Test beam 2024: purity of beam particle samples

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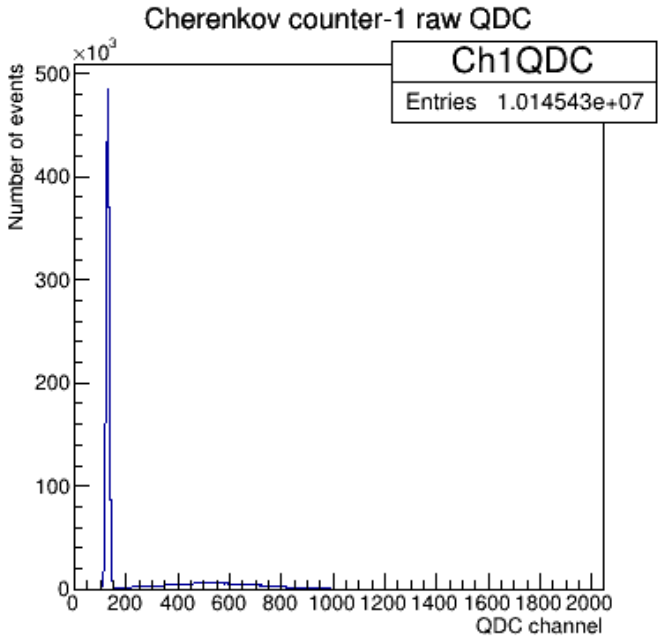
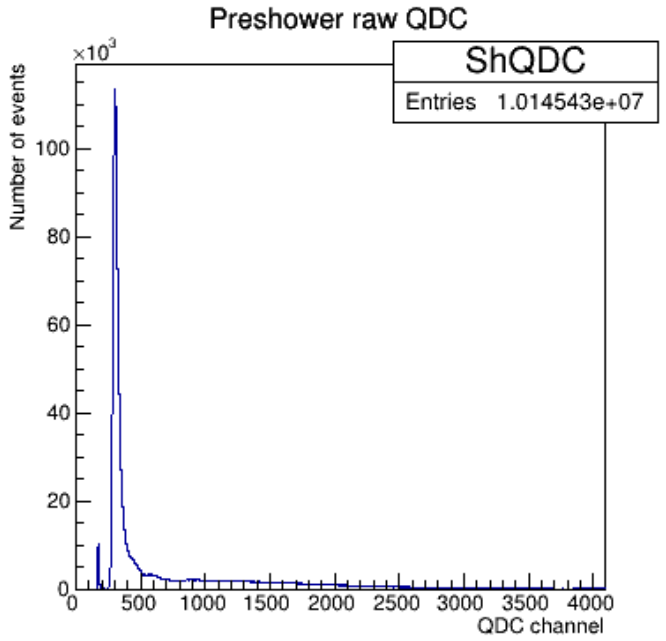
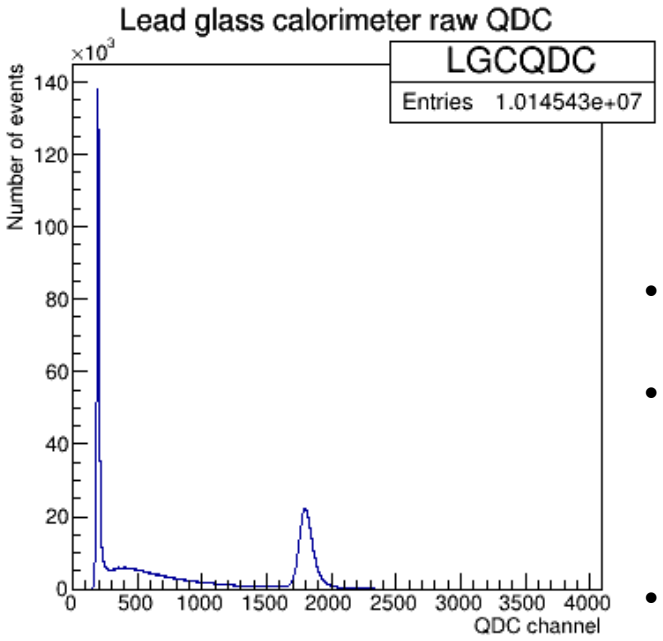
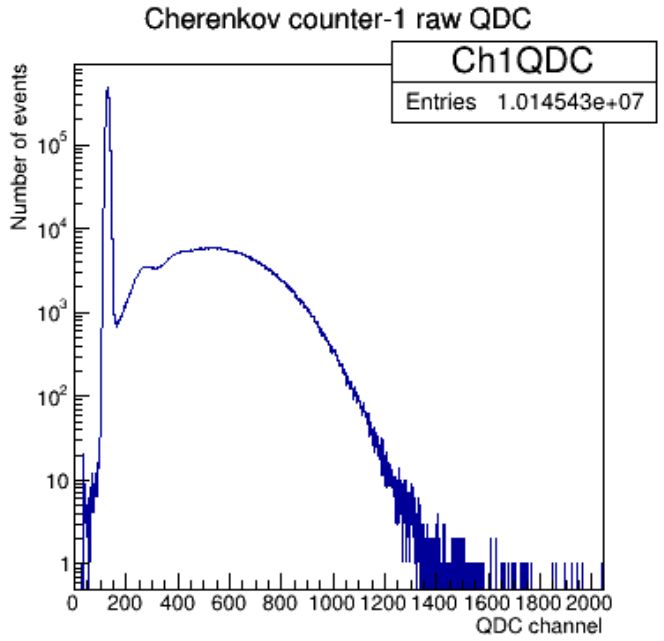
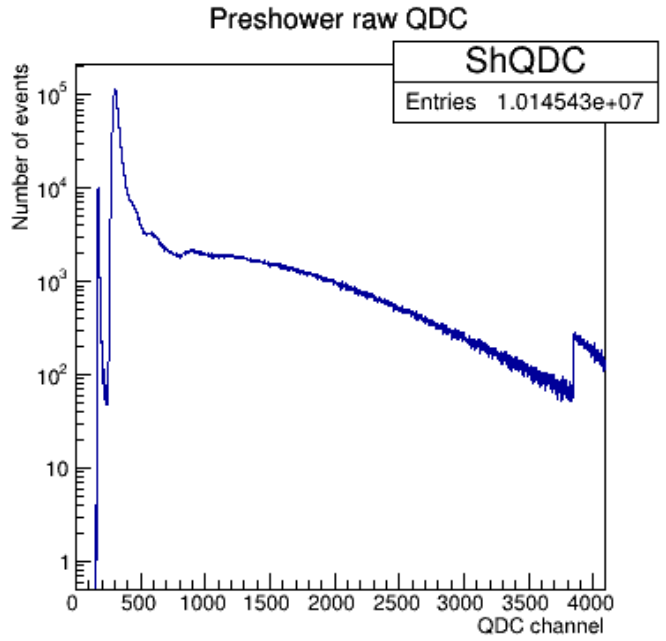
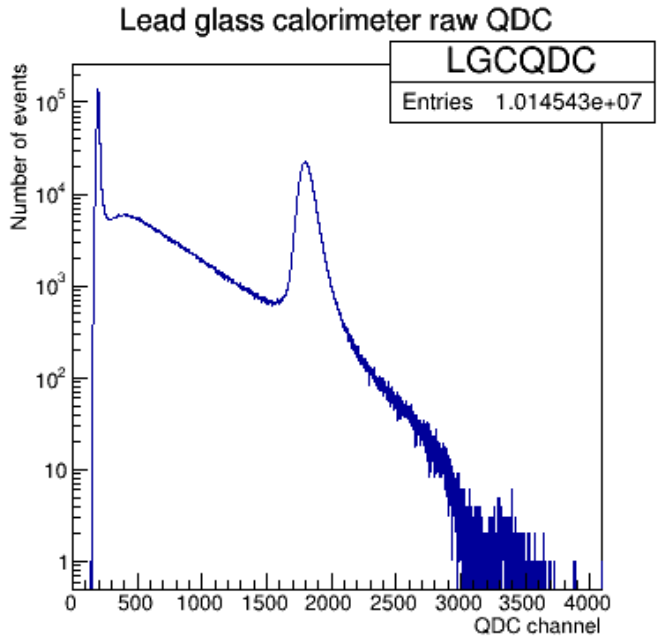




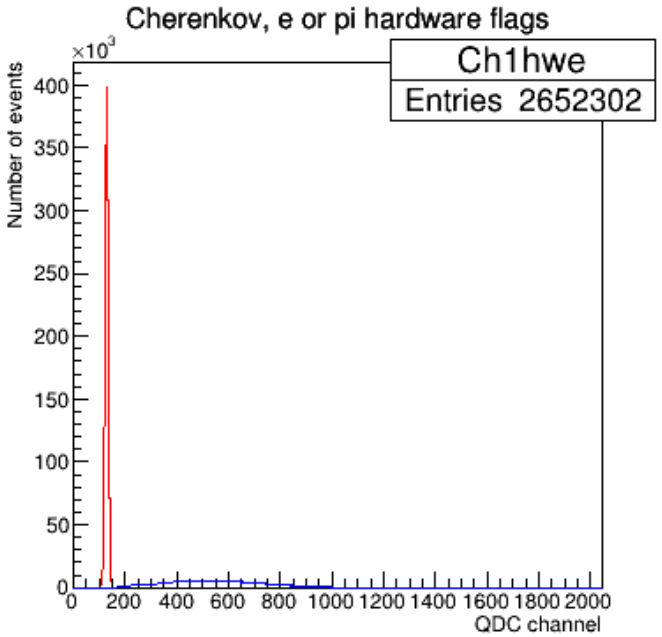


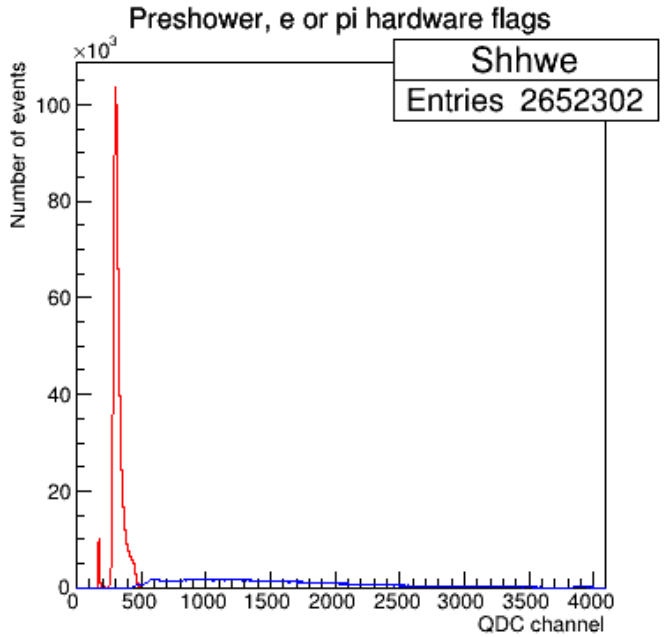


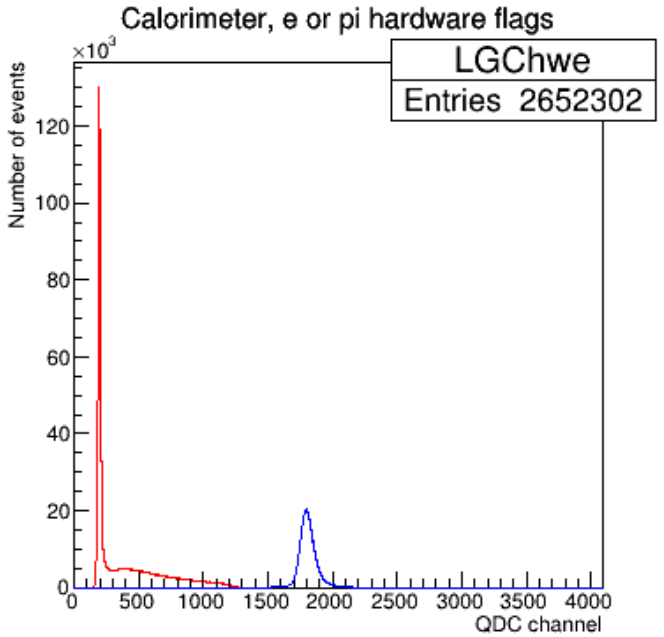


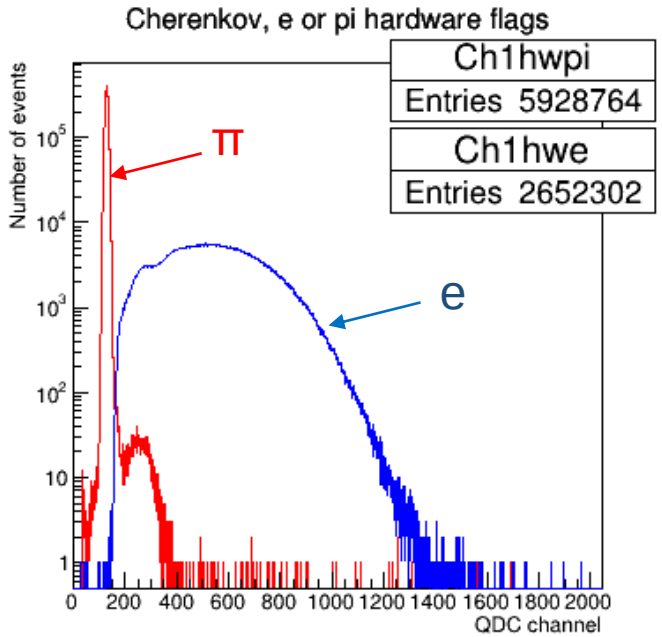


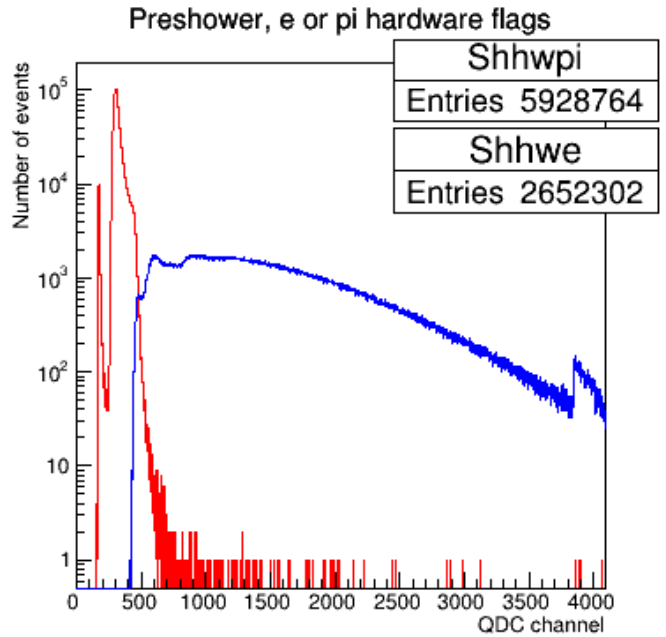
- Raw data, all triggers
- 71 runs, starting from “official” run period since 24 July
- Very large statistics: 10M events

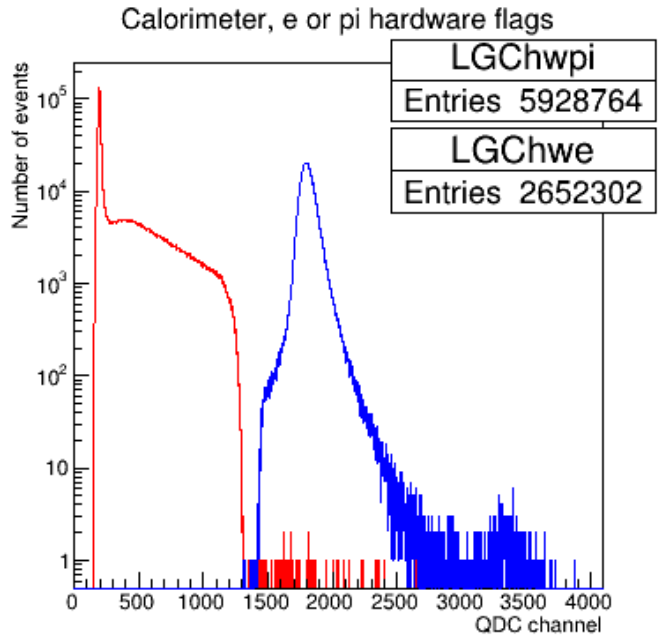




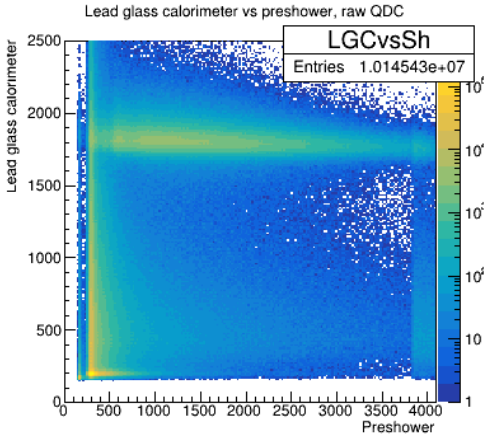


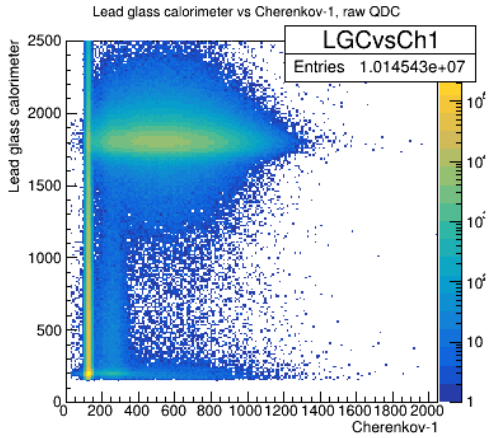


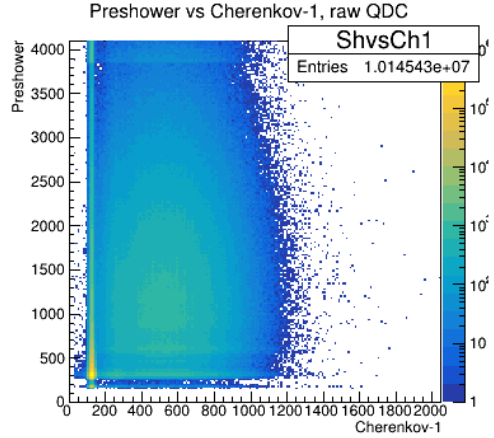




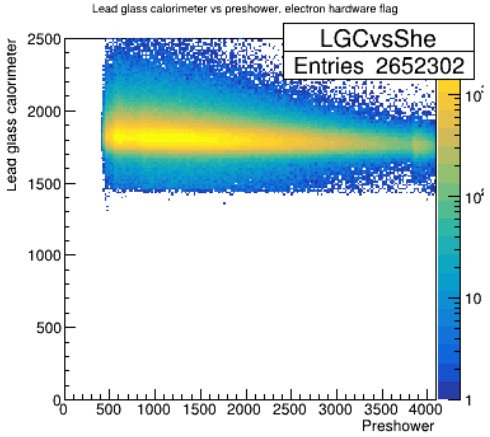
- Selected data, pion or electron flag

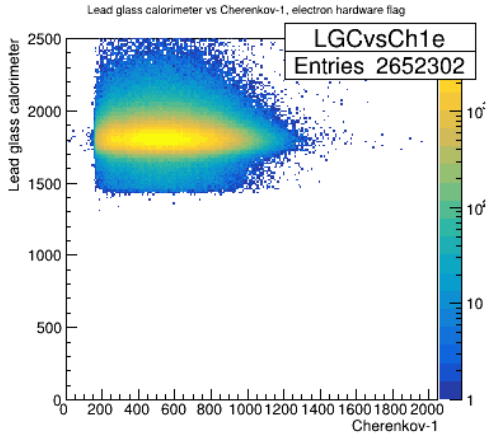


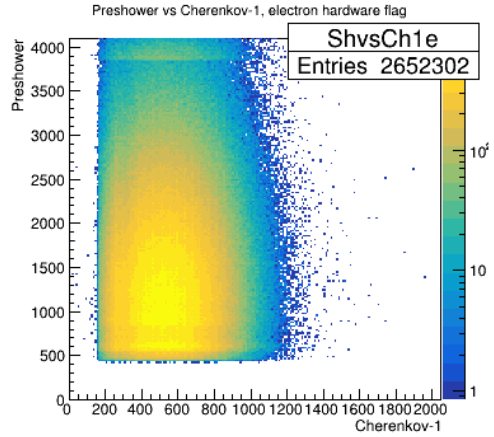




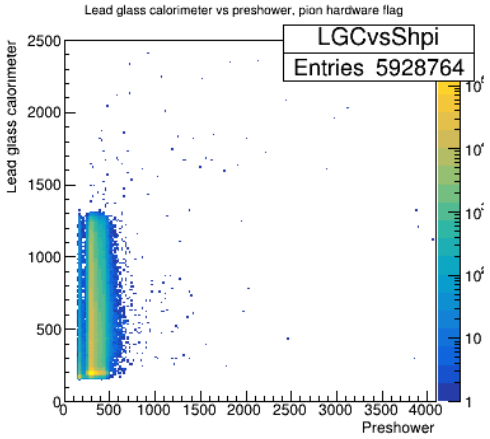
All trigger events

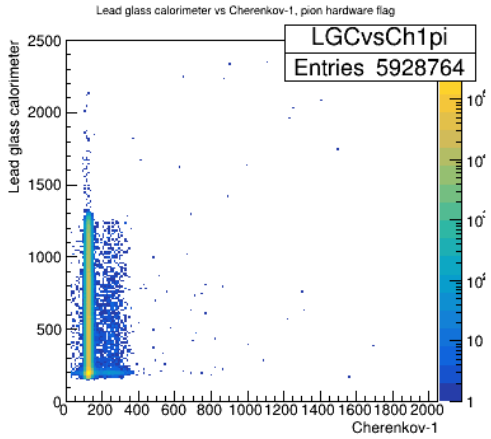


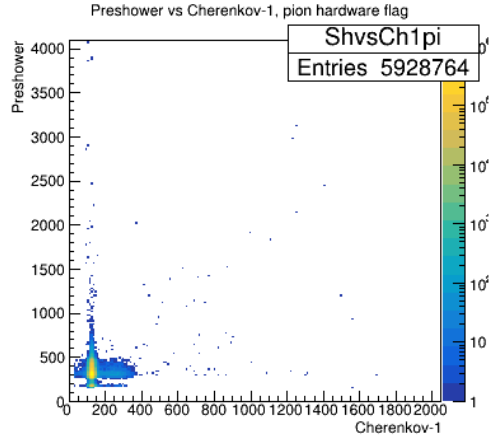




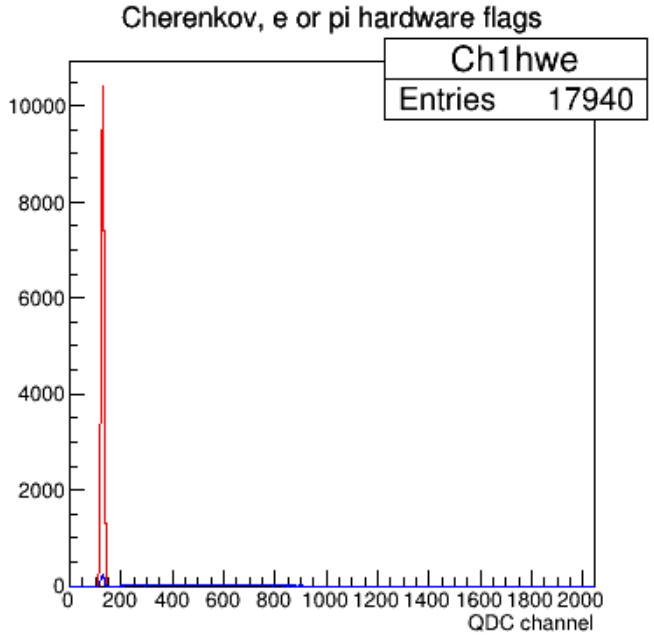
Electron trigger flag

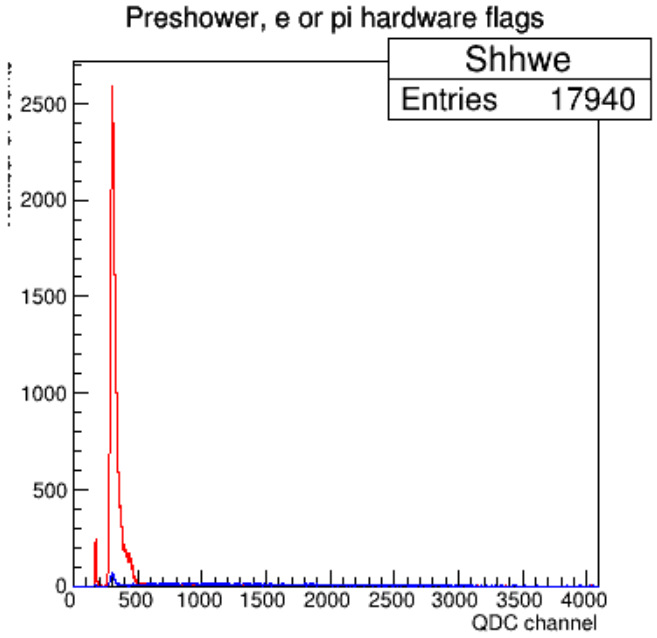


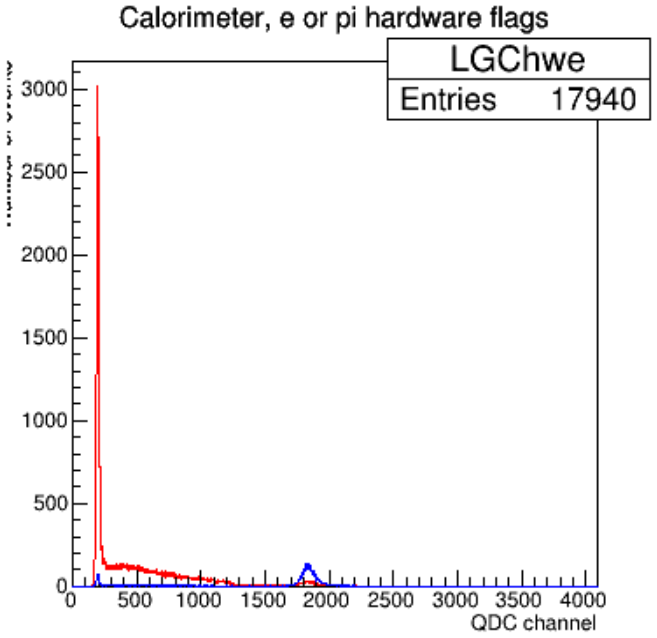


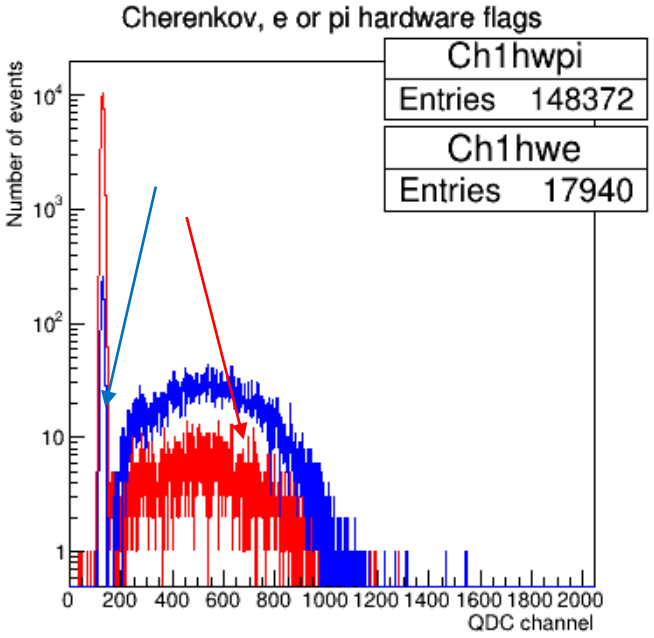


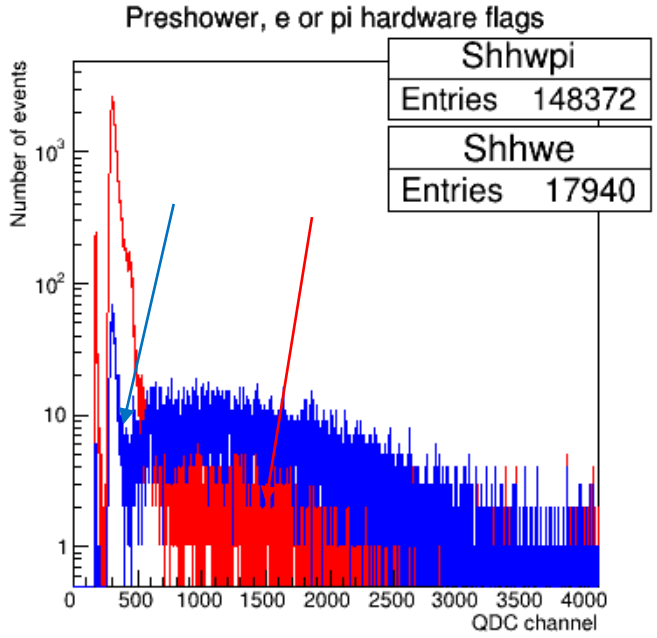
Pion trigger flag

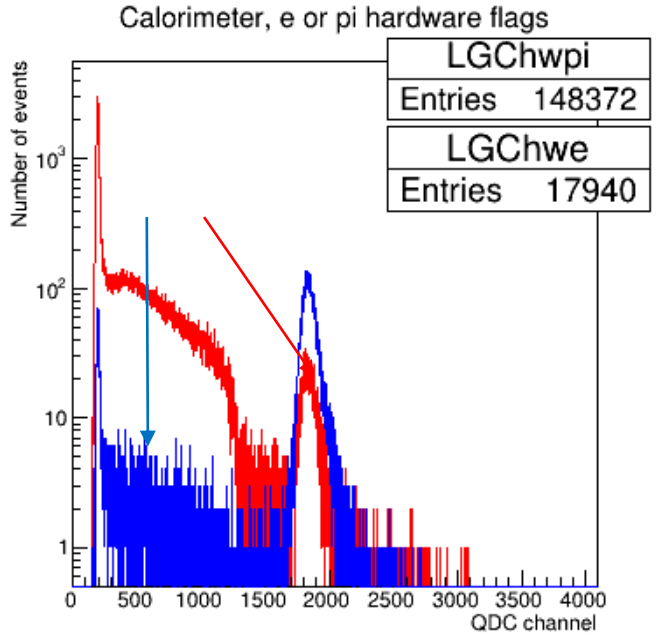








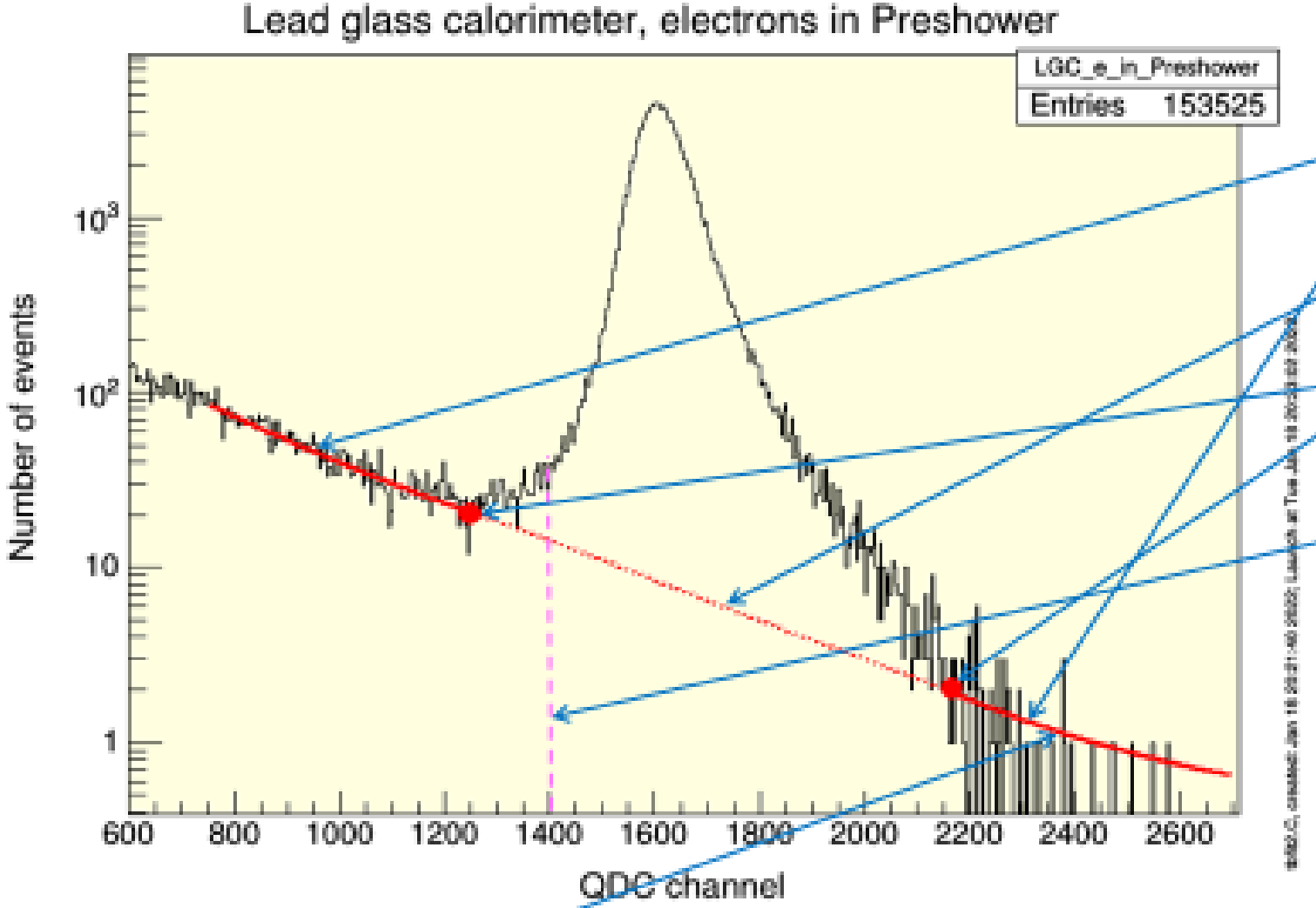




- Run # 397/1100: Accepted as “good”, but really is not: for unknown reason particle identification flag is wrong for many events.
- (Spent a lot of time identifying this bad run in the list)
- Fortunately, there is one more run – #435 – with the same conditions (distance, radiator, angle)

- Next steps: estimate the purity of beam particle samples, selected by our supporting detectors: multiplicity counter, preshower, lead glass calorimeter, Cherenkov detector.
- Next slides – reminder of the procedure used in 2021 test beam analysis.
- Some other new approaches are also possible for these estimations.

Electron sample purity: test beam 2021



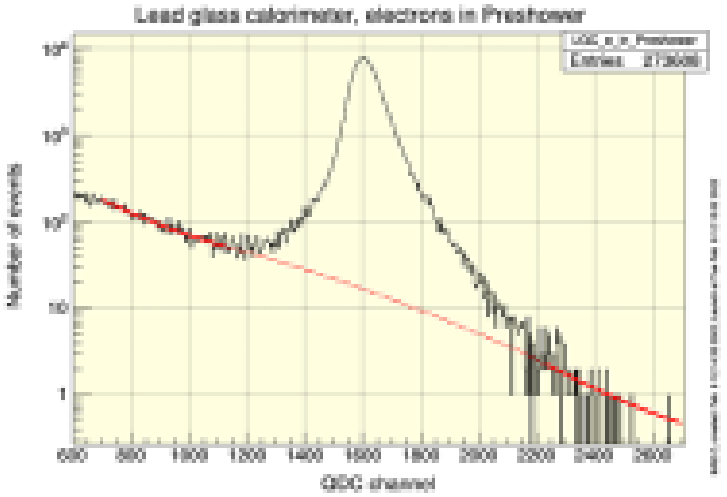
- Fit procedure:
1. Fit separately left and right side of background.
2. Sew left and right branches by three-degree polynomial. Polynomial coefficients are determined from the condition of continuity and smoothness at the joining points.

- Count the number of background events N_{bgrn} as integral of fitting function in the range above our threshold for electrons in LGC. Count total number of events N_{total} in histogram above this threshold. Define number of signal (i.e. produced by electron) events N_{signal} as $N_{total} - N_{bgrn}$. Define pion contamination as N_{bgrn}/N_{signal}.

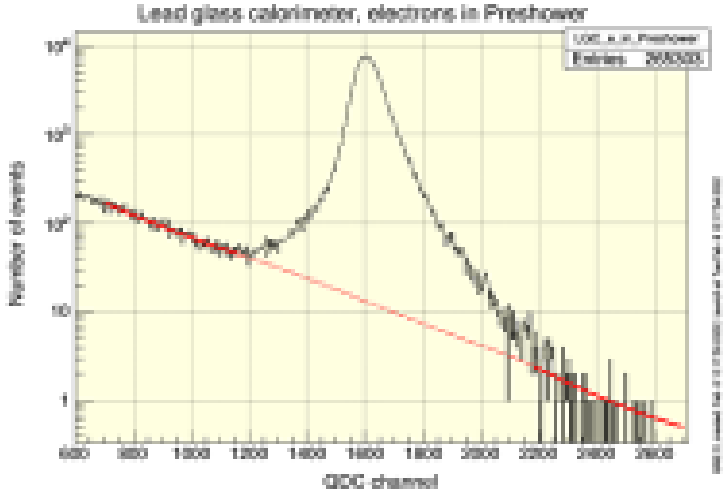
- In 2021 test beam measurements we had a run (#450) with very large statistics. So it is possible to fit directly the distribution (particularly the right branch) of electrons in calorimeter after selection by preshower. Here background/signal ratio is 1.1%
- Results are depend on interval choice for background fitting and range from 1.0% to 1.3%.

Electron sample purity: test beam 2021

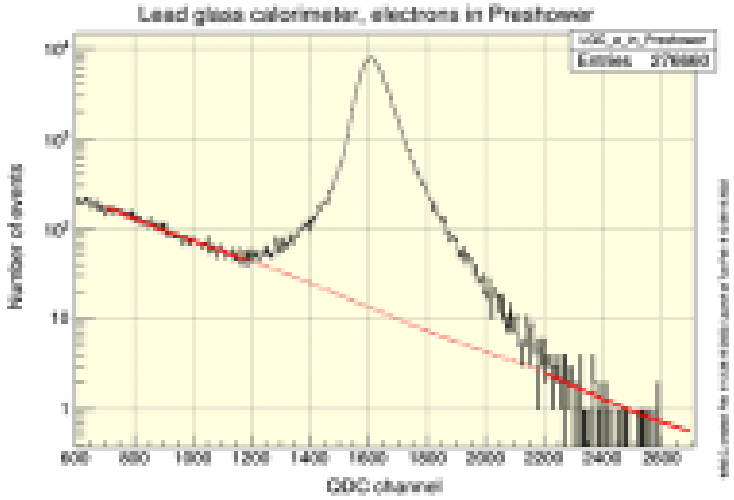
Runs 461-473: Background/signal = 1.1%



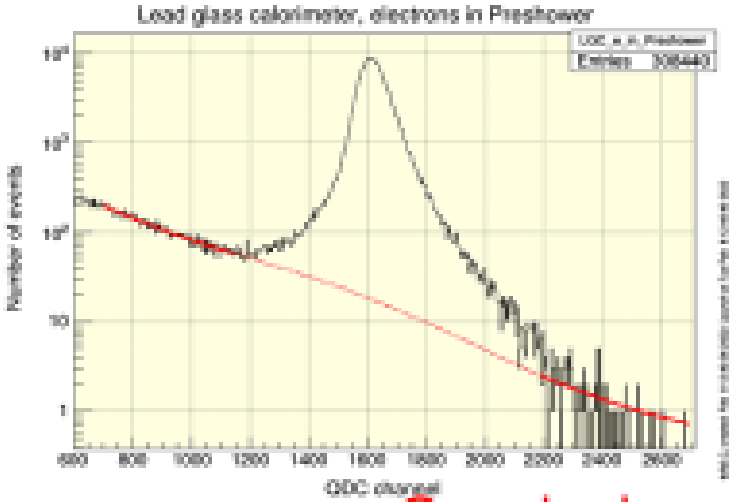
Runs 475-488: Background/signal = 0.91%



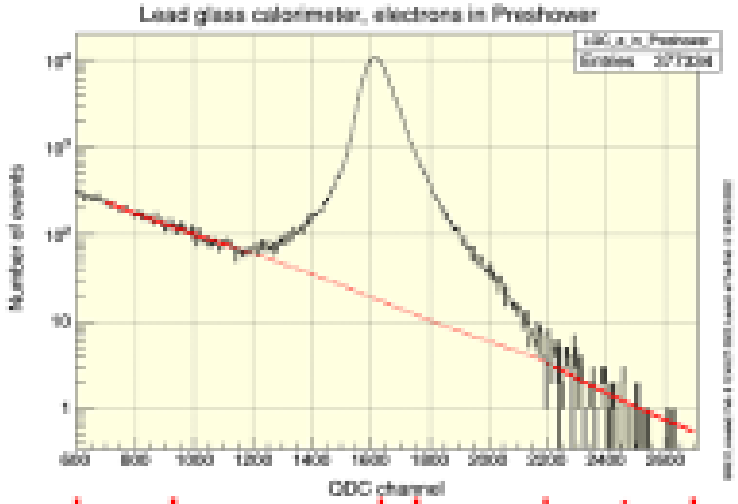
Runs 489-500: Background/signal = 0.90%



Runs 501-523: Background/signal = 1.0%



Runs 530-544: Background/signal = 0.92%



All runs 461-544: Background/signal = 1.2%

Conclusion: pion background in selected electrons is ~1%

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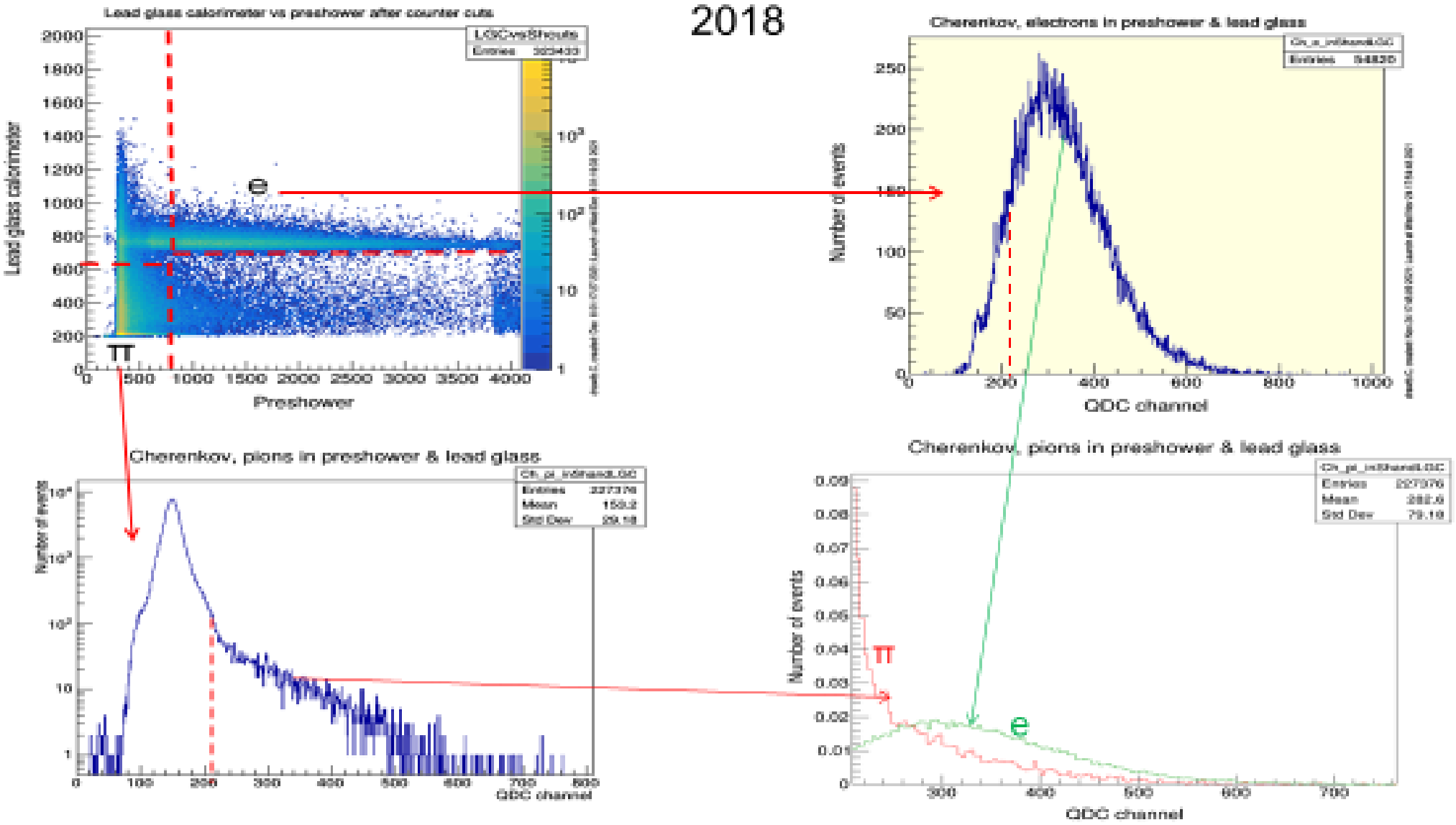
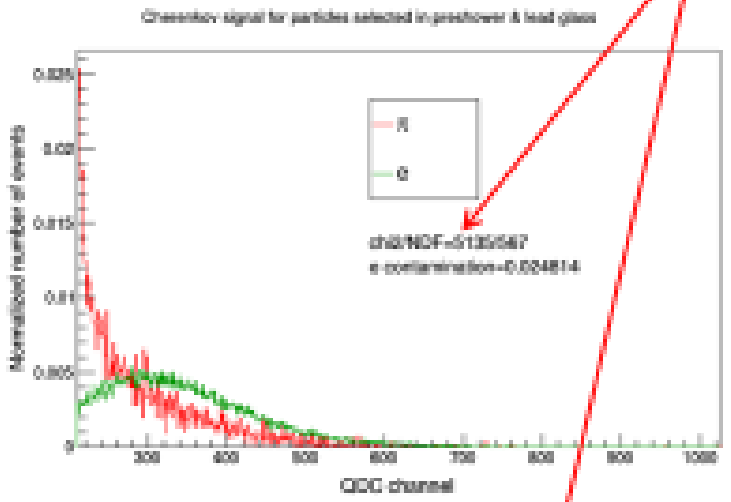
Estimation of electron contamination in selected pion samples

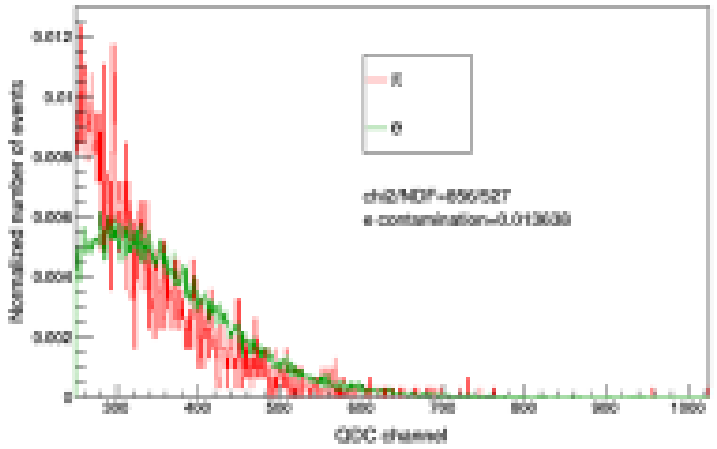


ROOT procedure of histogram comparison

>210 QDC



>250 QDC



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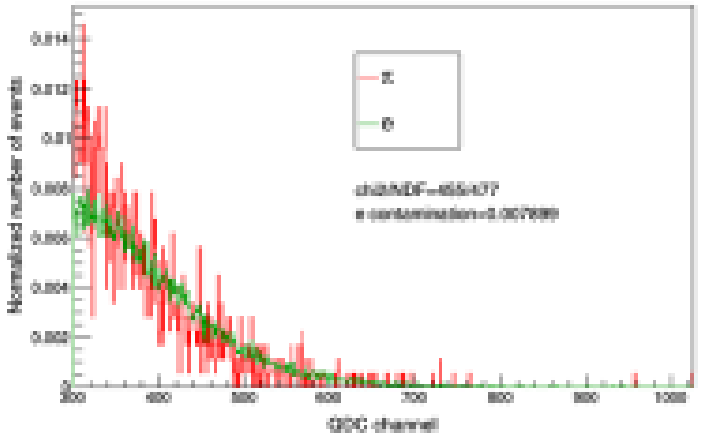

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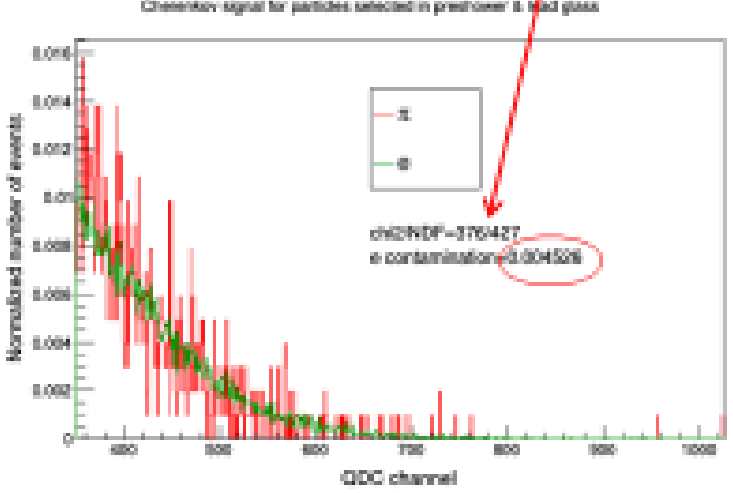

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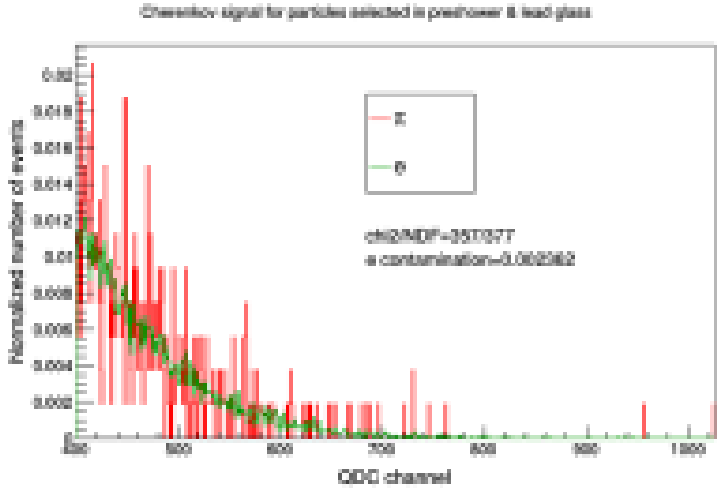

>450 QDC