Mixup (Multiplicity dependence)

2023/10/11

INTTMT

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Purpose

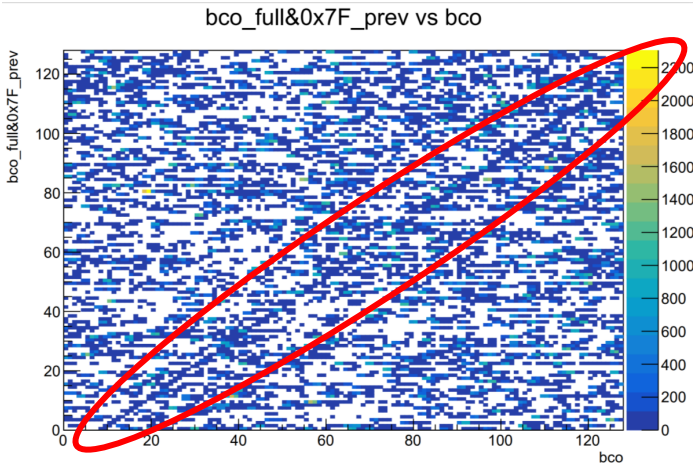
- Mixup is a situation in which the processing of data from the next beam collision starts before the current processing is completed and the collision data from the previous and next collisions are mixed up.
- Mixup degrade the performance of INTT
- I found out that a mixup is occurring and I'm looking into it.

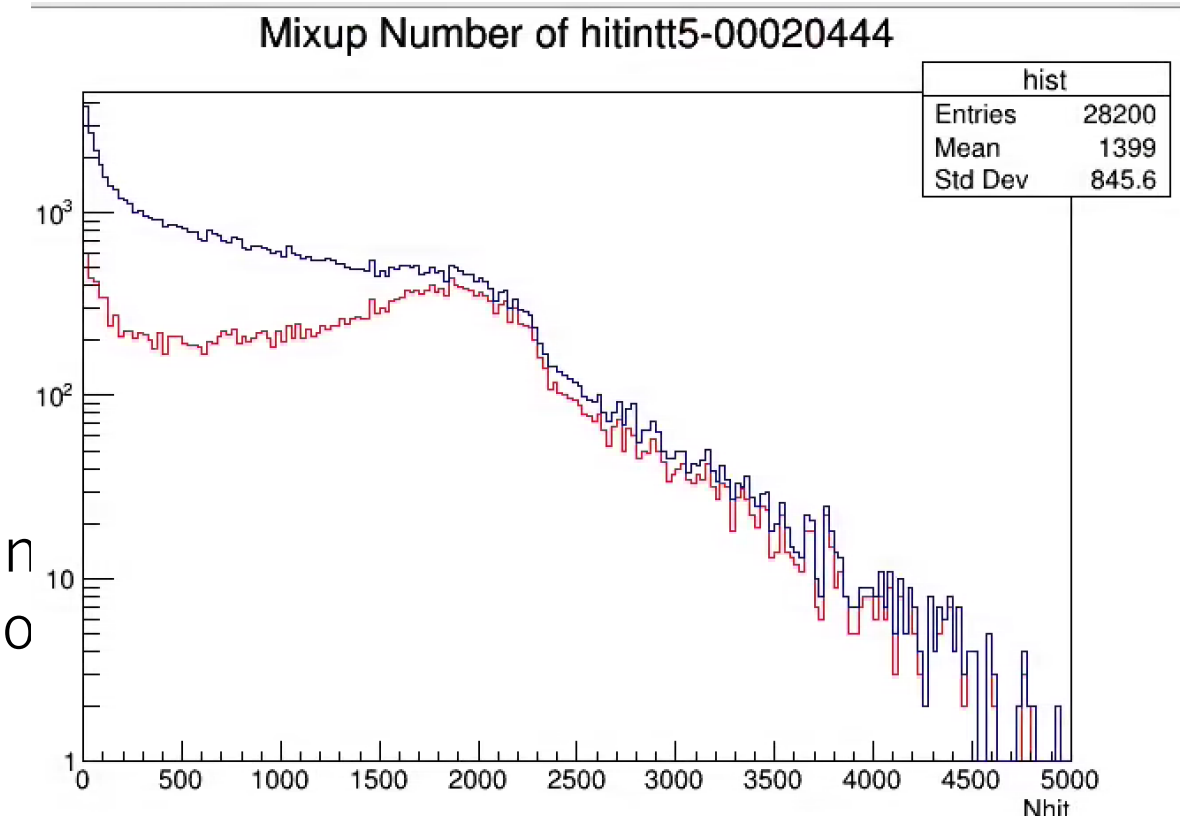
- To check for multiplicity dependence, I made a multiplicity plot of the events Mixup occurring

Run20444 Mixup

- Number of hit are plotted in black for all events and in red only for events where mixup are occurring.
- This plot shows that there is multiplicity dependence in the mixup.
- Many mixup is occuring where Multiplicity is high.

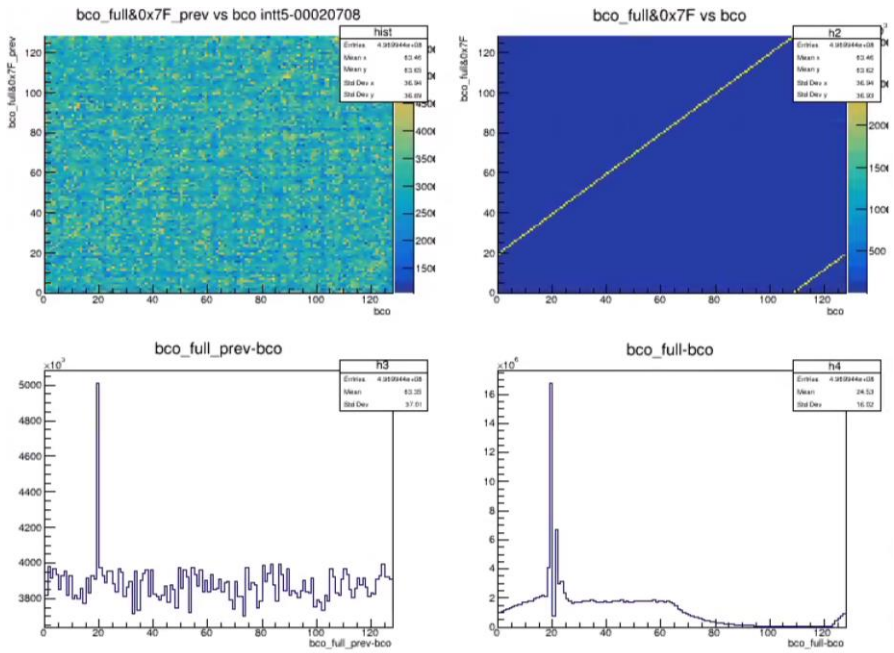
- Also, the reason why the figure looks like this above 2500 is because this run was measured with n_collision=127, so there is a lot of noise.

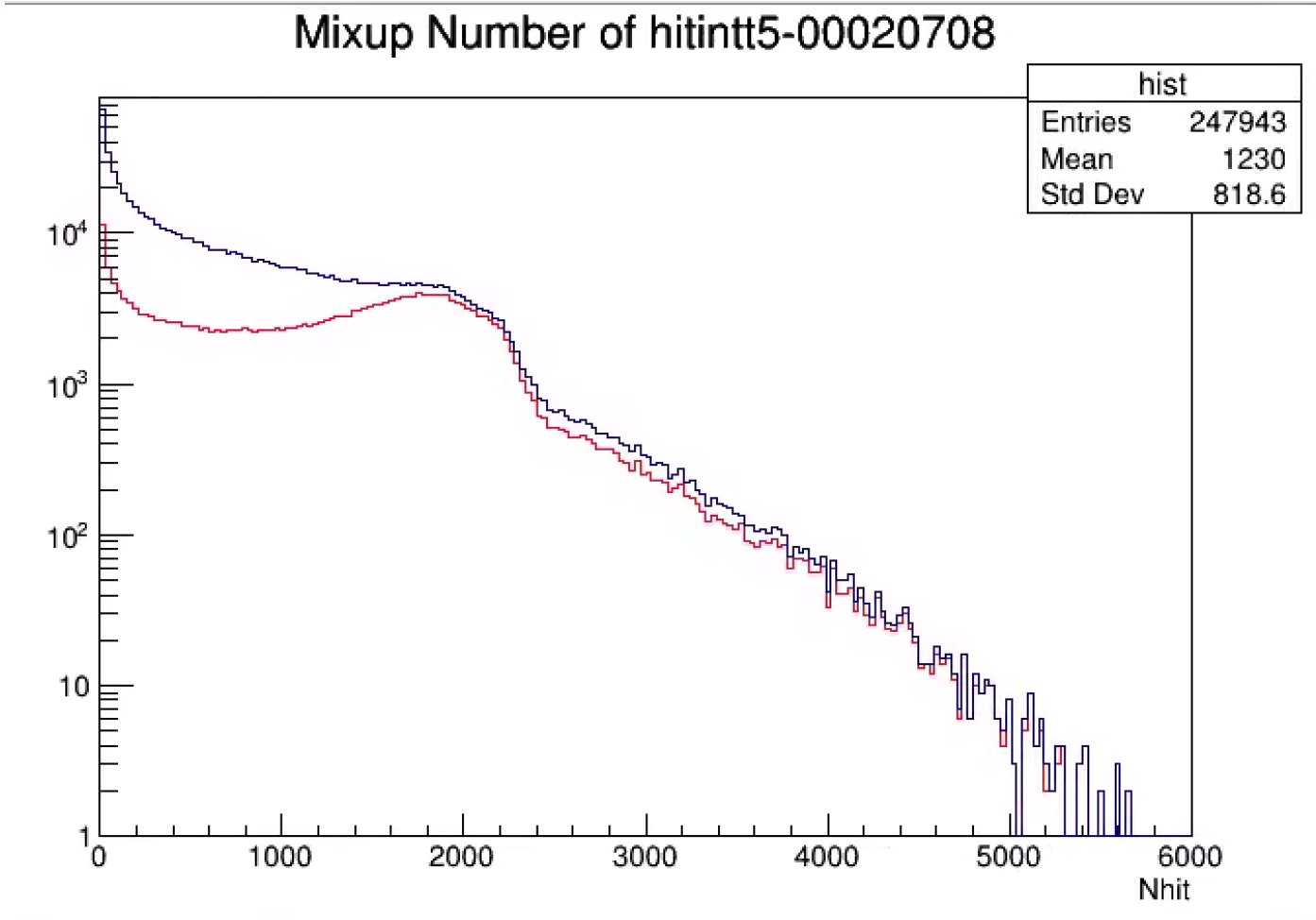




Run20708 Mixup

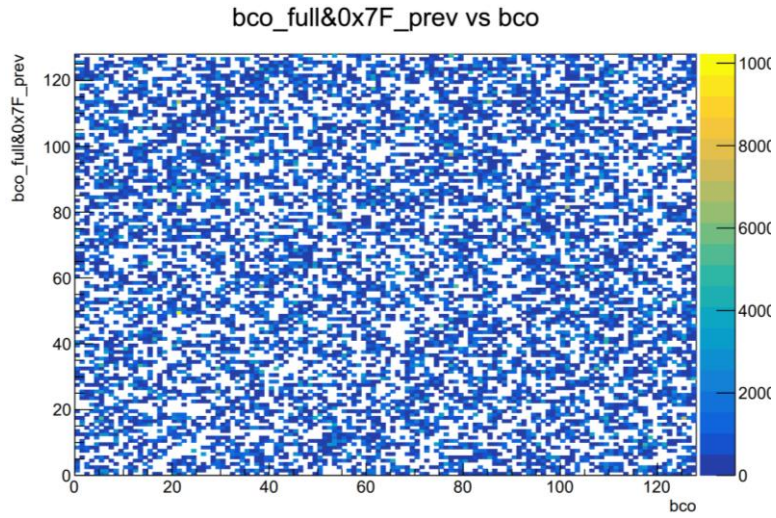
- Similar results were obtained on Run where another Mixup was occurring

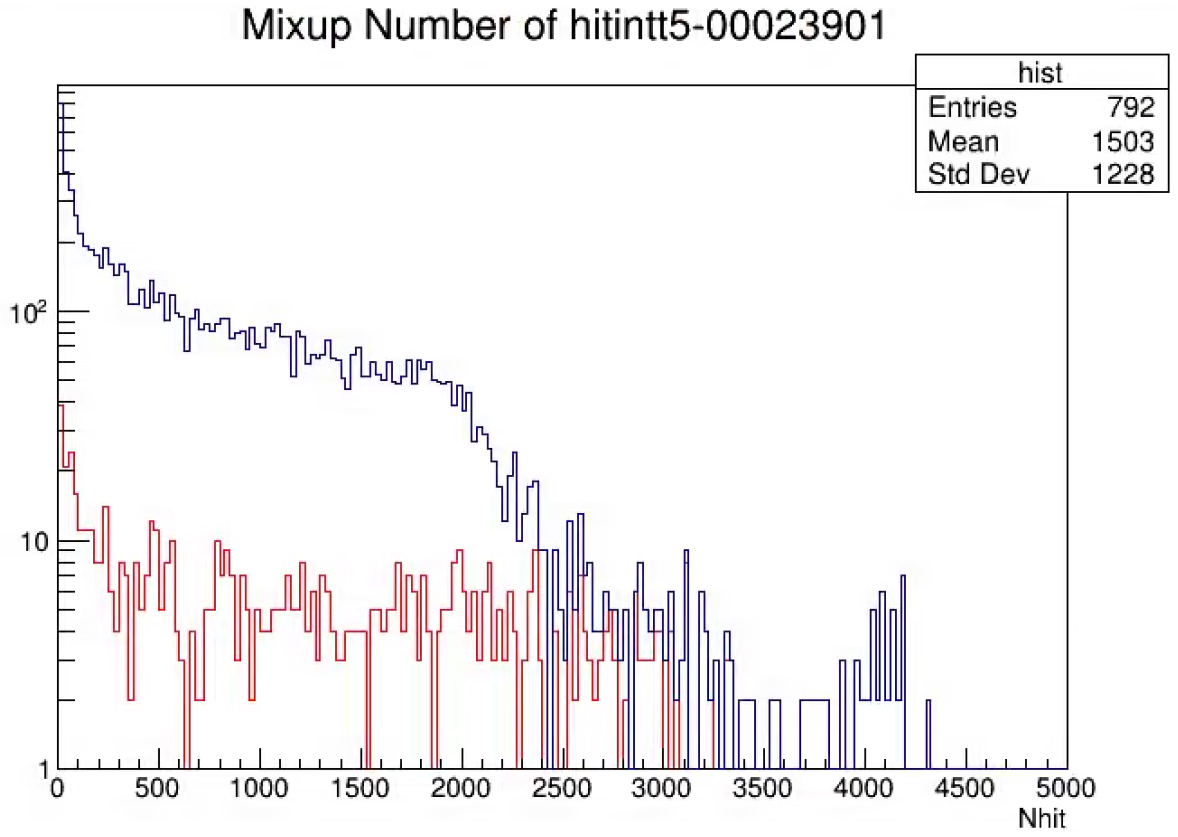




Run20901 Mixup?

- However, Run20901, which has fewer events than the Run on the previous page, appears to have mixup occurring, but it is difficult to see the line of correlation.
- The results of this Run did not show a clear multiplicity dependence, probably due to the small number of mixups.





Summary

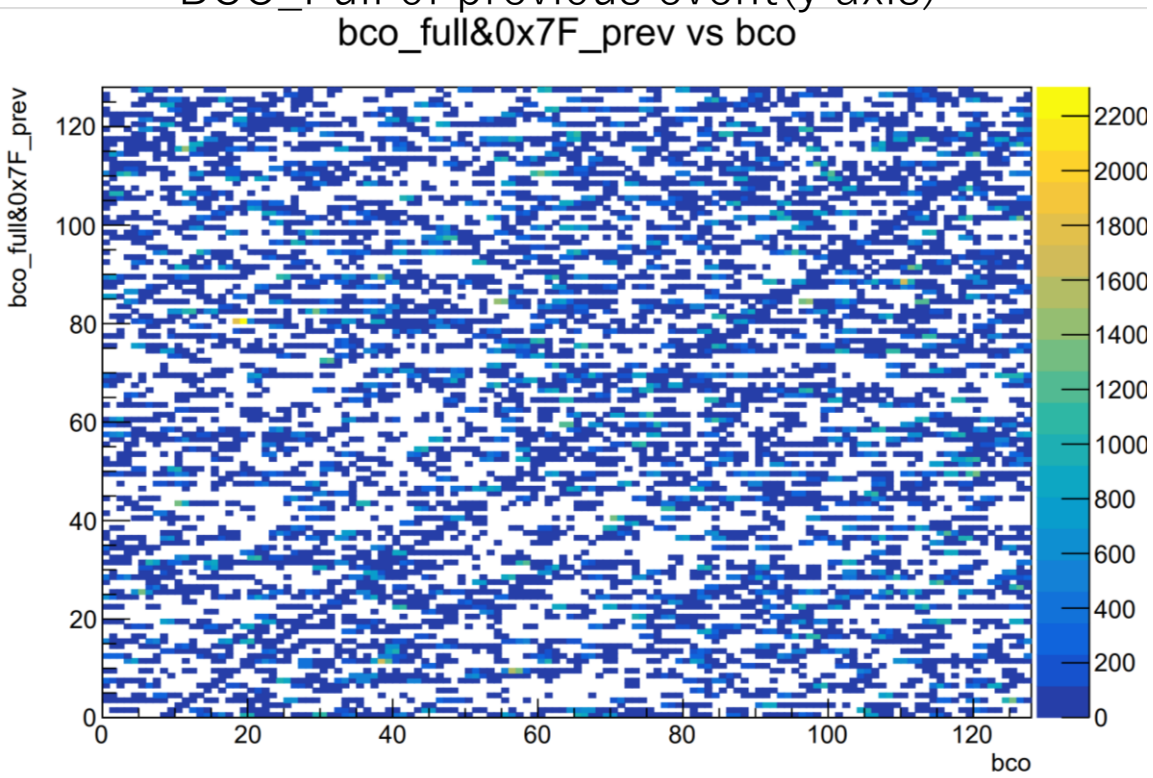
- Mixup has Multiplicity dependence , but not sure on Run with low number of events.

- With the clone hits removed, re-create the previously created BCO vs BCO_Full, 2D histogram cluster count correlations, etc. and examine the mixup.
- Quantify using correlation coefficients to see if there is a correlation.
- I will summarize what we have done so far and report back to Raoul on the event mixup issue.

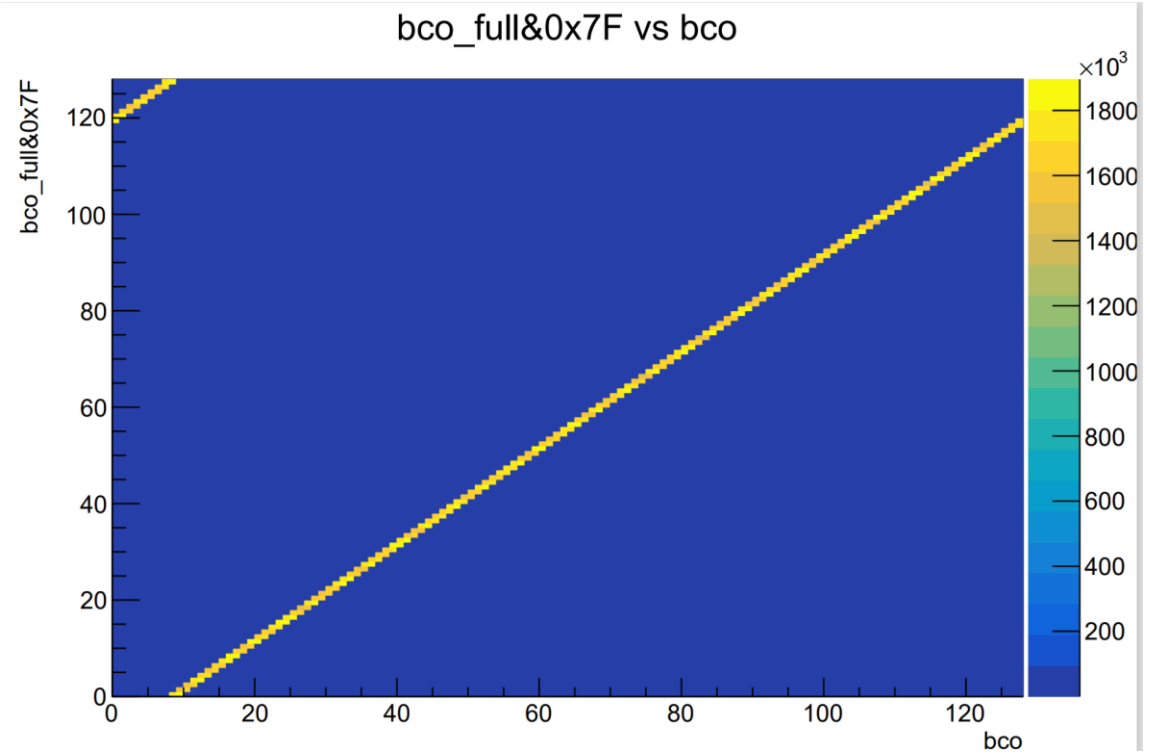
Back up

Run#20444(06/29) intt5 n_collision=127 Modebit=79 60min

BCO of one event (x axis)
vs
BCO_Full of previous event(y axis)



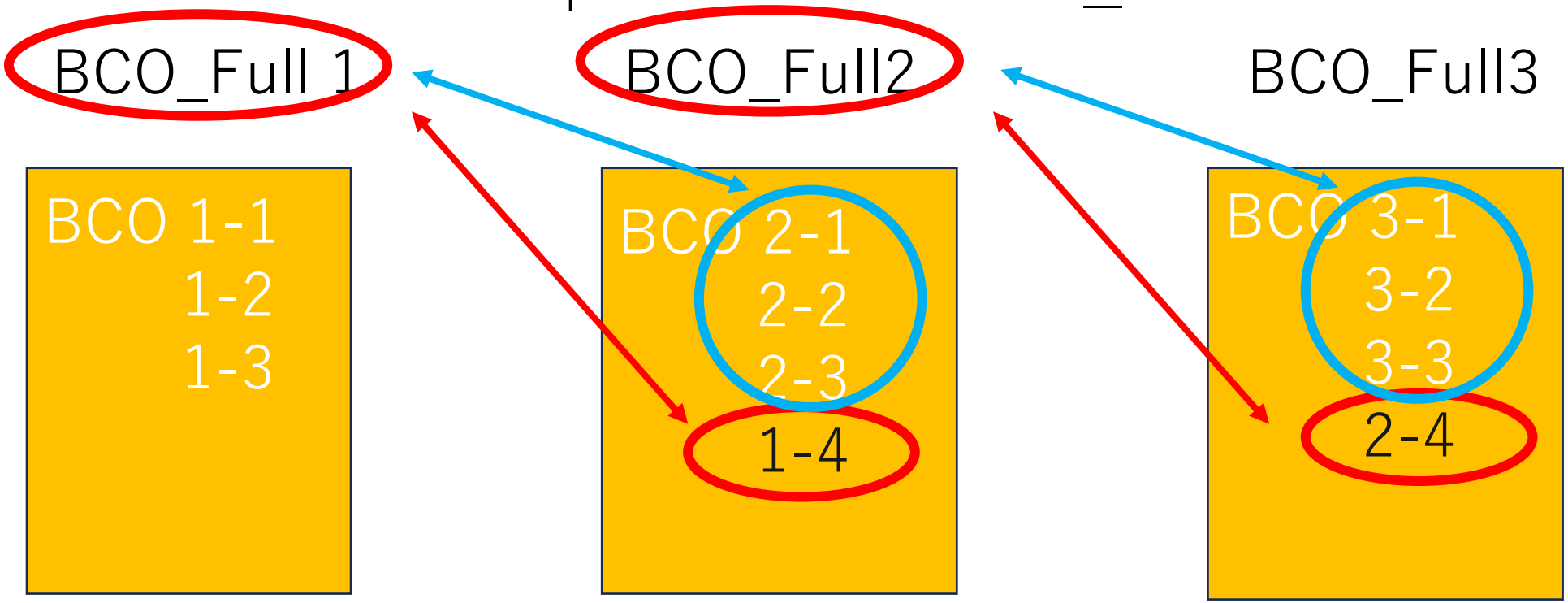
BCO vs BCO_Full of same event



Correlation is seen in the left figure at the same location as the right figure.
→ Pileup is occurring.

Why did the correlation disappear?

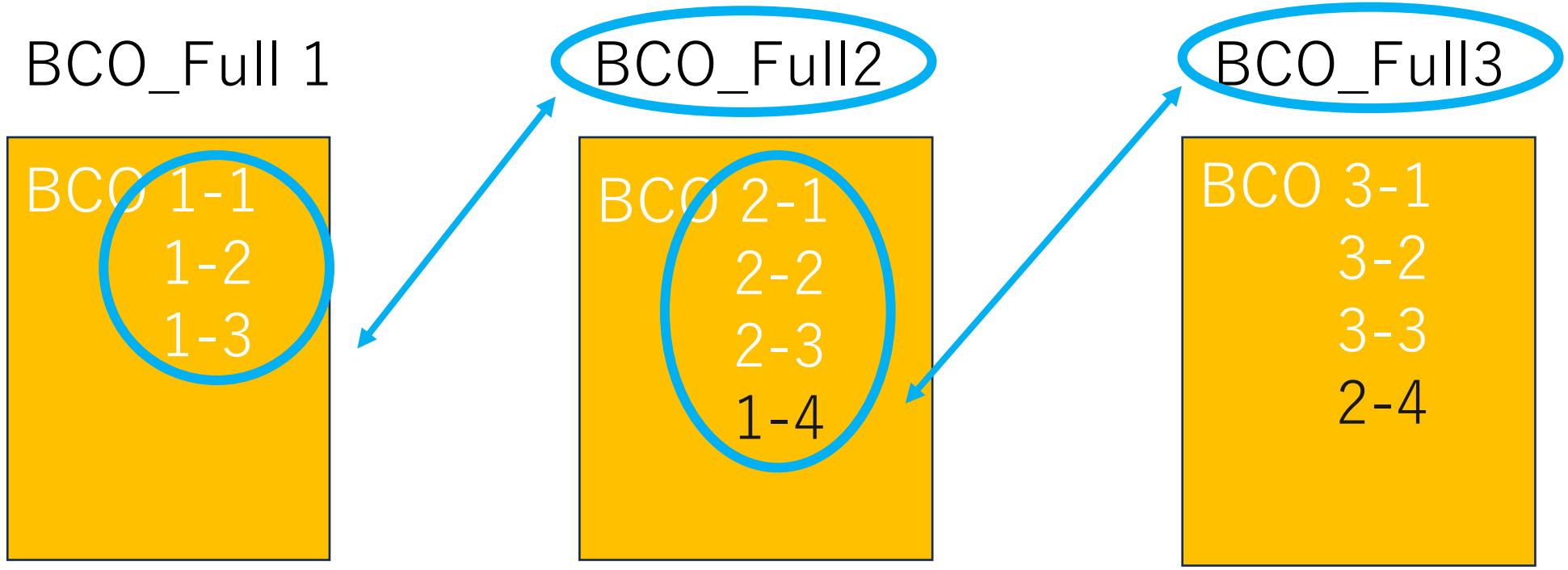
BCO vs prev event BCO_Full



The red circled areas are correlated because the information is from the same collision.

The blue circled area do not match, so there is no correlation.

Why did the correlation disappear?
BCO vs next event BCO_Full



There is no longer any combination of data for the same collision and there is no correlation because the labels do not match, as shown in the blue circles.