Timing Scan Status (towards preliminary approval)

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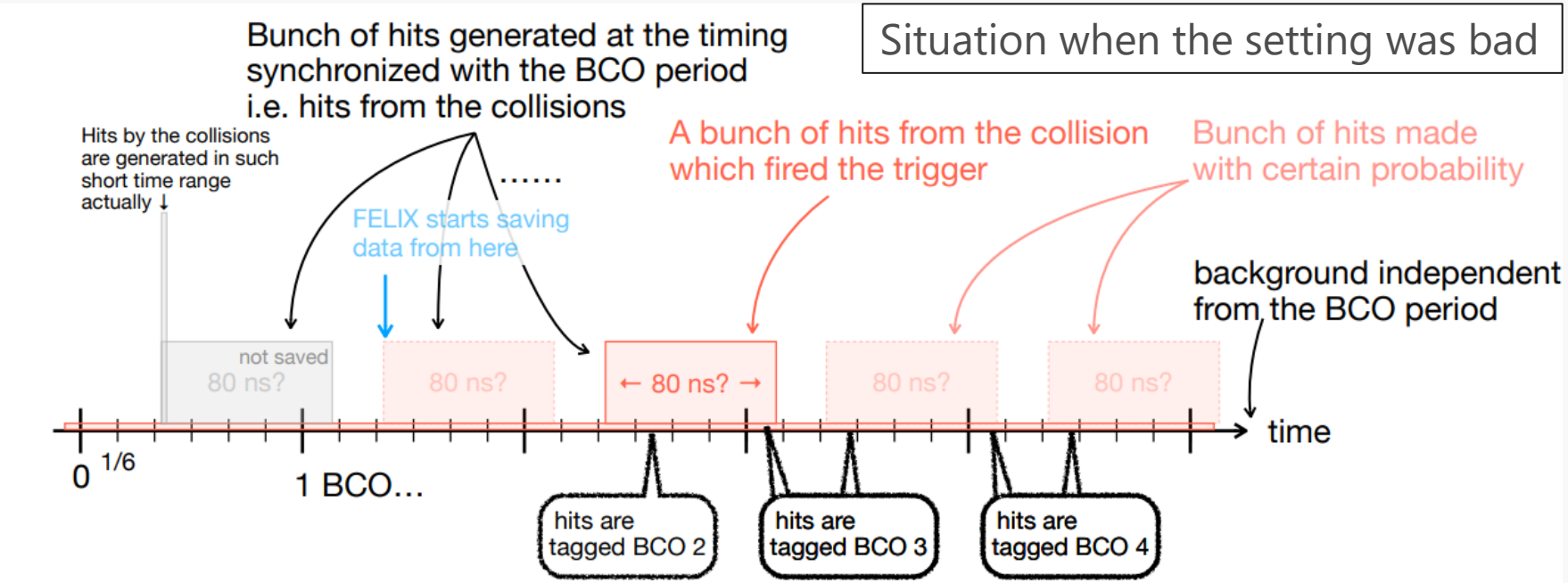
Context

- I would like to give a poster presentation in the RHIC/AGS Annual Users' Meeting.
- The candidate topic is the timing scan of INTT in p+p collision, which Genki inspected partially in July 2024. https://indico.bnl.gov/event/24122/

- I took over the analysis and need an approval of preliminary plots.
- Analysis note is not ready …
- For today, I will share the status and show some new plots
- Feedbacks are welcome!

Delay Parameters

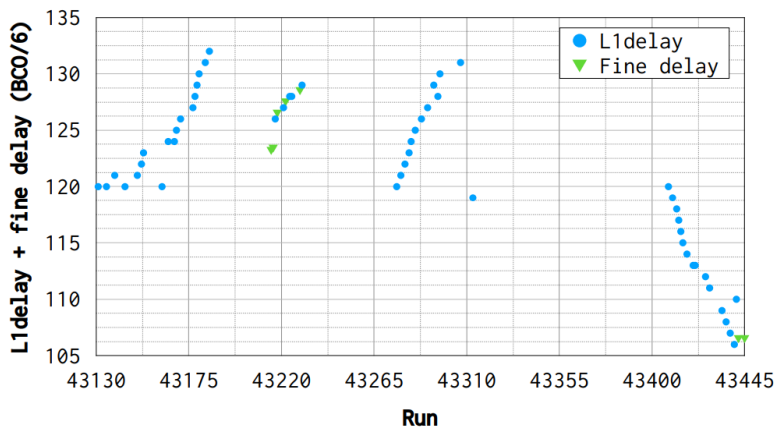
- Delay can be applied through the L1 delay parameter (and other(s)).
- L1 delay shifts the (INTTs' ?) timing by a unit of 1/6 BCO.
- Bad setting may cause problems;
  Hits from a single collision can be associated to multiple BCOs.



Introduction slide by Genki

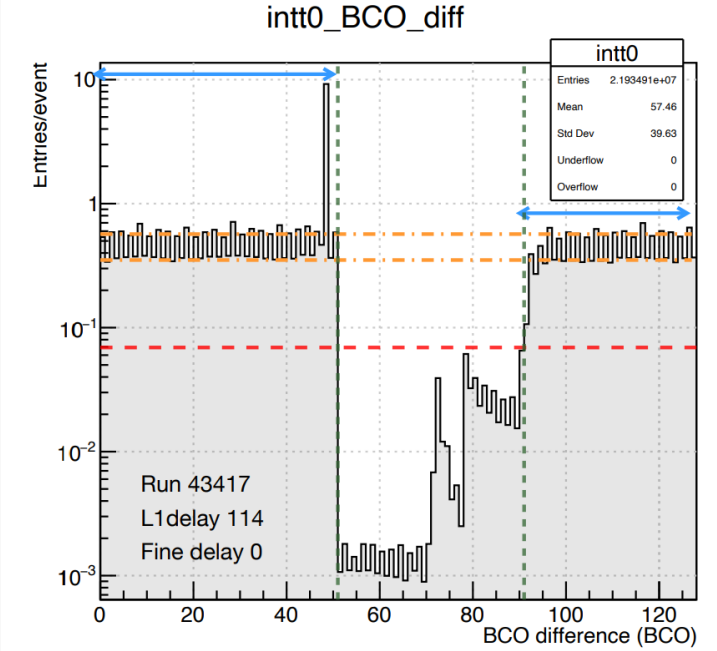
Timing Scan

- For the search of the best condition, INTT group conducted a parameter scan last year.

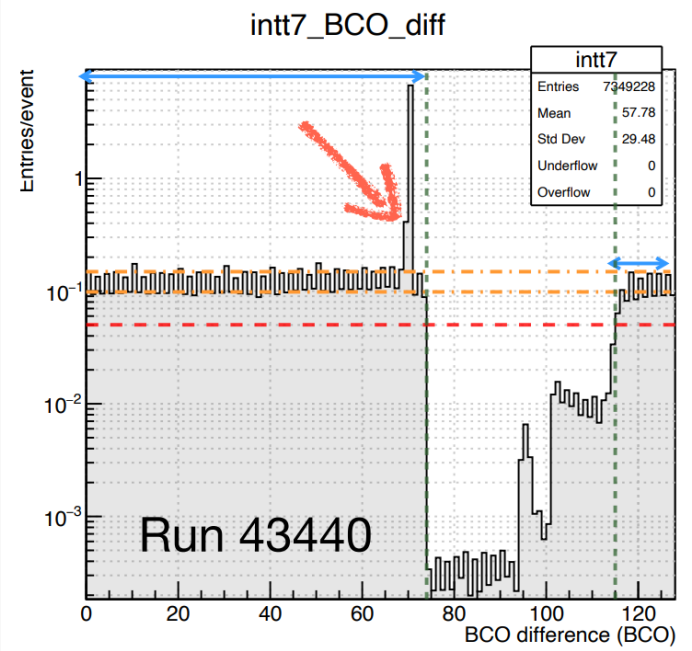


[Introduction slide by Genki]

Good case



Bad case

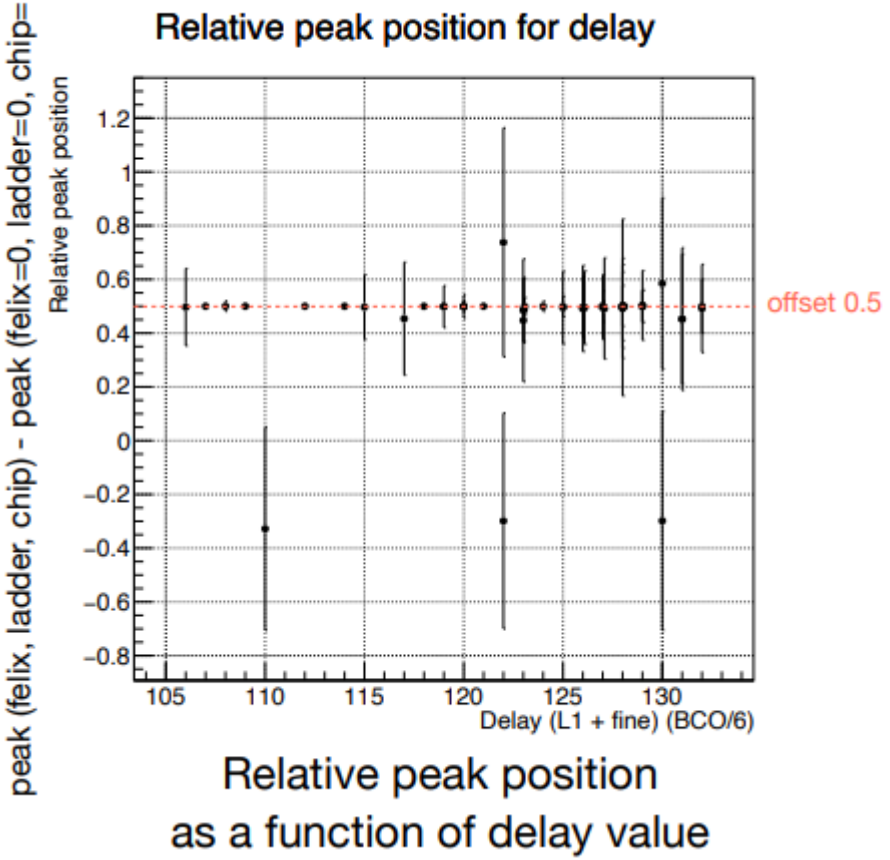


Lower 7 bits of GTM BCO - FPHX BCO (BCO = 106 ns)

[Analysis slide by Genki]

What is known? What is left?

- **Genki confirmed that**
  - Peak positions (relative to the rising edge) are nicely aligned among all chips.



Relative peak position
as a function of delay value

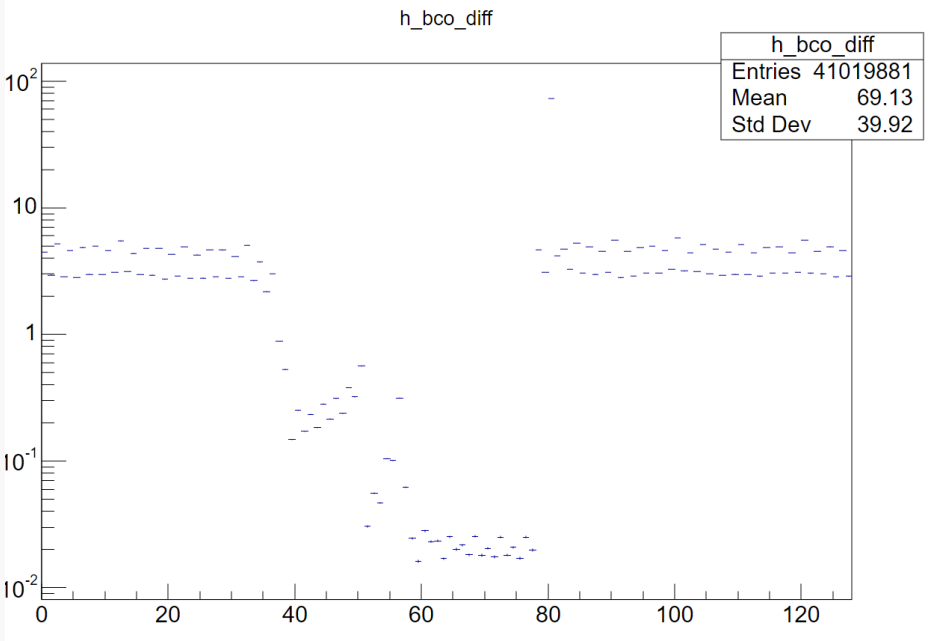
- **How good was each parameter setting?**
  → My work

Goal: <u>to define how good the settings were</u>,
and <u>to pin down the “best” setting</u>

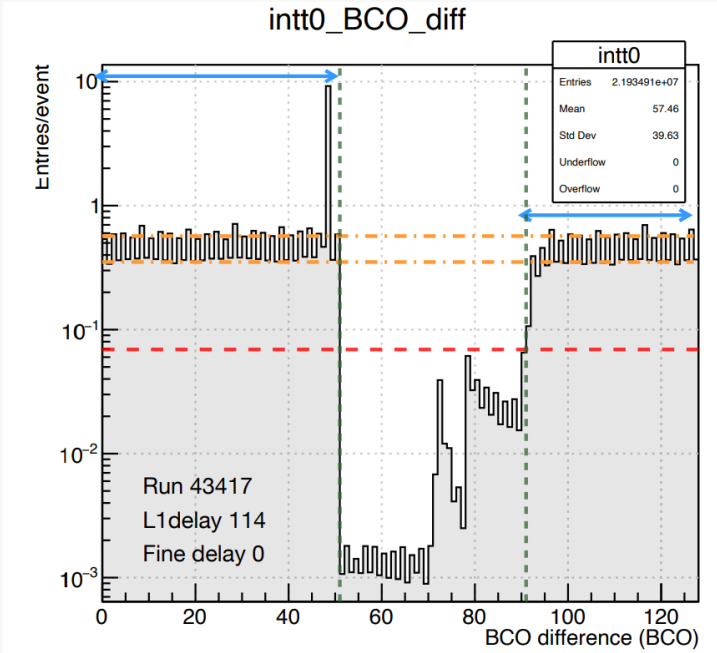
[Analysis slide by Genki]

My work

- BCO diff plots are reproduced.



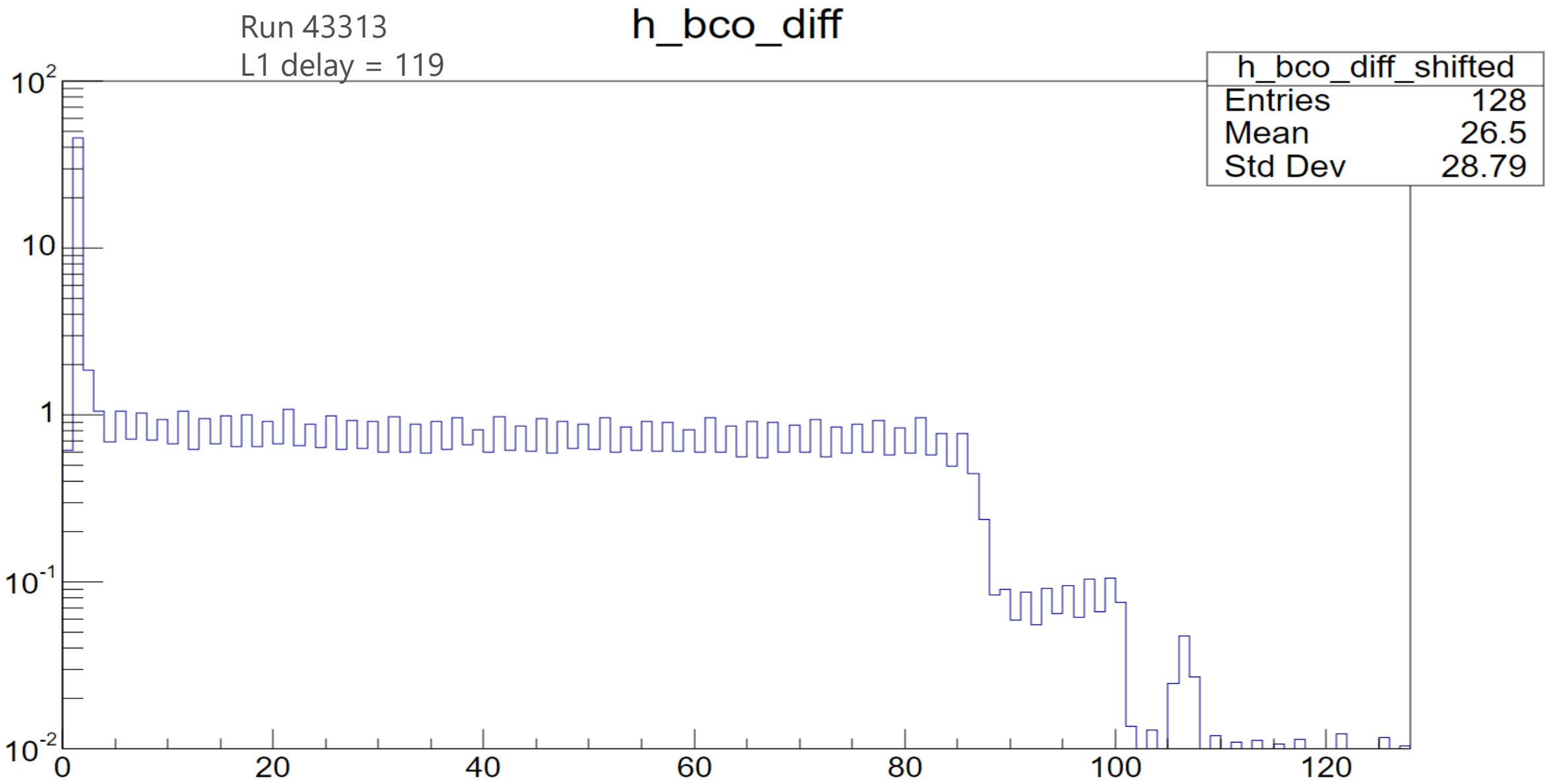
FPHX BCO – Lower 7 bits of GTM BCO



Lower 7 bits of GTM BCO - FPHX BCO

- The direction of x-axis is inversed.

You can tell by your eye, but …



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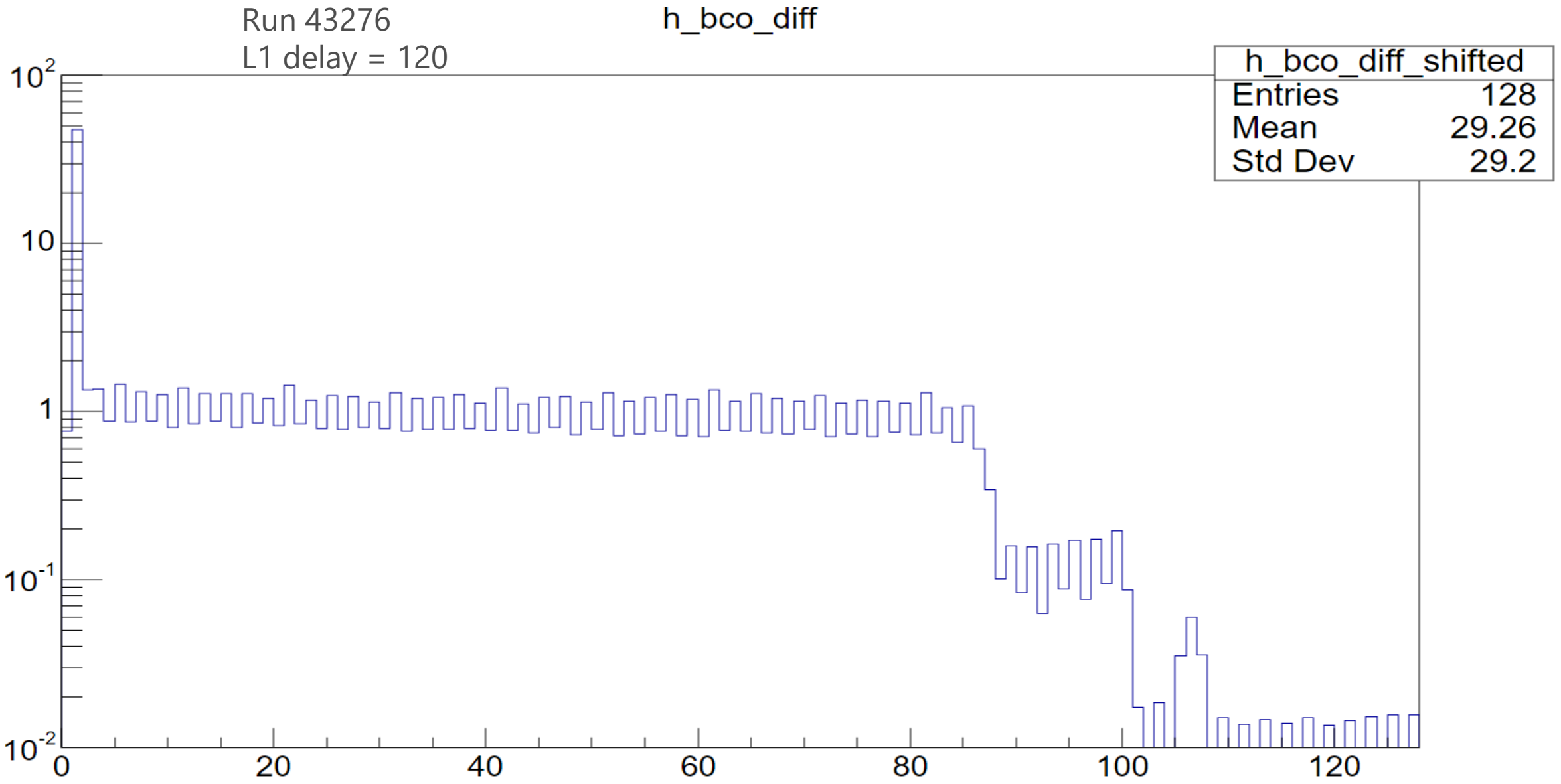

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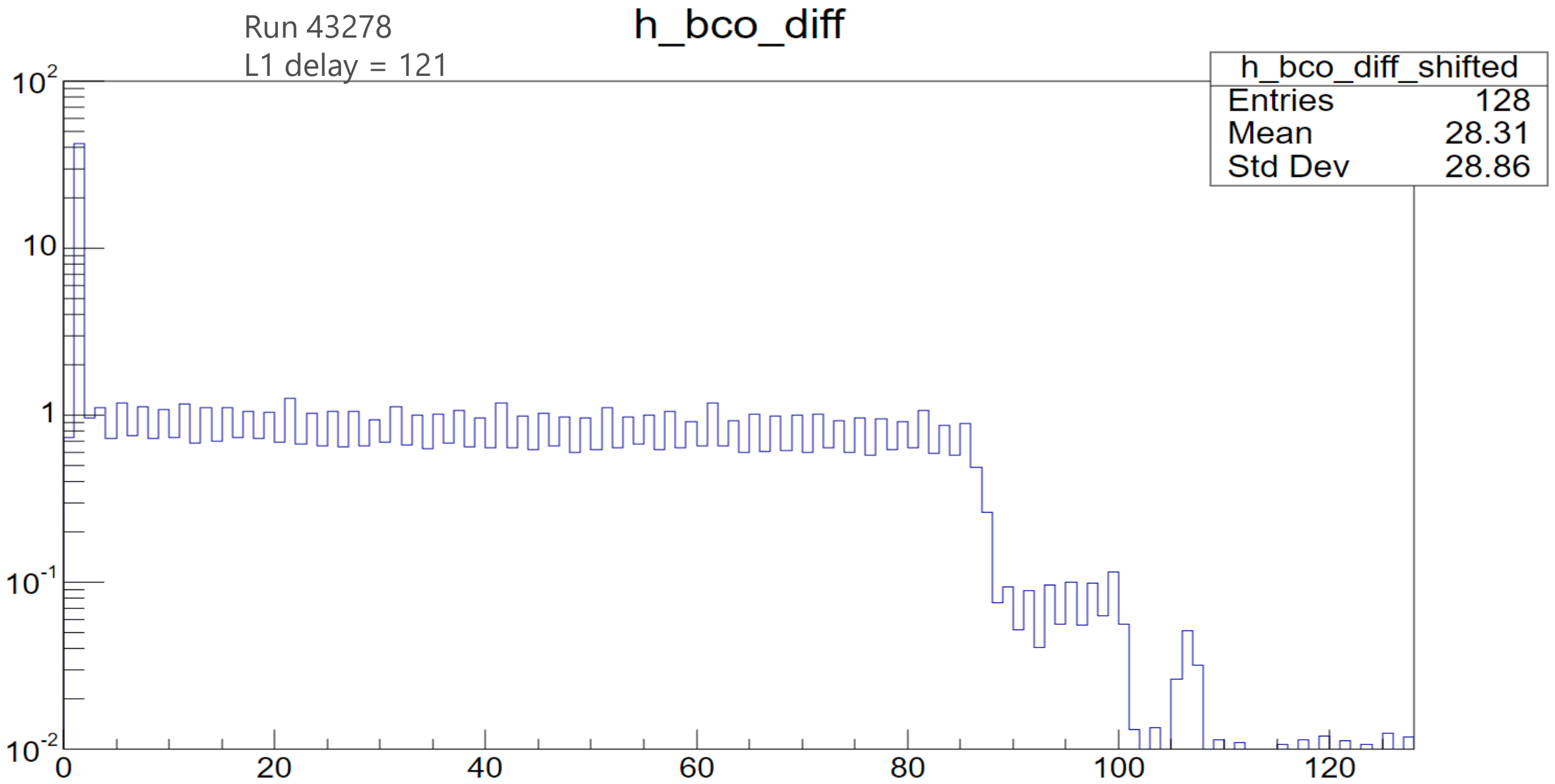

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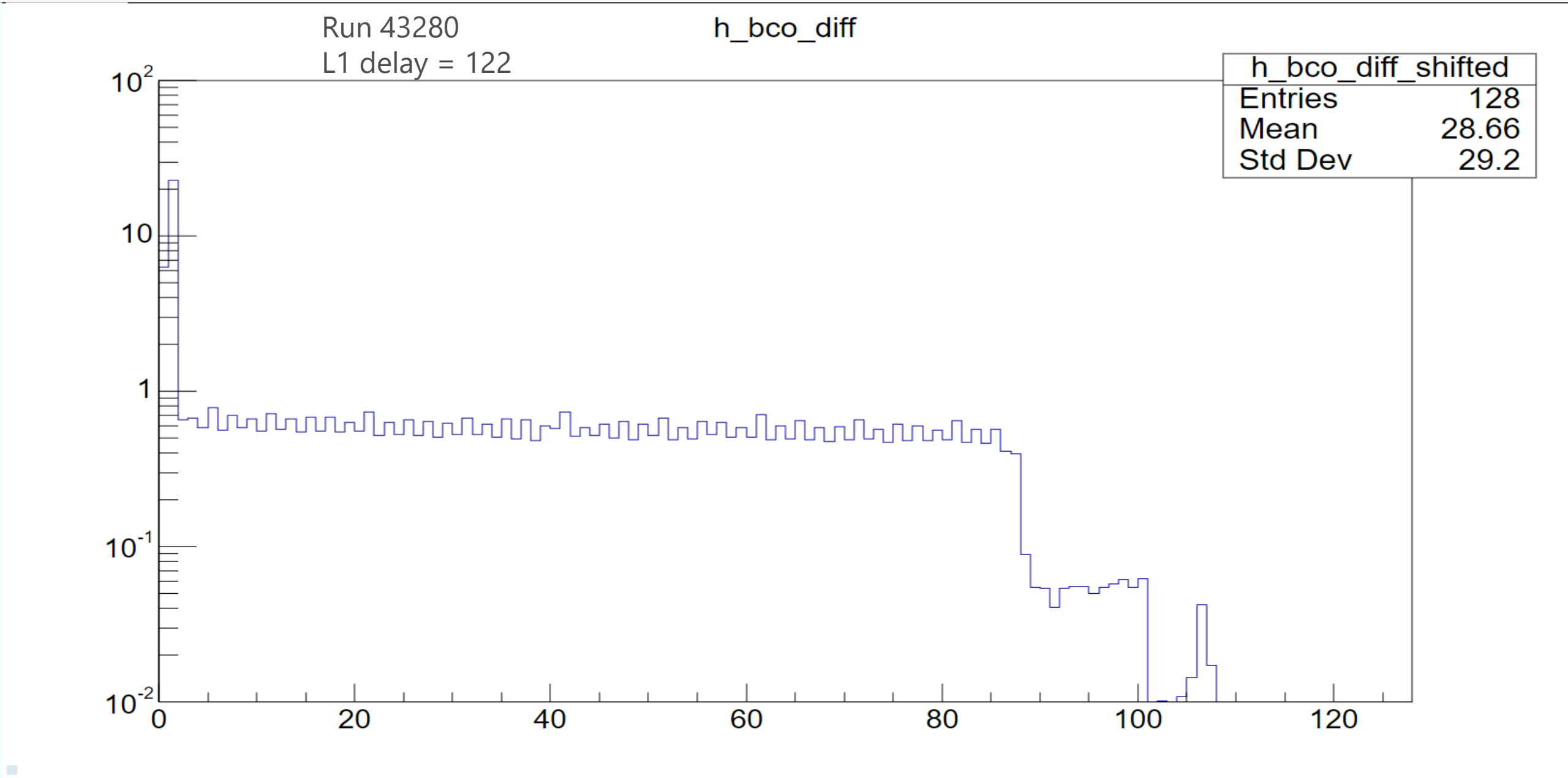

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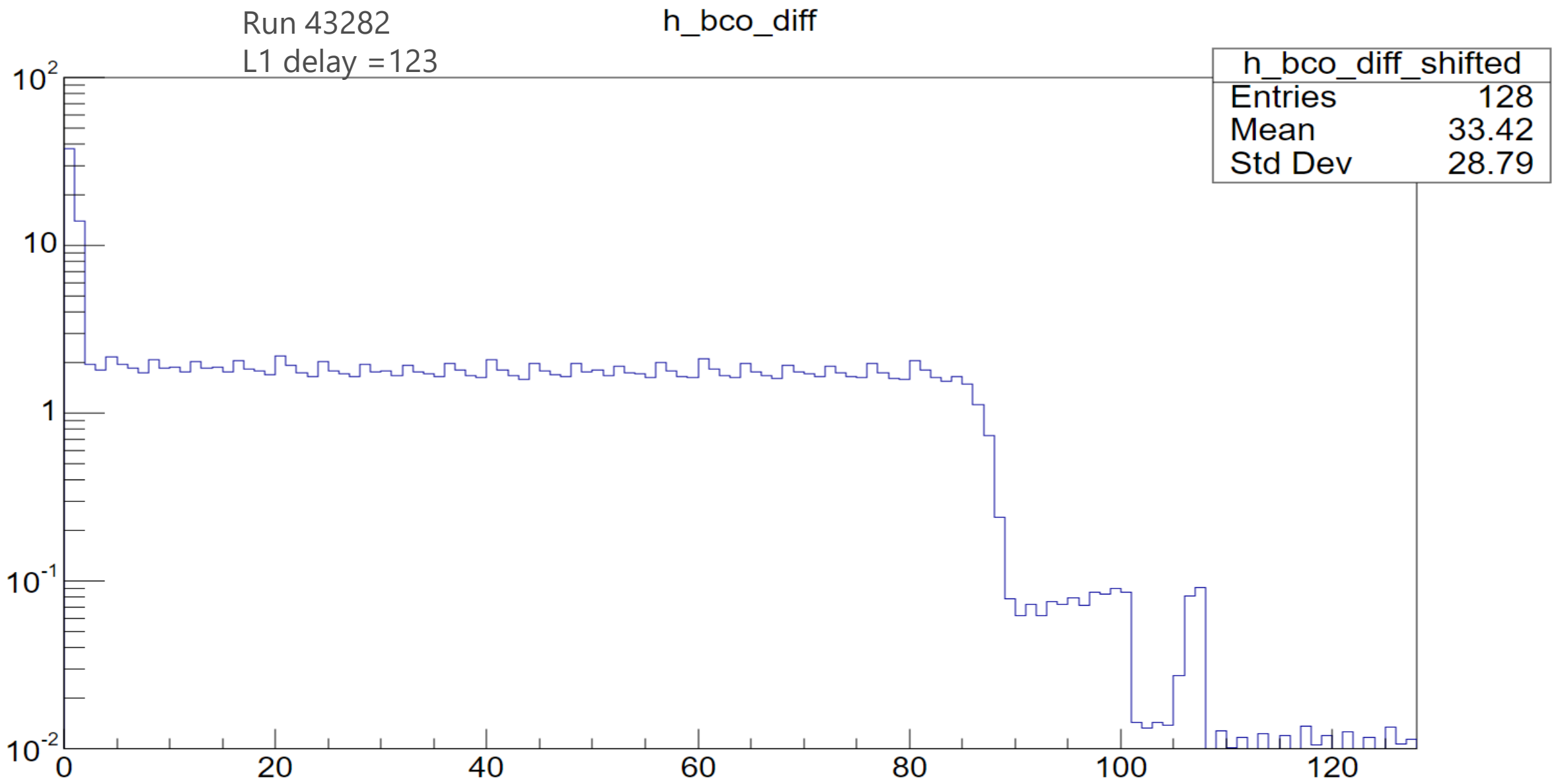

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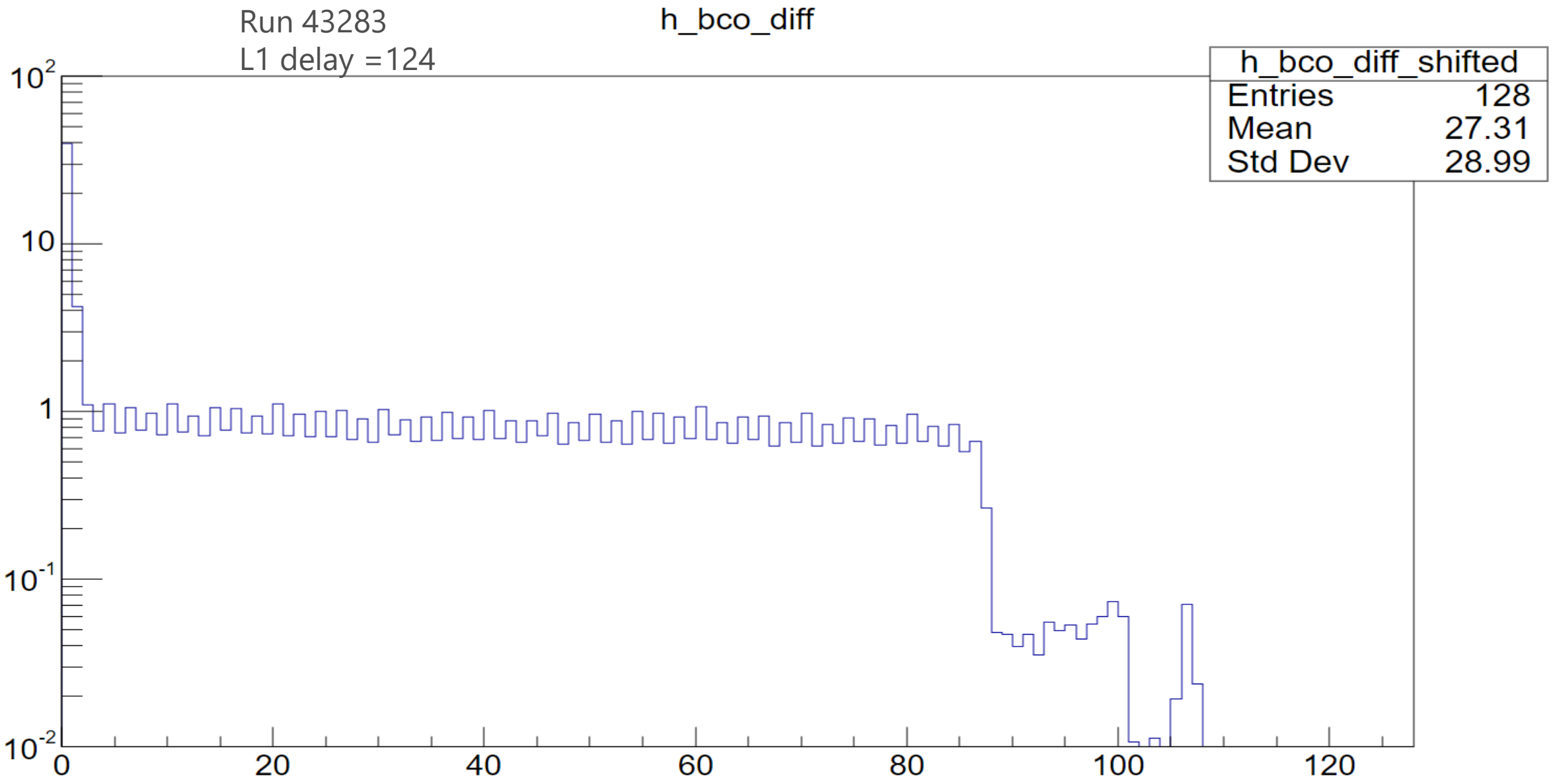

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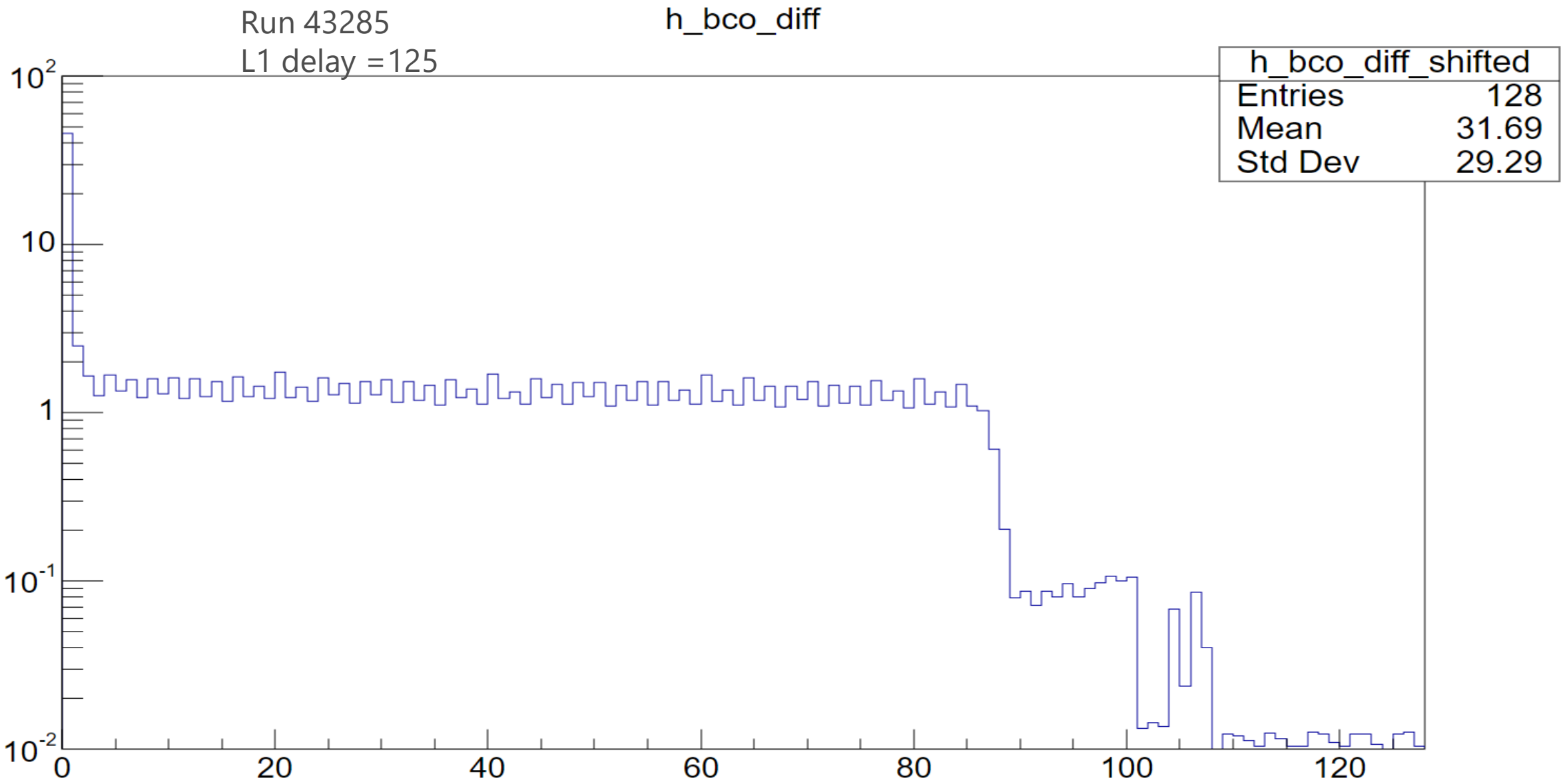

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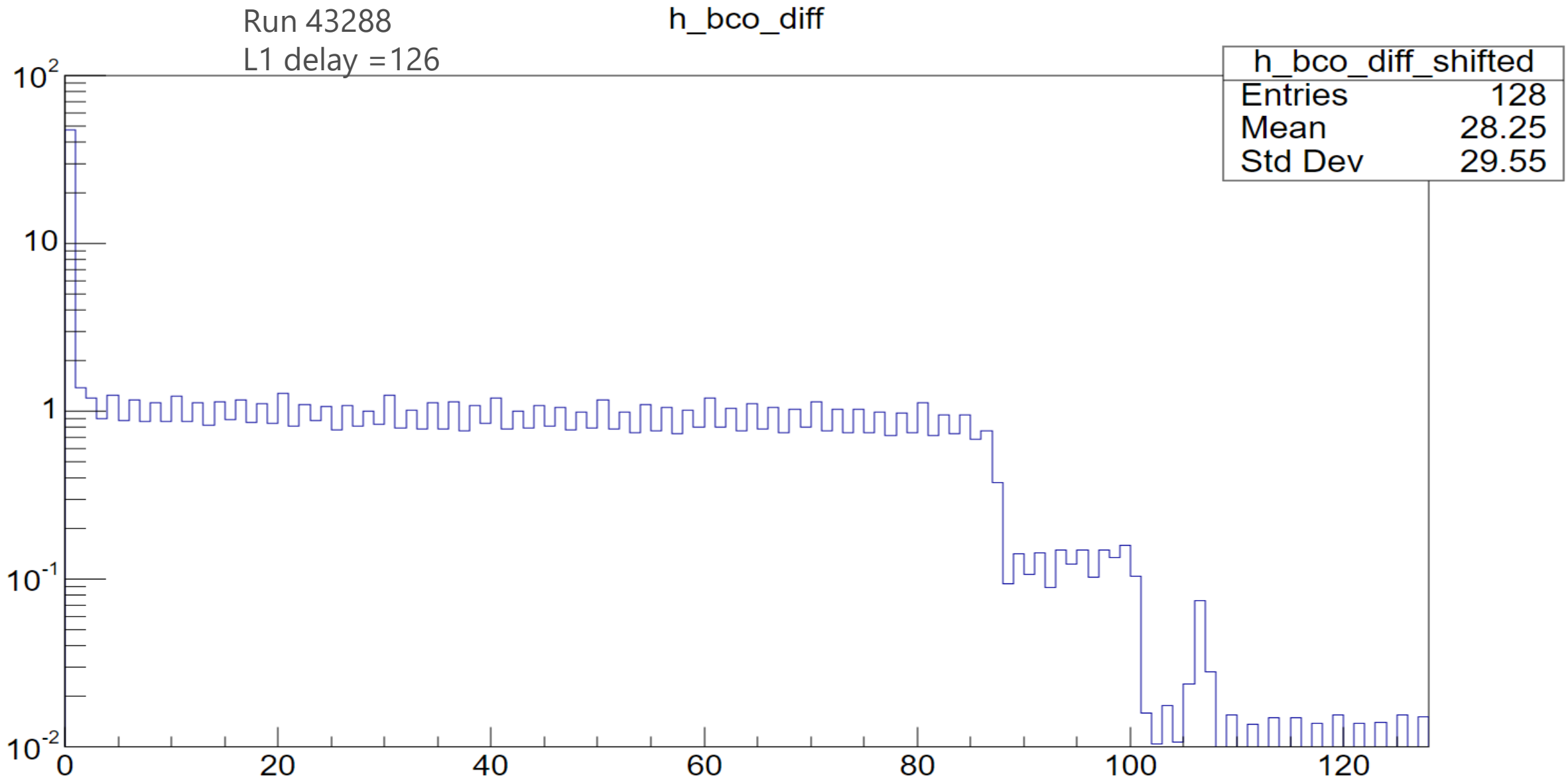

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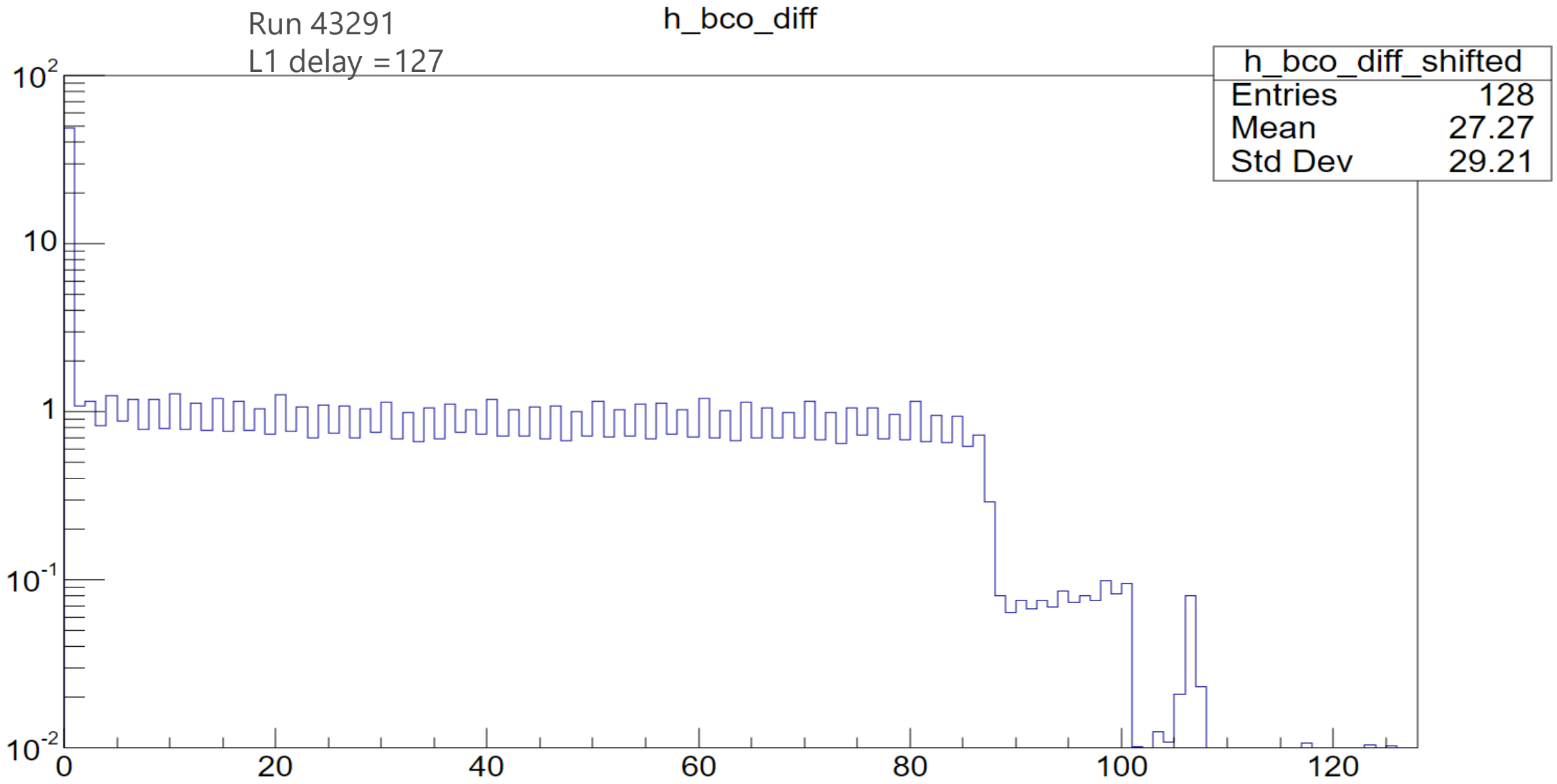
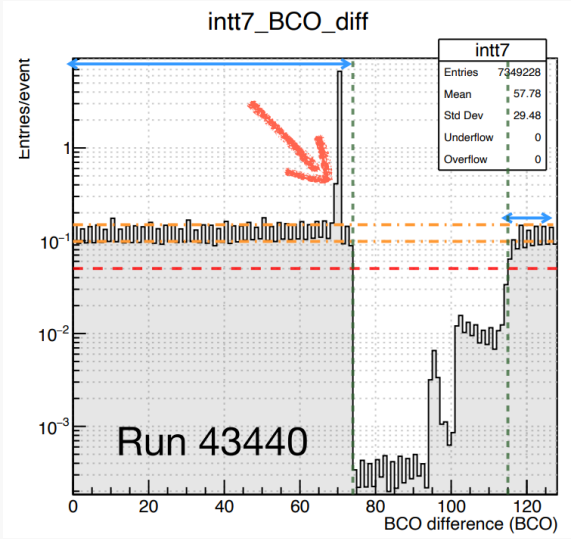


Methods to evaluate the “goodness”

- “Good” means the peak is sharp, or most of events are within a single bin.

Bad example



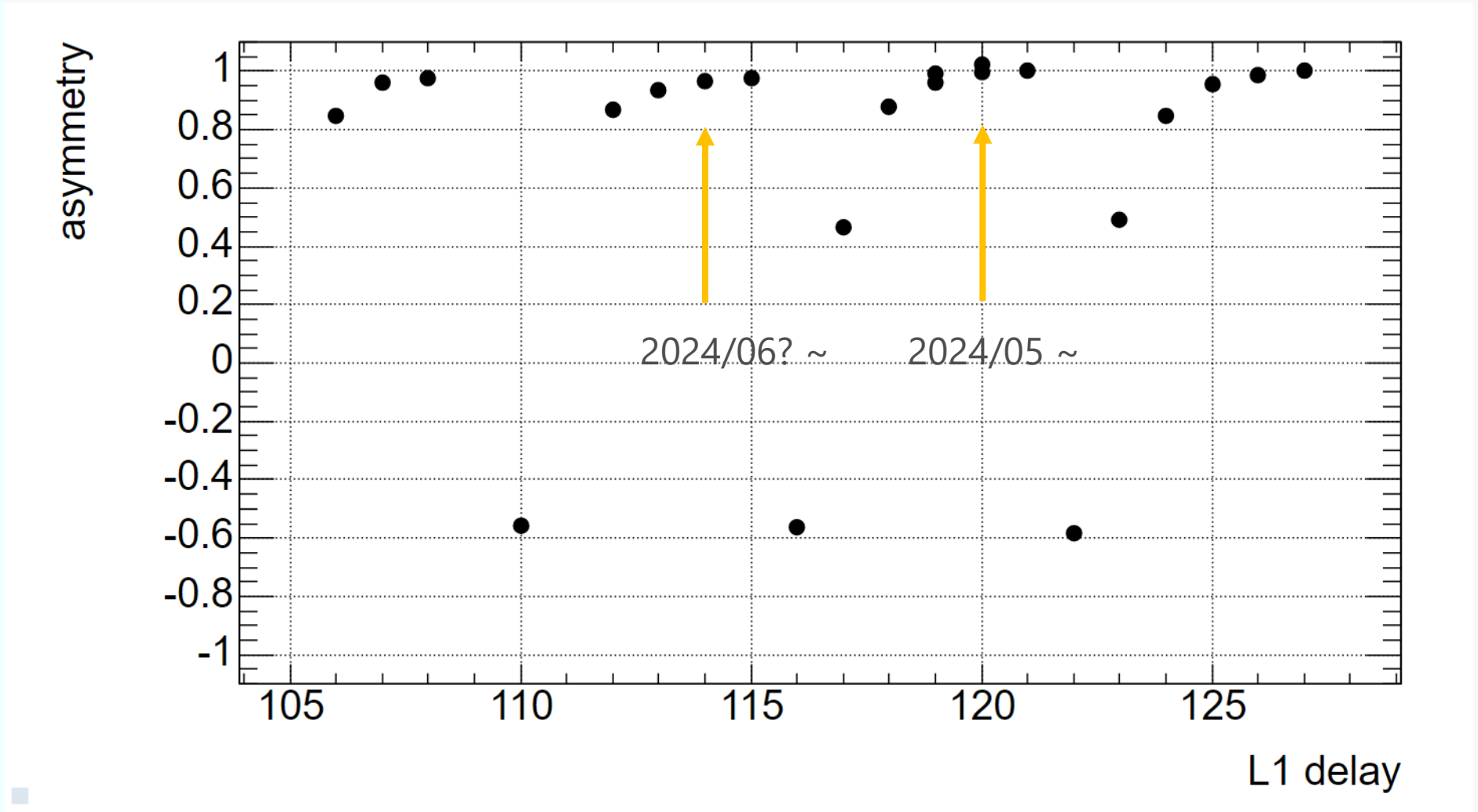
- I did the evaluation in 2 steps;
  ⓪ Subtract plateau height
  ① Choose 2 bins
  (the highest bin + a neighboring bin which is higher than the other neighboring bin)

  ② Calculate values that describe the <u>imbalance between the 2 bins</u>
  - Asymmetry: $(N_{1st} - N_{2nd})/(N_{1st} + N_{2nd})$
  - Ratio: N_{2nd}/N_{1st}

Results

- **Asymmetry:** $(N_{1st} - N_{2nd})/(N_{1st} + N_{2nd})$

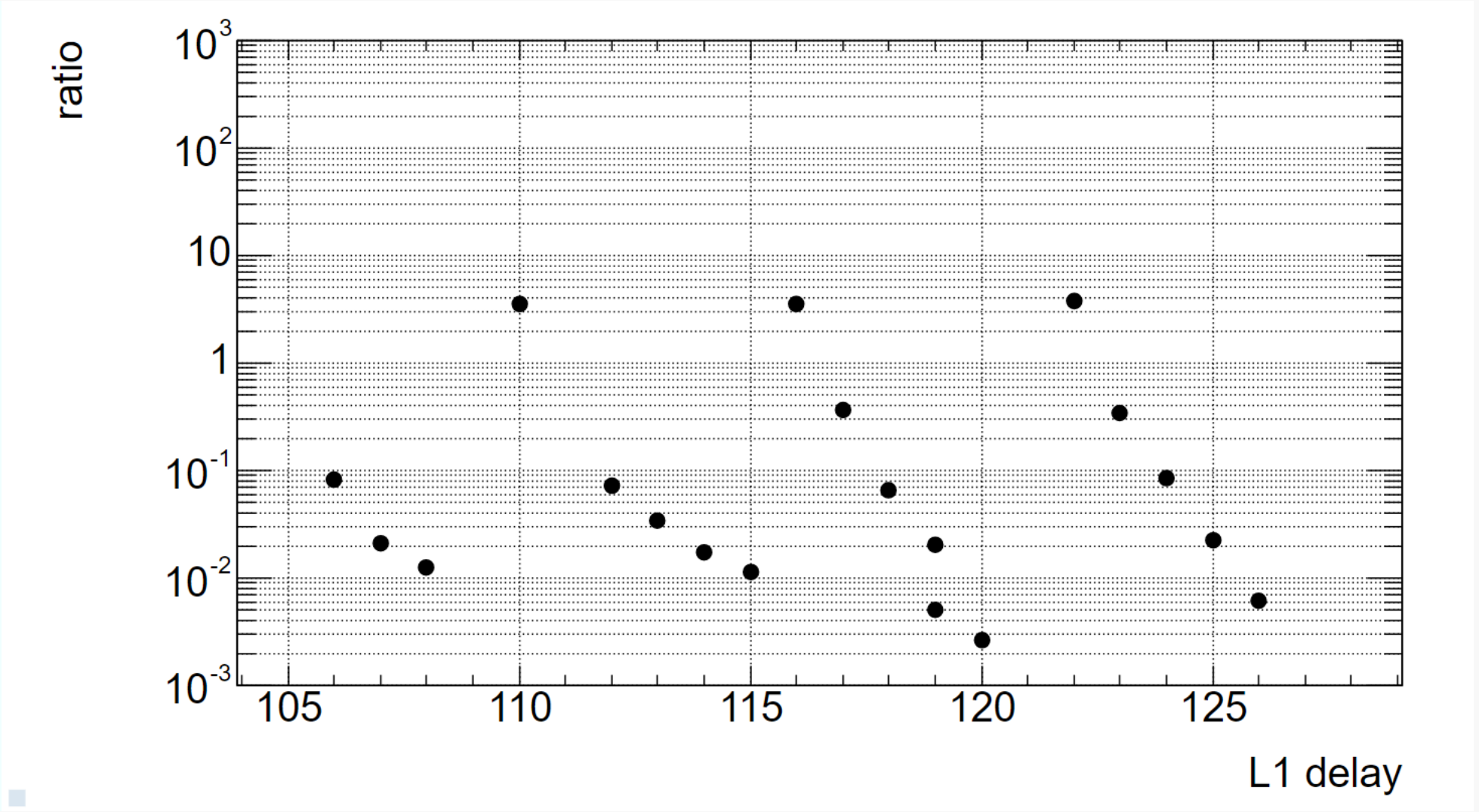
"goodness" = deviation from 0



Results

- **Ratio:** $N_{2\mathrm{nd}}/N_{1\mathrm{st}}$

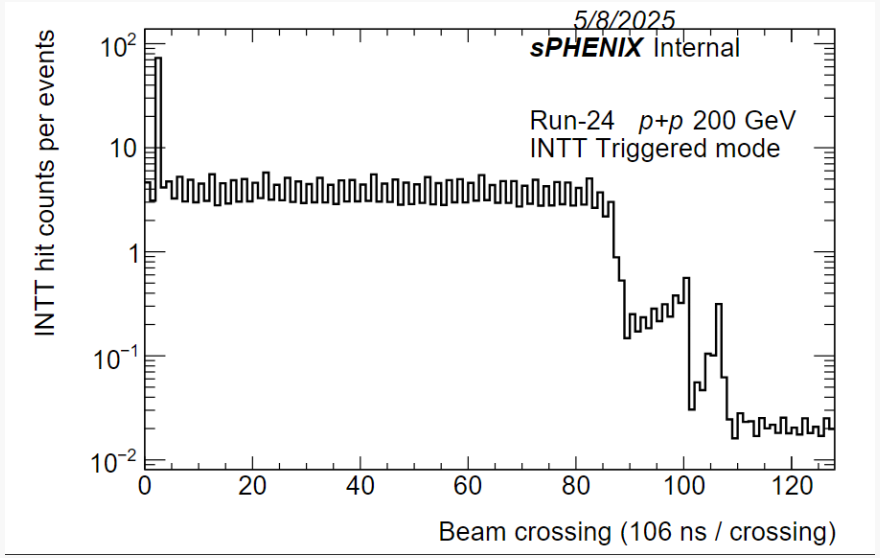
"goodness" = deviation from 1



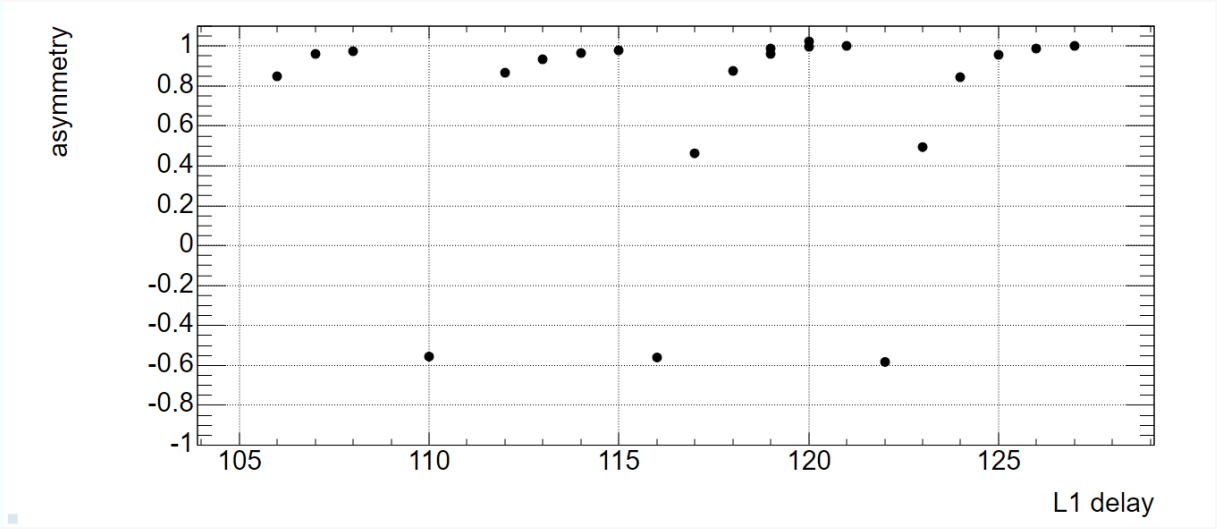
Message of the poster

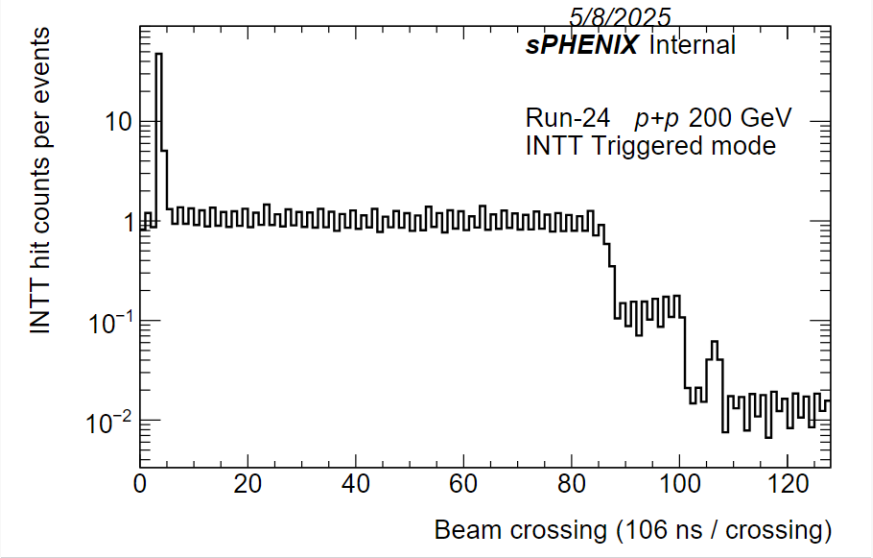
- Evaluated the “goodness”
- The setting of physics data taking were good.
-

Plots waiting for the preliminary approval



Run 43417, L1 delay = 114





Run 43440 , L1 delay =106

Combine into 1 canvas?
to emphasize the difference

Not yet finalized …

Plan

- Put error bars & prepare plateau-subtracted plots by tomorrow
- Write an analysis note
- Circulate it to INTT group on Friday
- Circulate it to sPHENIX by May 12
- Get preliminary in GM on May 15

- Poster presentation in RHIC/AGS

Backup

Analysis details

- DST file used: /sphenix/tg/tg01/commissioning/INTT/data/dst_files/2024/DST_beam_intt-{run}_no_hot_special.root
- DST node that was used: TRKRHitSet
  - To exclude hot channels

Plateau subtraction