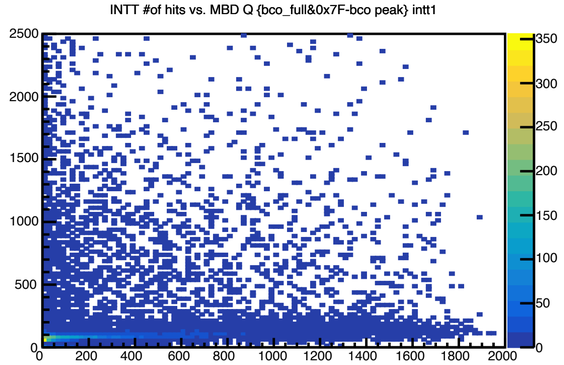


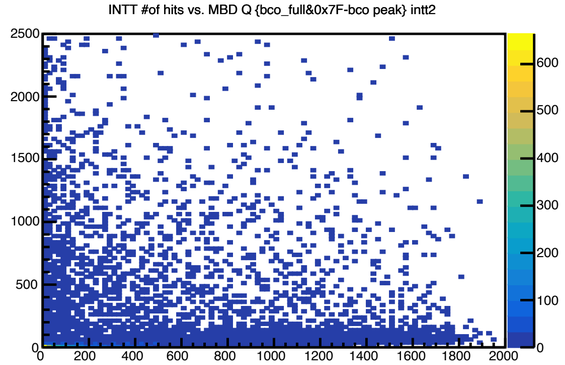


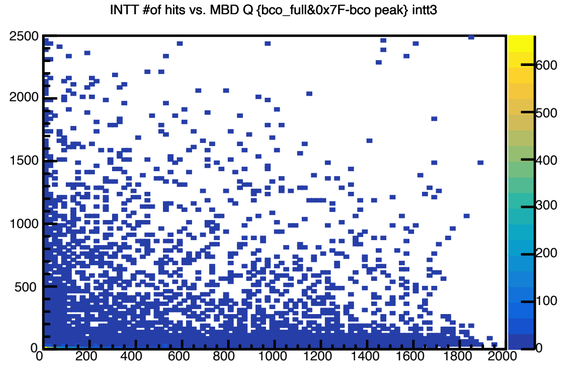


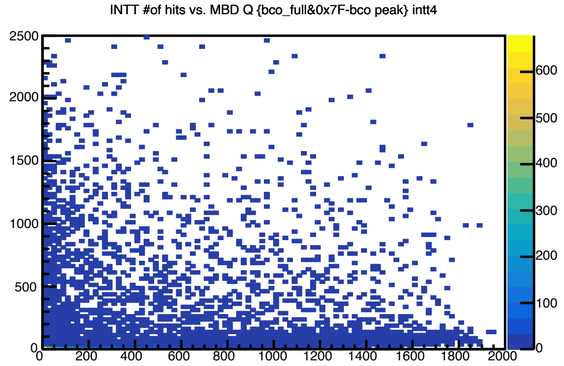
INTT # of hits vs. MBD Q (tail)

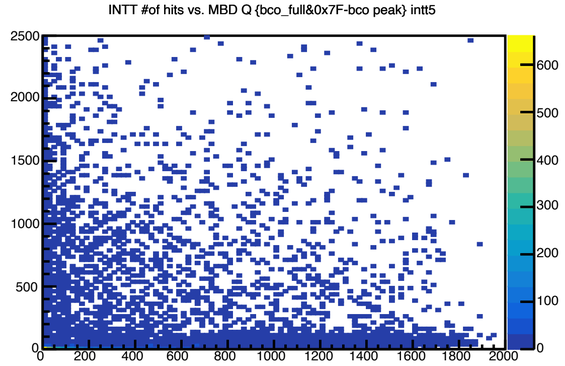


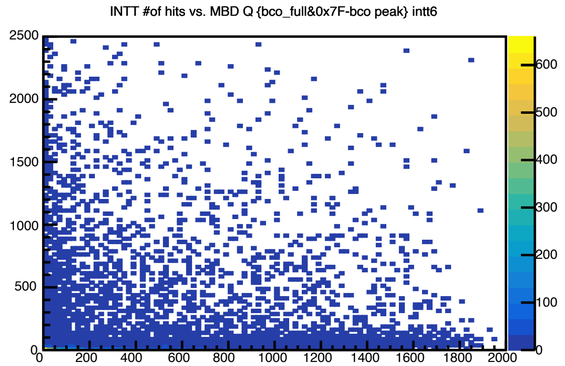


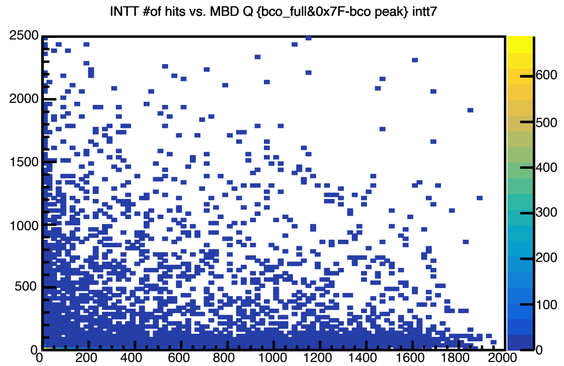




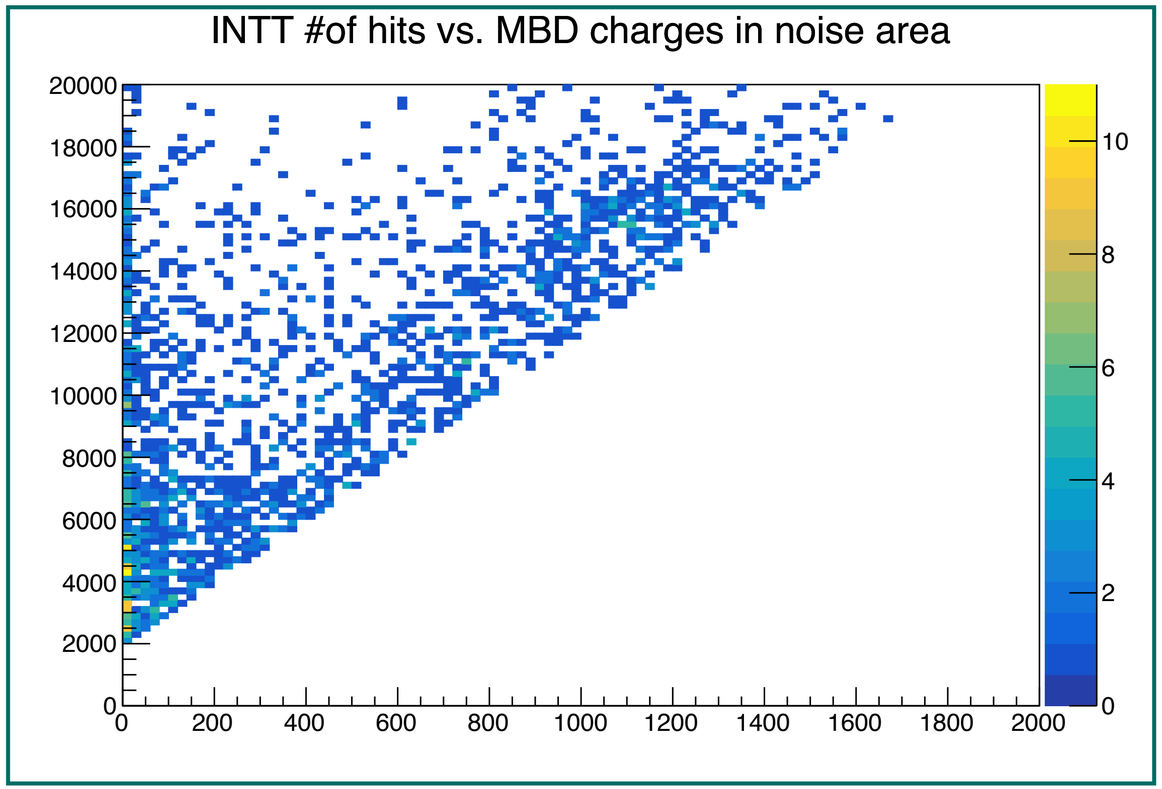


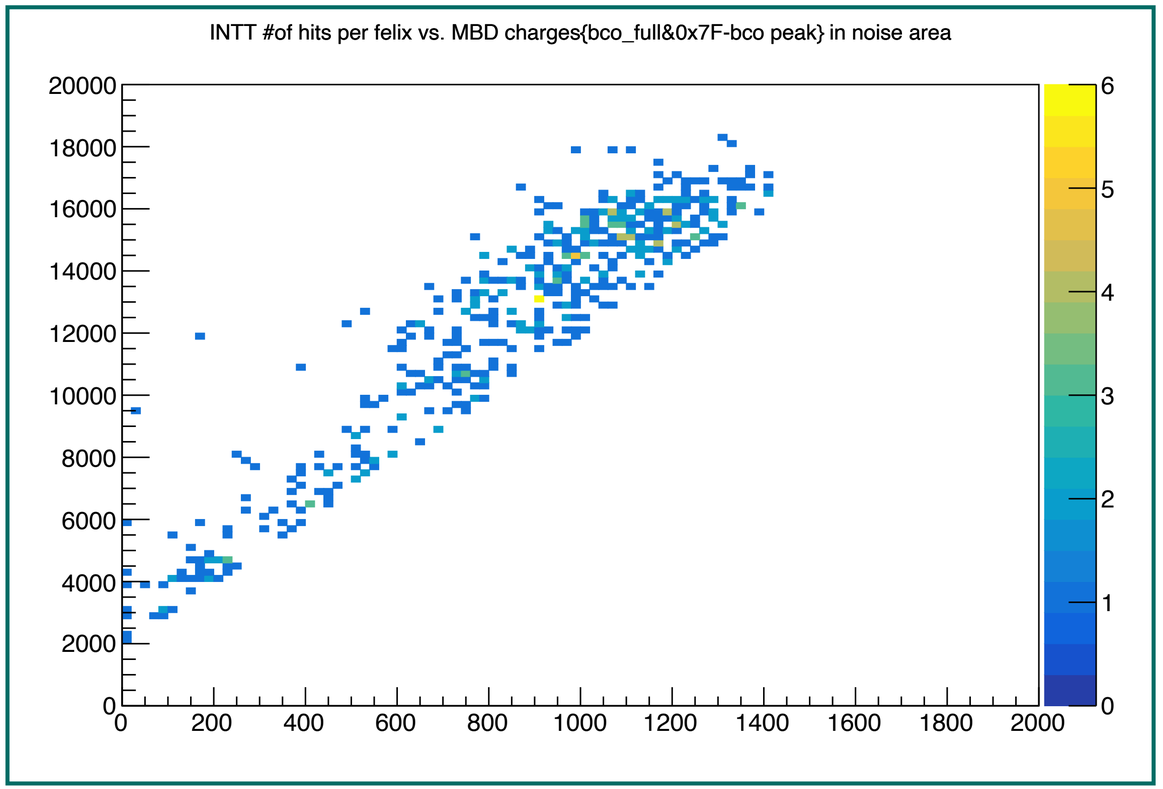




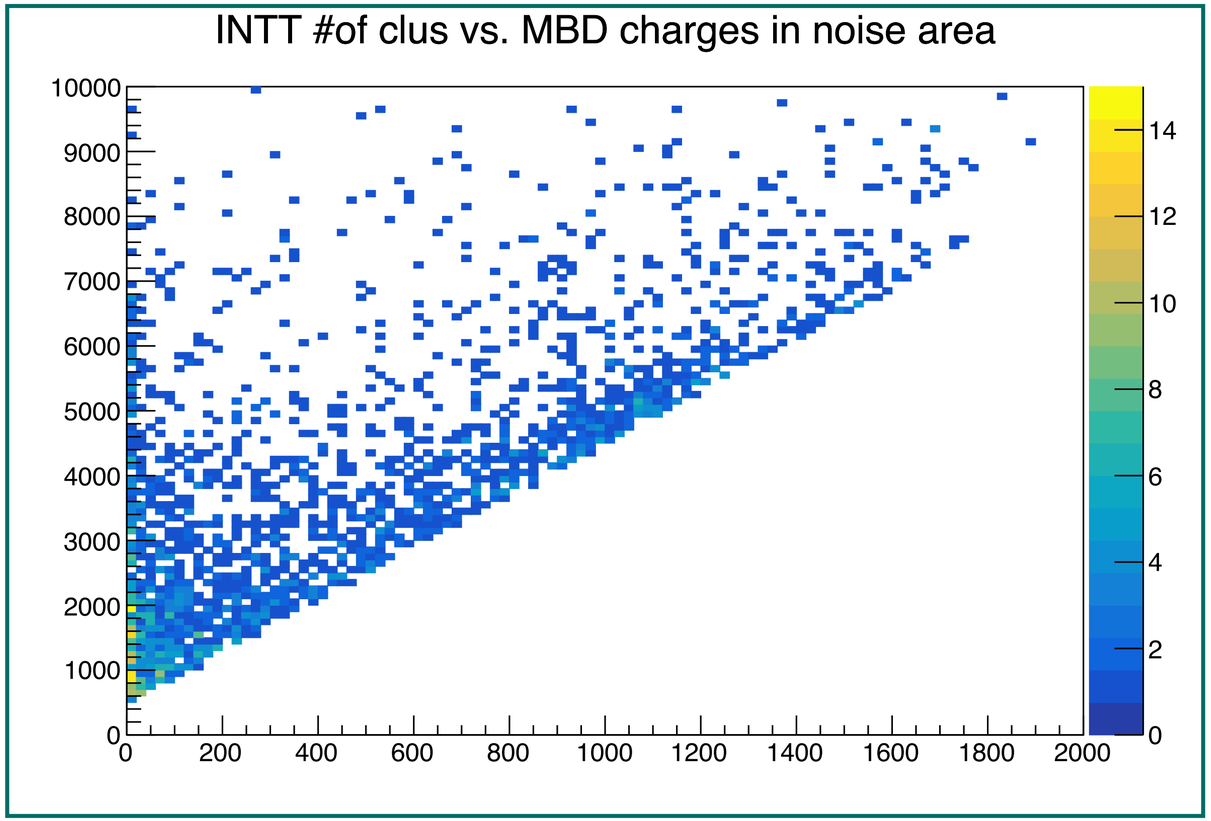


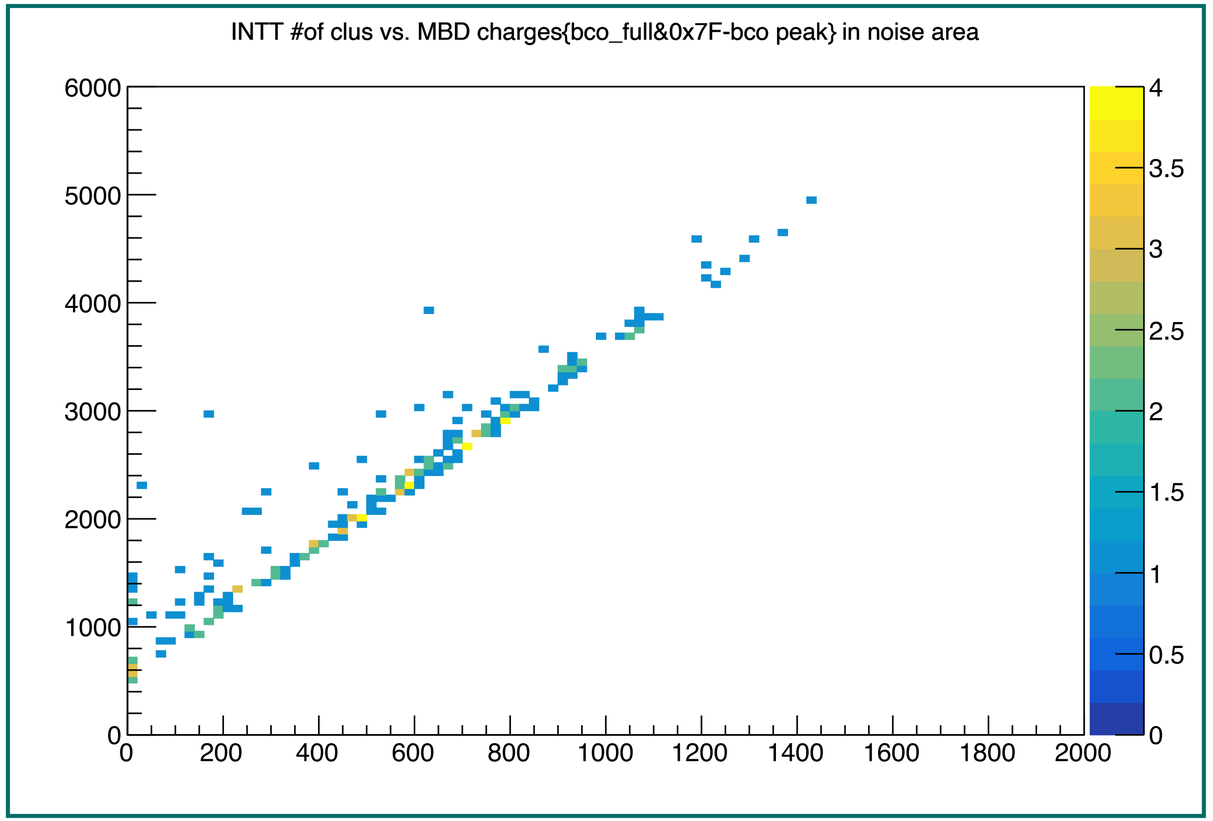
noise area after bco cut



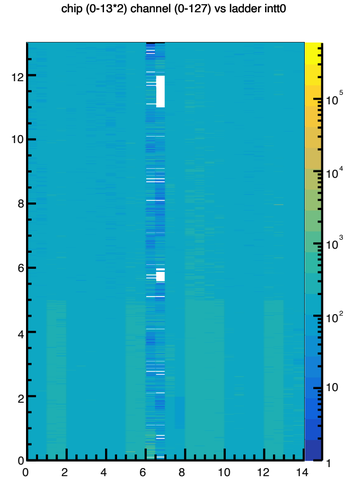


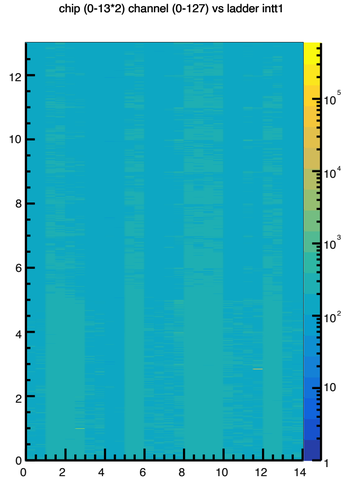
noise area after bco cut & clustering

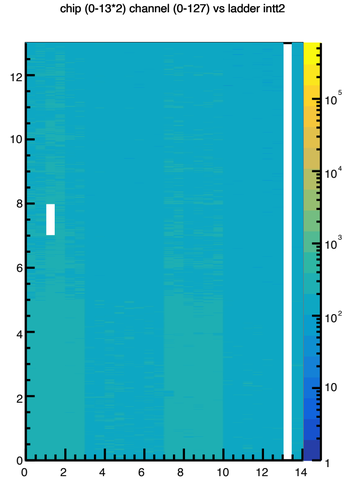


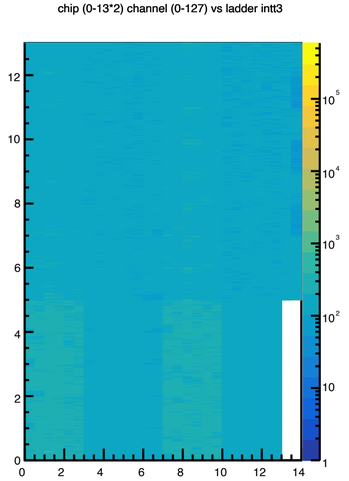


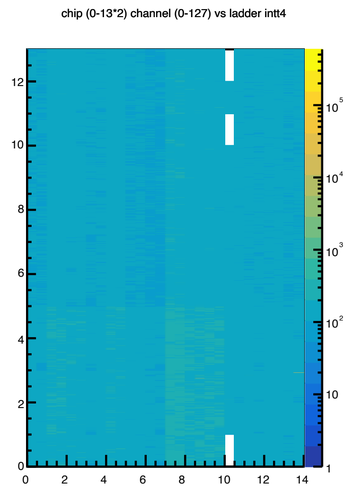
hit map

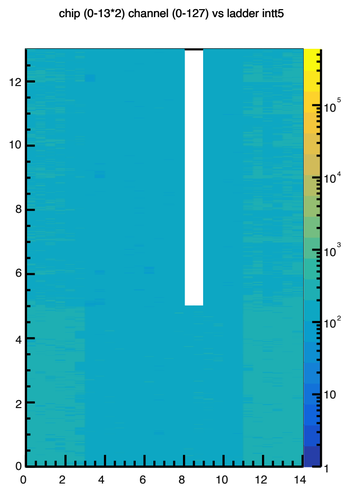

chip (0-13*2) channel (0-127) vs ladder intt0

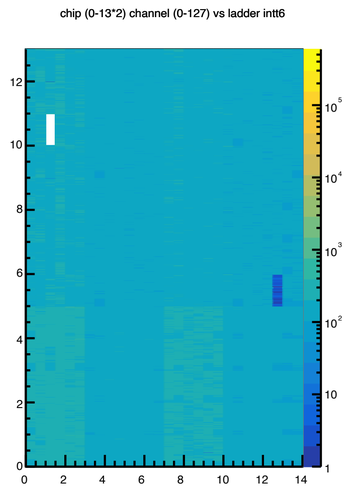

chip (0-13*2) channel (0-127) vs ladder intt1

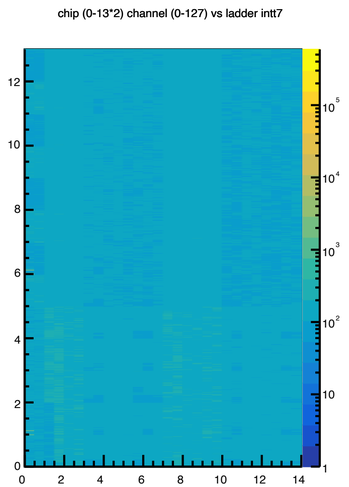

chip (0-13*2) channel (0-127) vs ladder intt2


chip (0-13*2) channel (0-127) vs ladder intt3

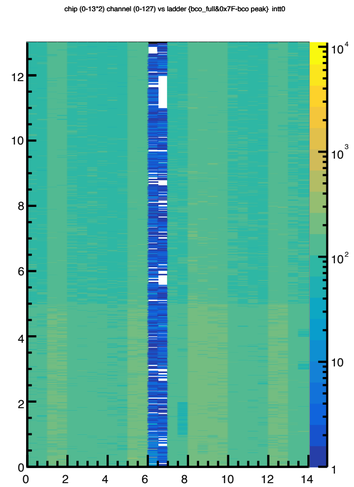

chip (0-13*2) channel (0-127) vs ladder intt4

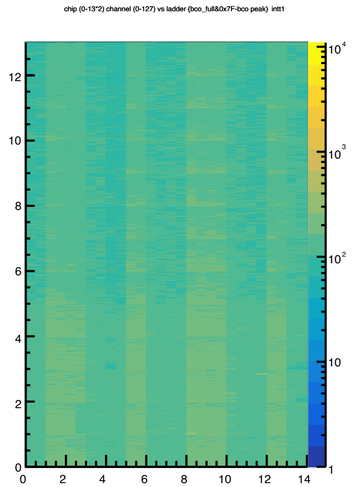

chip (0-13*2) channel (0-127) vs ladder intt5

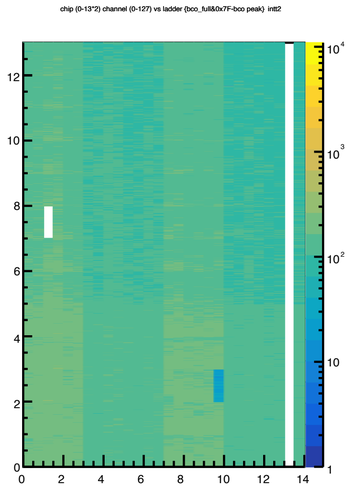

chip (0-13*2) channel (0-127) vs ladder intt6

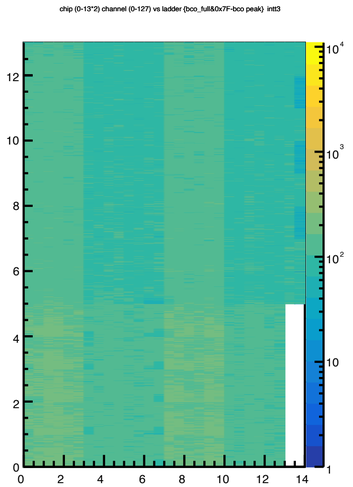

chip (0-13*2) channel (0-127) vs ladder intt7

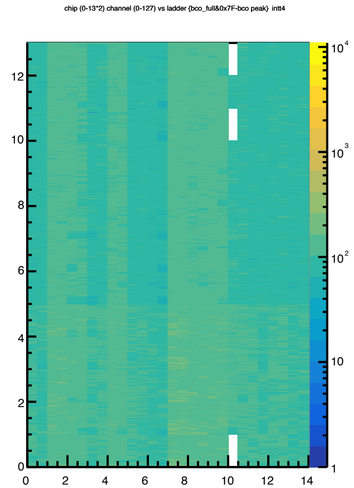
hit map in peak

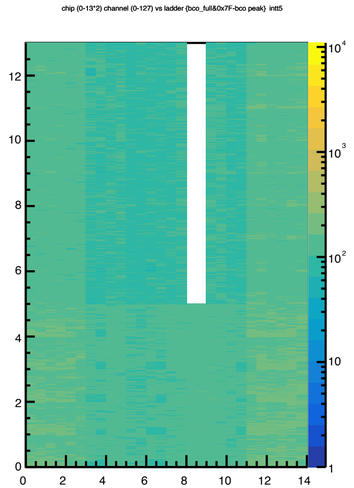


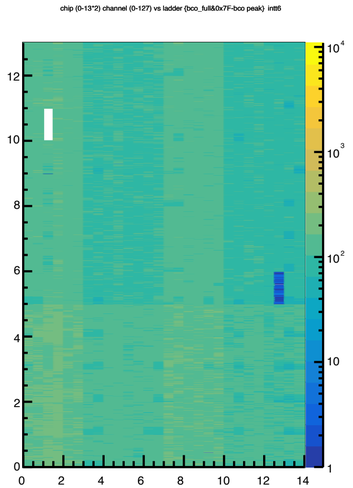


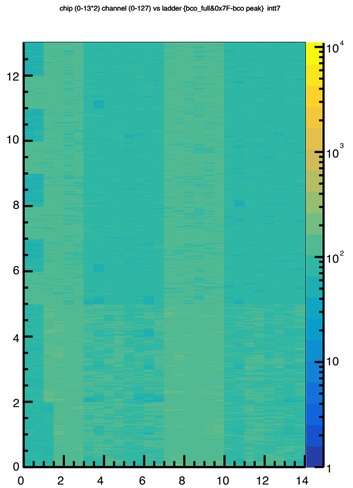




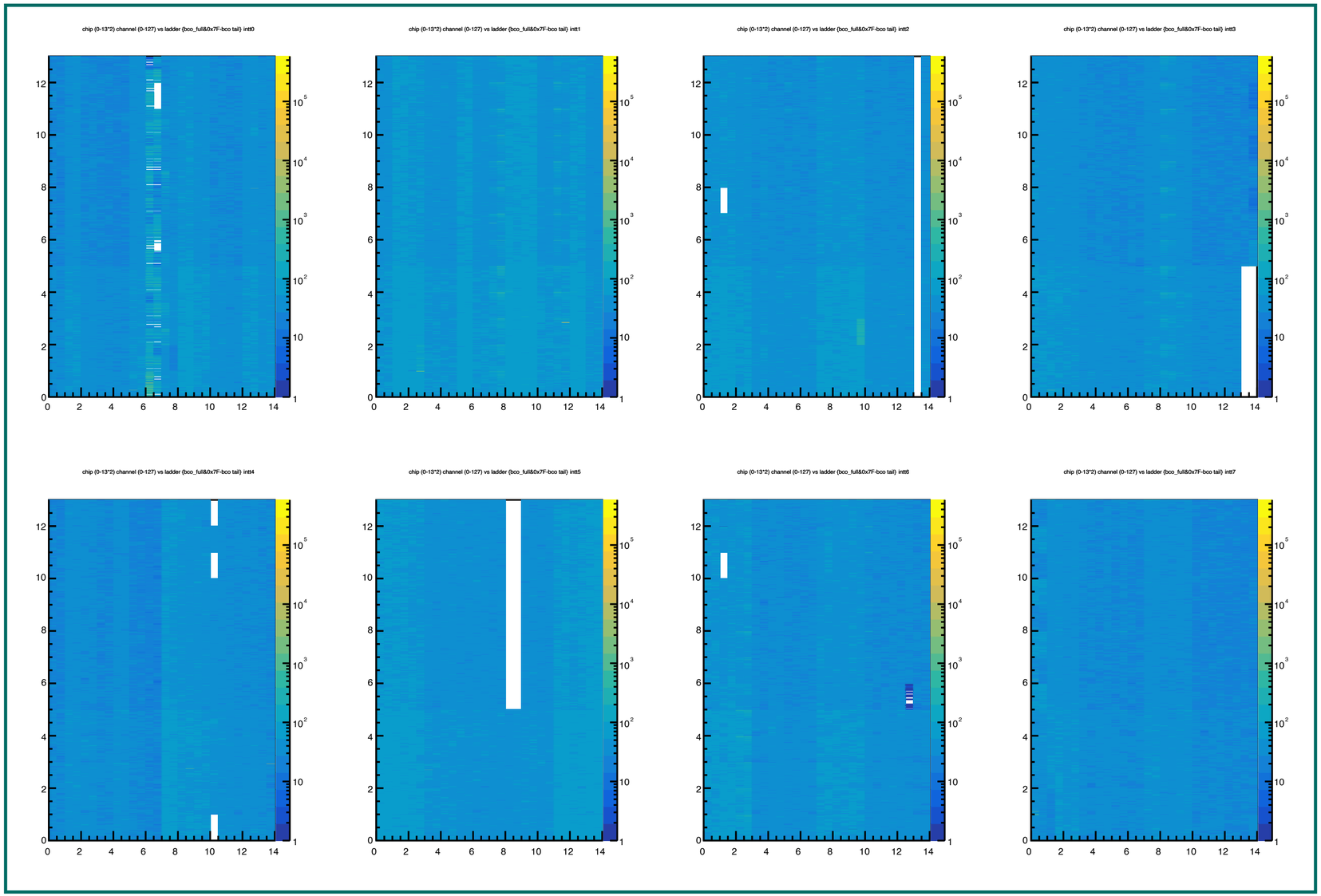








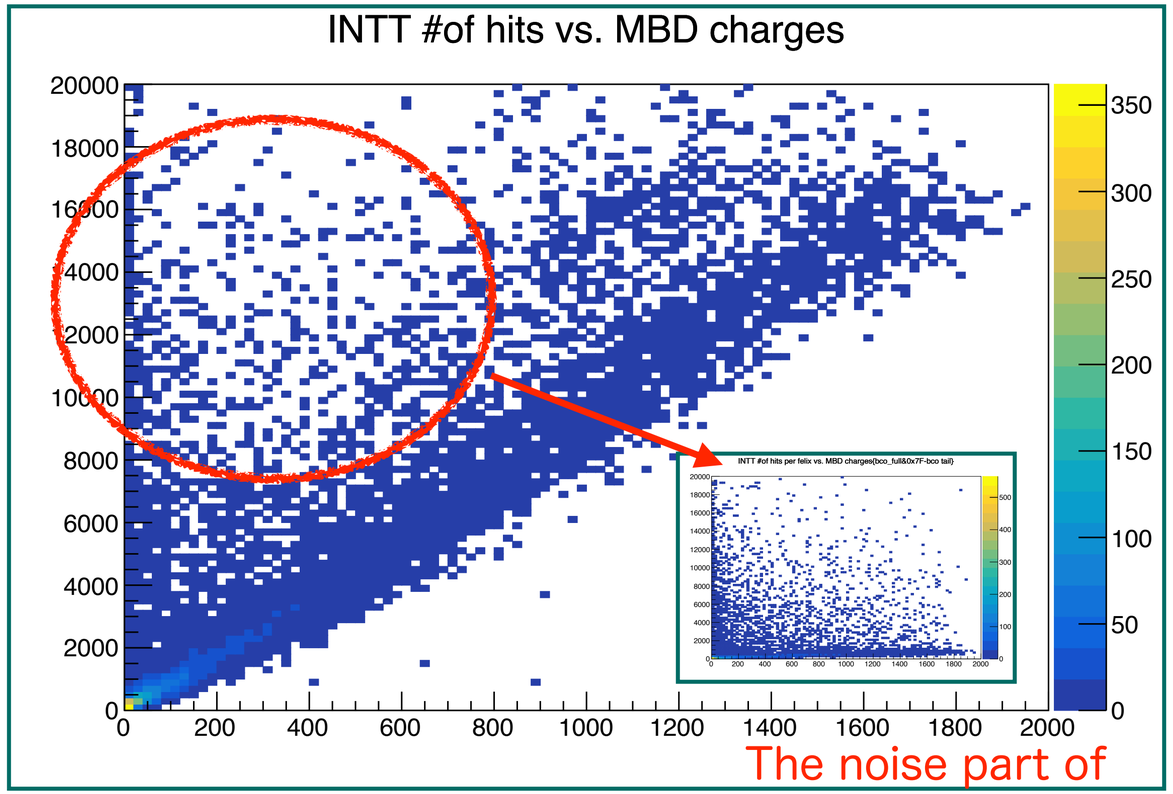
hit map in tail



With the timing cut

- The plots show the difference before and after the timing cut

INTT # of hits vs. MBD Q (before cut)



The noise part of INTT # of hits

INTT # of hits vs. MBD Q (after cut)