

TOF-Wall calibration updates and future plans

Matteo Morrocchi



Updates

Updates from the past general meeting:

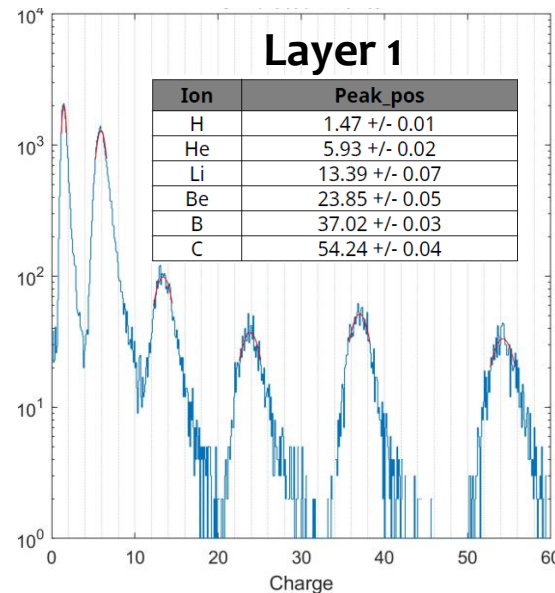
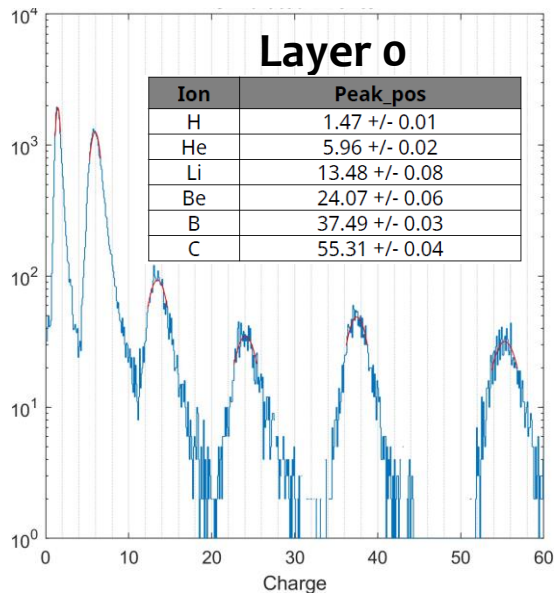
- The TW calibration for the CNAO 2022 and 2023 campaigns is finished
- Up to now, a bar-to-bar calibration has been performed, further improvements can be studied
- The improvements that can be obtained from the TW scan in the calibration still need to be understood

CNAO 2023 Calibration

For the calibration, all the available runs with both targets and both triggers schemes were used (with the magnet in place). A list of the used runs, together with more details, is available in the presentation done at the physics meeting of April, 10. <https://agenda.infn.it/event/41081/contributions/229193/attachments/118415/171308/TW%20calibration%20update.pdf>

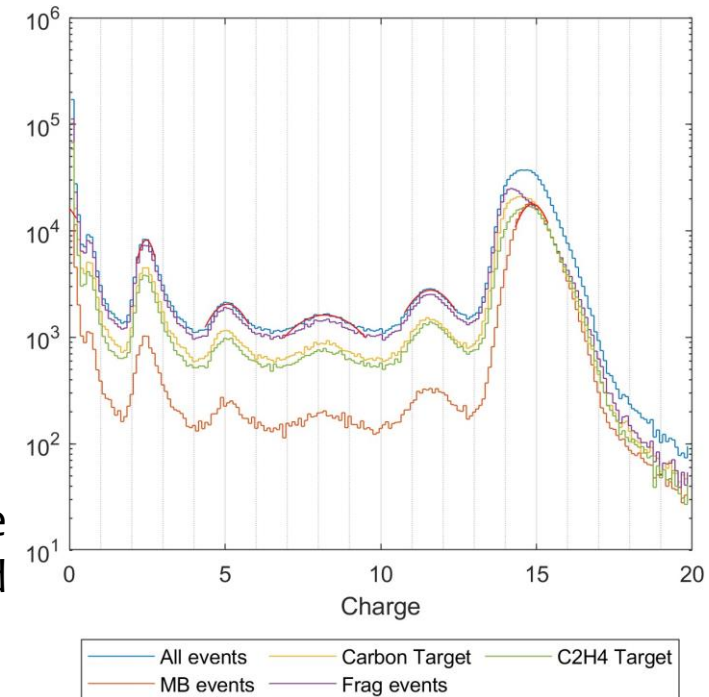
- The TW scan has not been used yet
- A bar-per-bar calibration has been implemented
- The fragment energy has been evaluated in simulation separately for the two layers with no differences between bars

Simulations



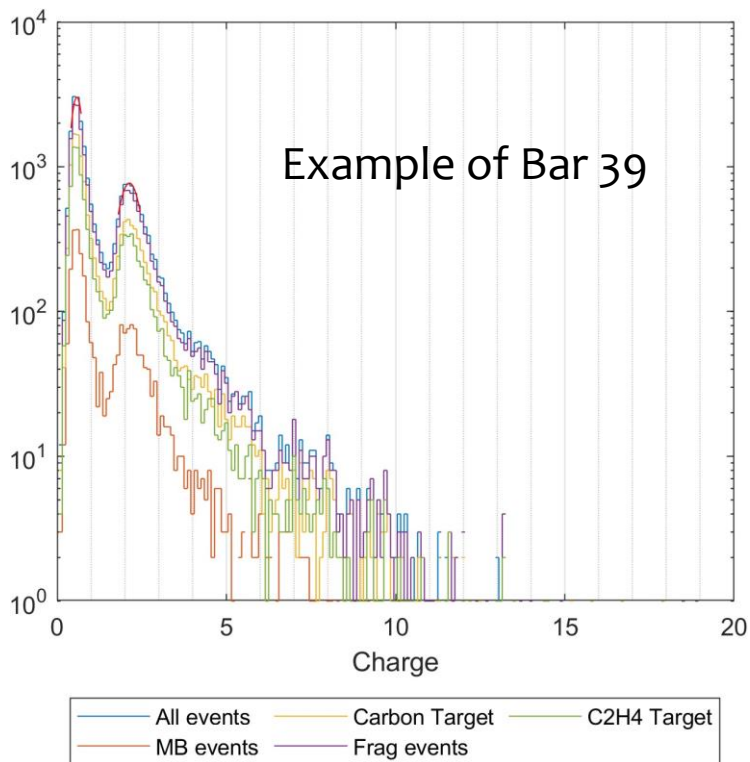
All data were used together for the calibration to improve the population of the heavier fragments on each bar. No differences were observed in the distribution using different targets or trigger schemes

In the 3 + 3 central bars the Carbon peak has to be fitted using MB events only.

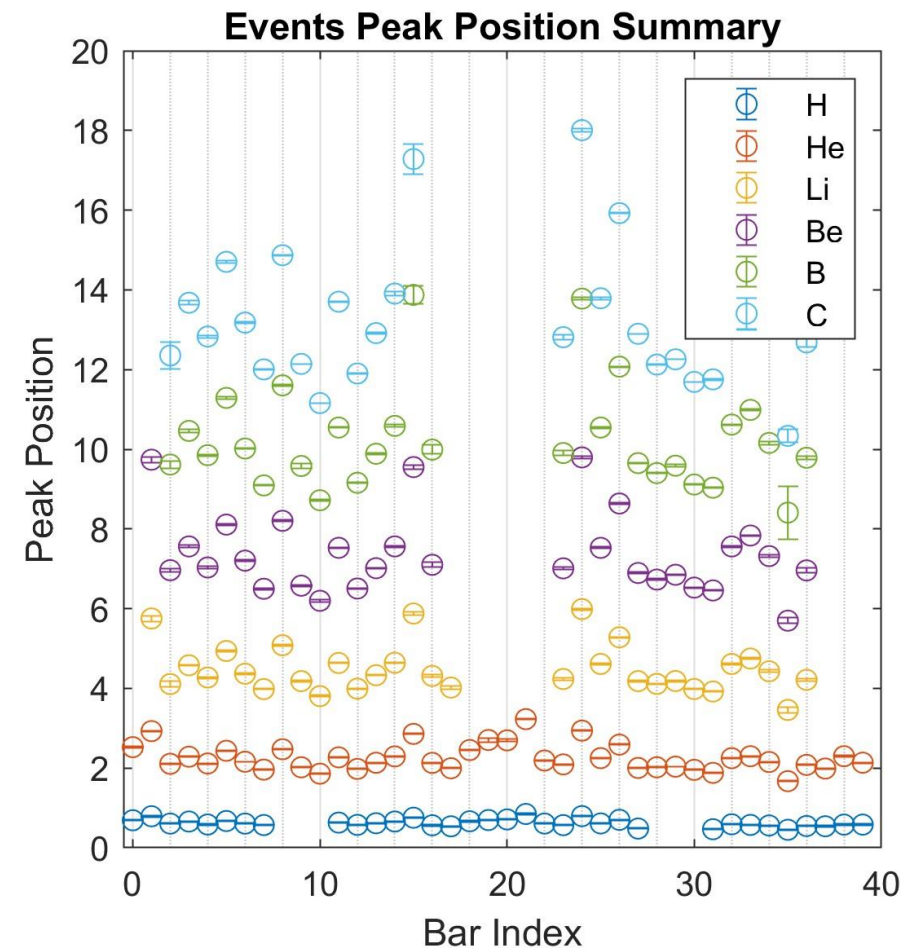
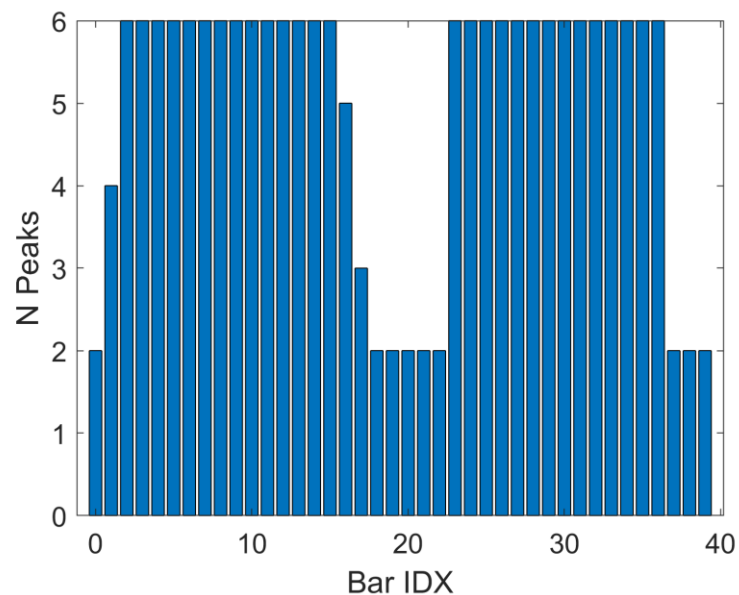


CNAO 2023 Calibration Fitted Peaks

The number of fitted peaks in some peripheral bars is very low, in the future the TW scan data will add a point in those bars, but so far some bars have only two peaks...

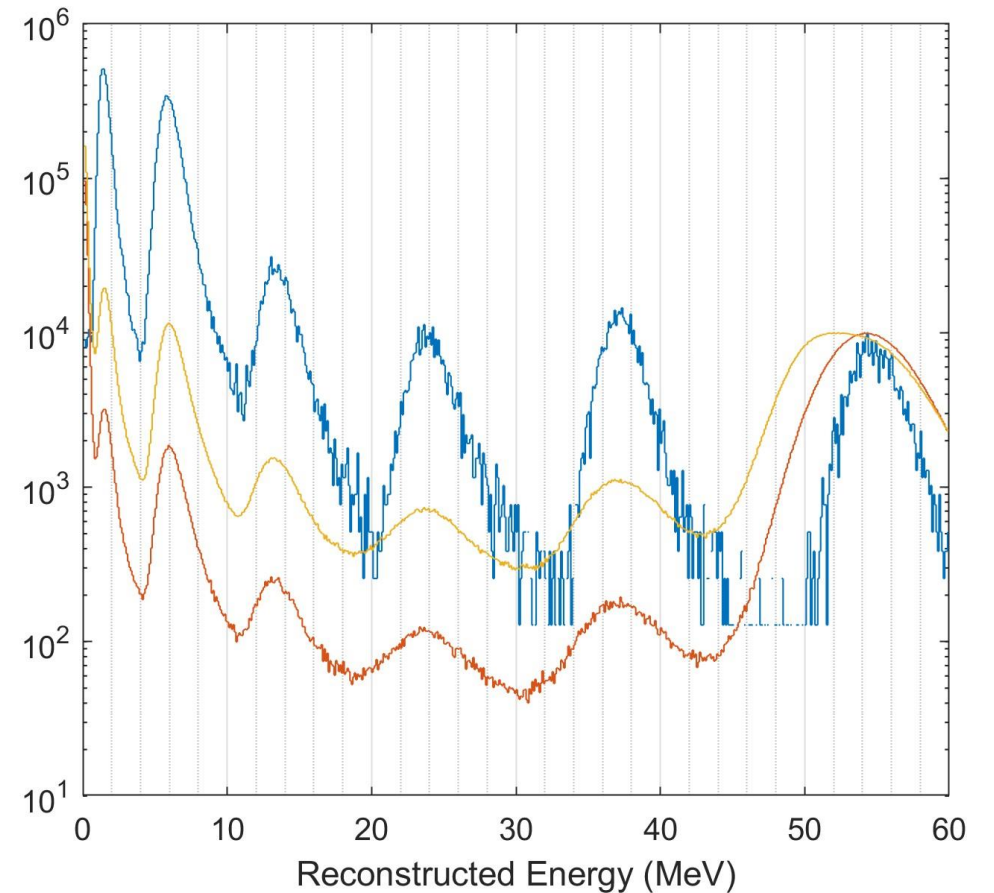
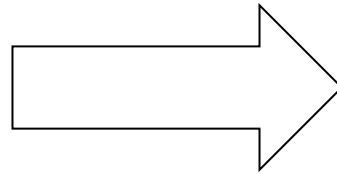
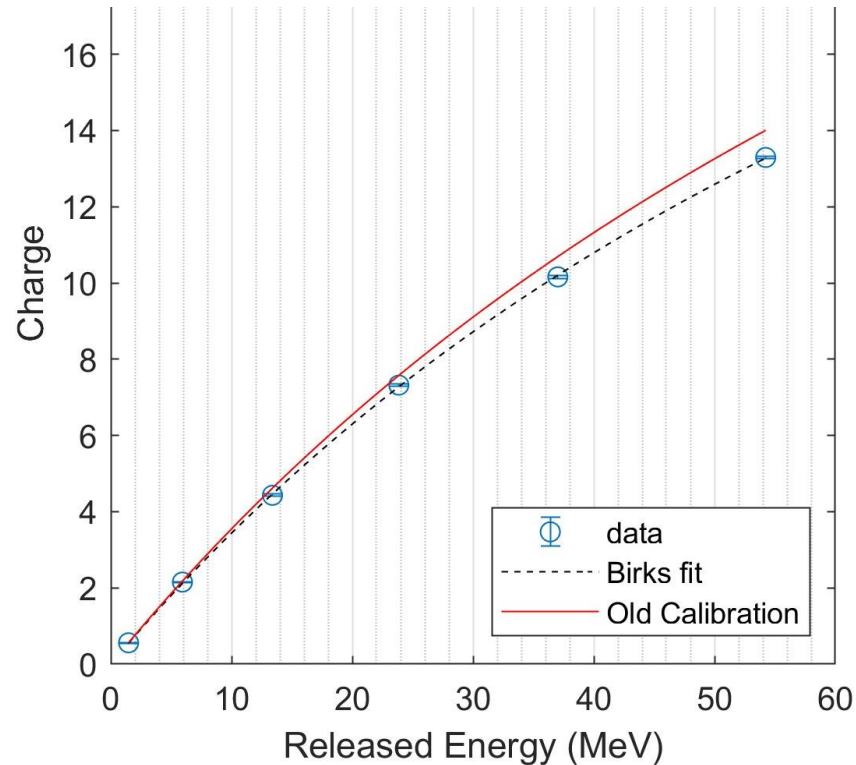


In the central bars, sometimes the proton peak cannot be fitted (not a problem since we have all other peaks in that region)



CNAO 2023 Calibration Fit results

Fits converge very well in both cases, If the k parameter found in the fit differs by more than 50% from the previous value, the previous k value was used and only the s value was fitted (anyway, not a remarkable difference, just for consistency).

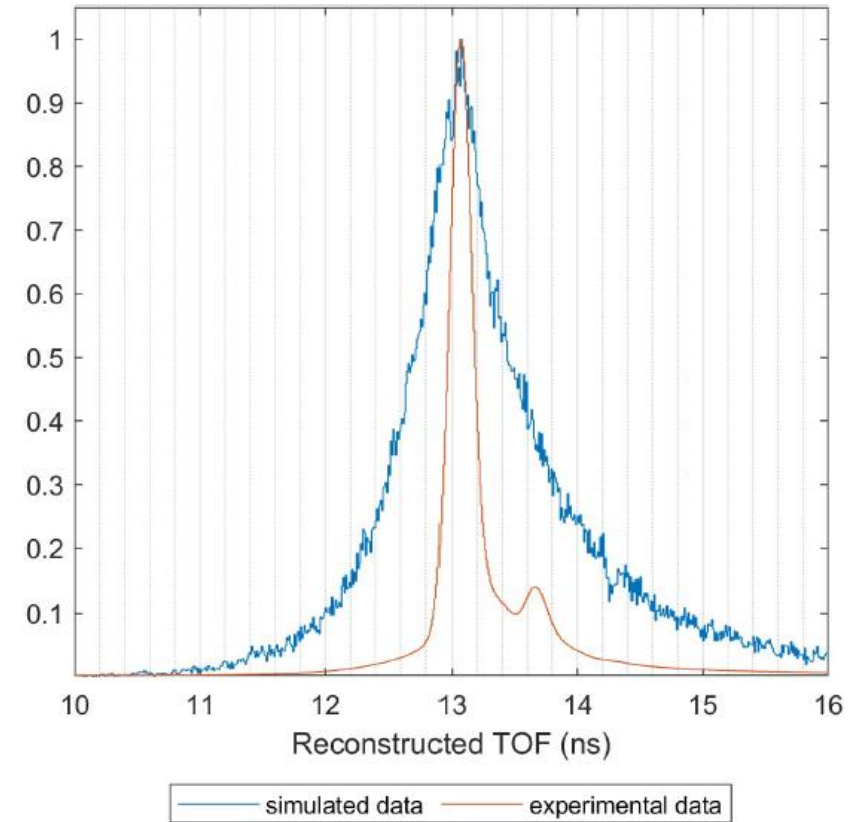
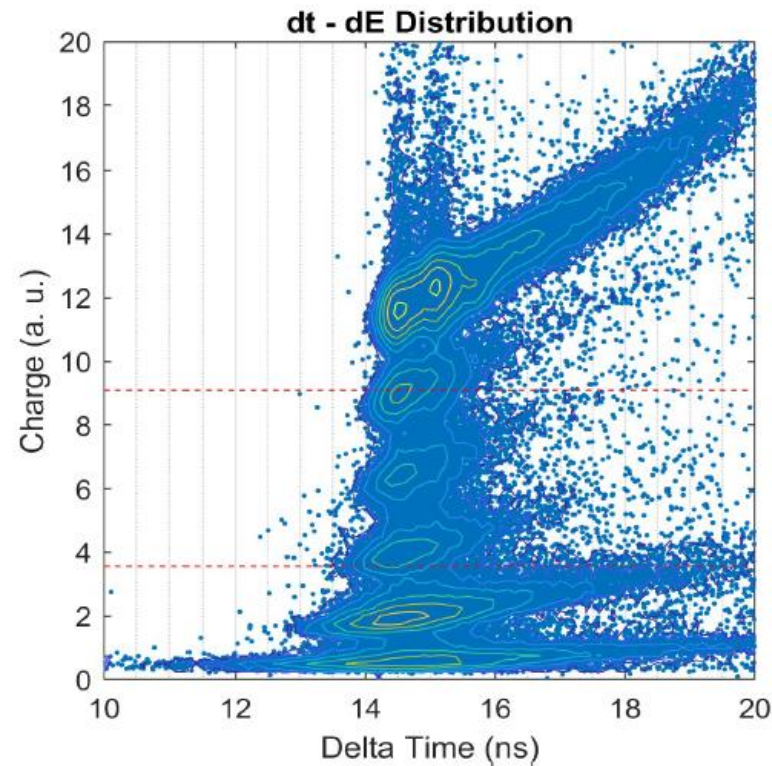
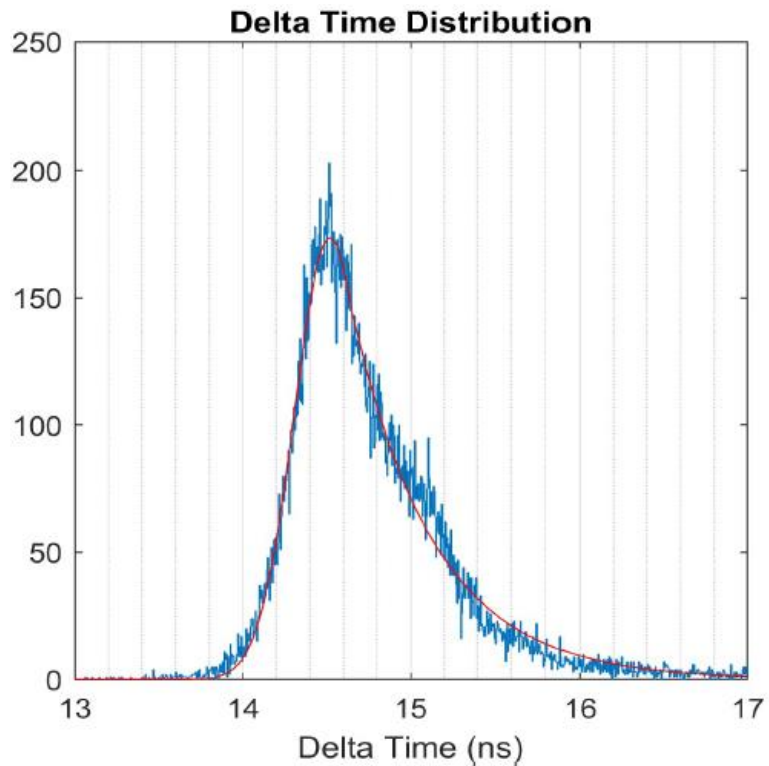


— simulated data — minimum bias data — fragmentation data

CNAO 2023 Time calibration

Not always trivial due to the double peak in the dt - dE plot

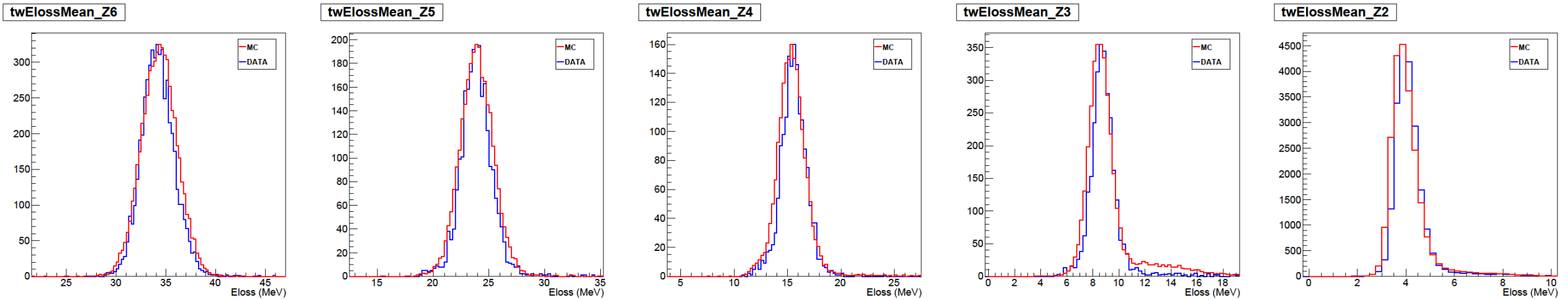
Several attempts to understand the best interval and fit



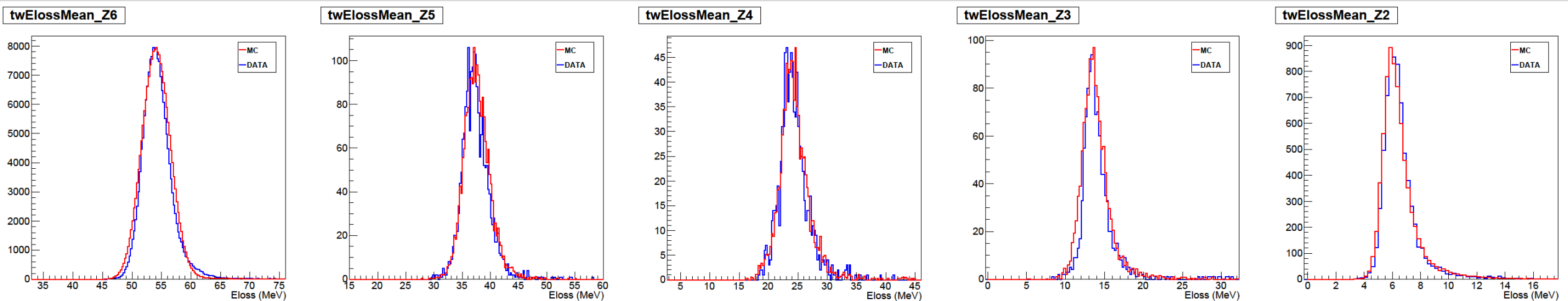
Agreement with simulation is good, slight adaptations on few bars to improve the agreement with simulations

GSI Comparison with CNAO 2023

GSI (bar-per-bar calibration)

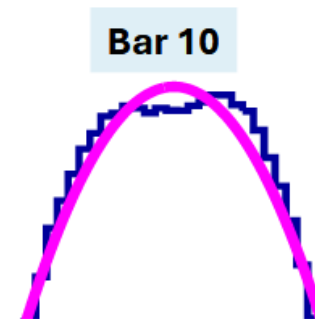
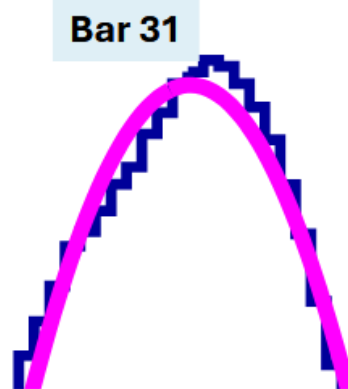
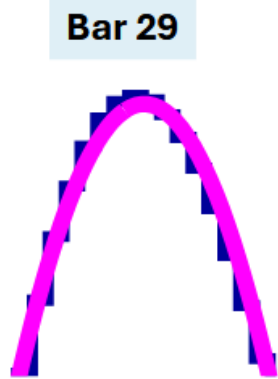
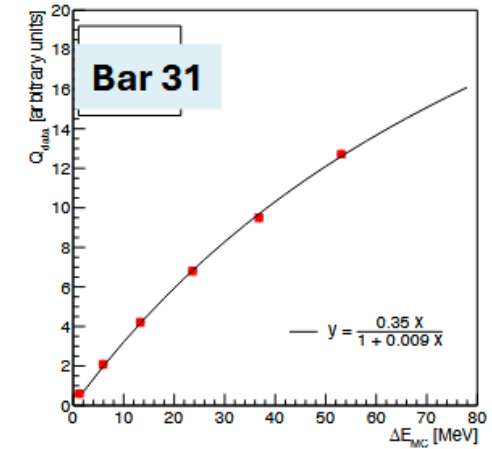
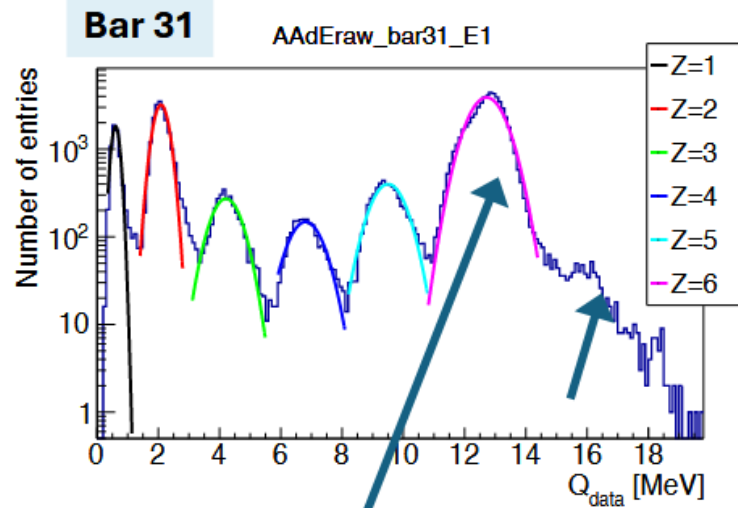
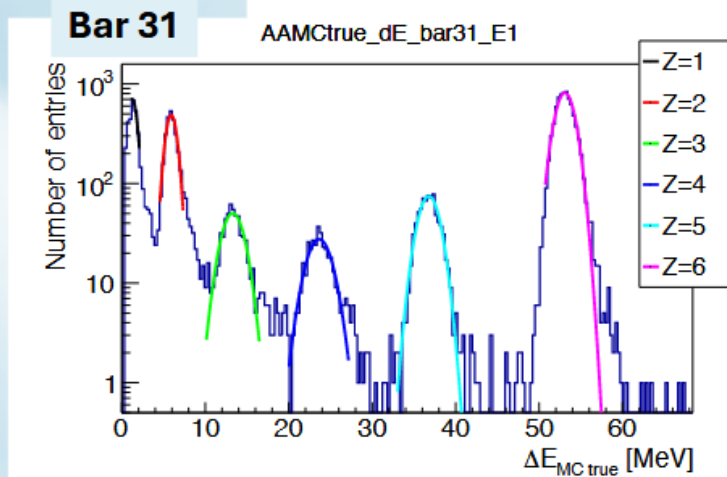


CNAO 2024 (bar-per-bar calibration)



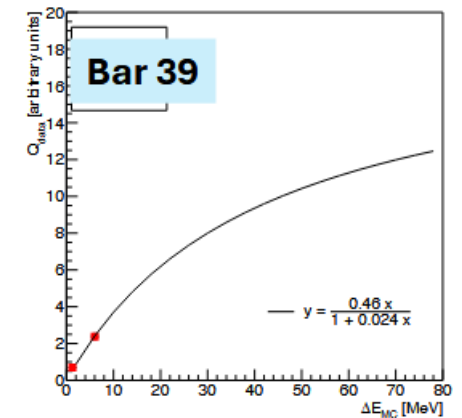
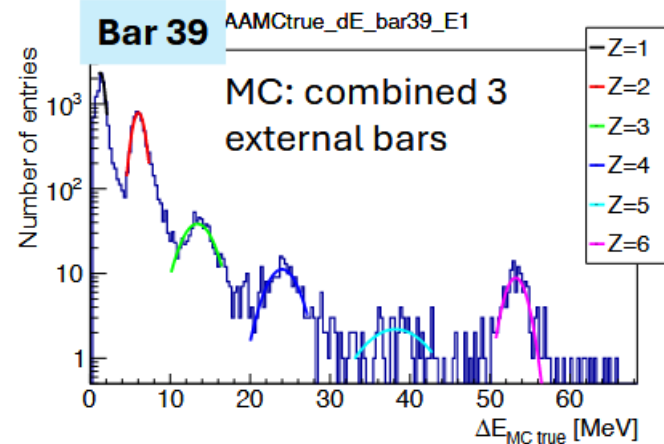
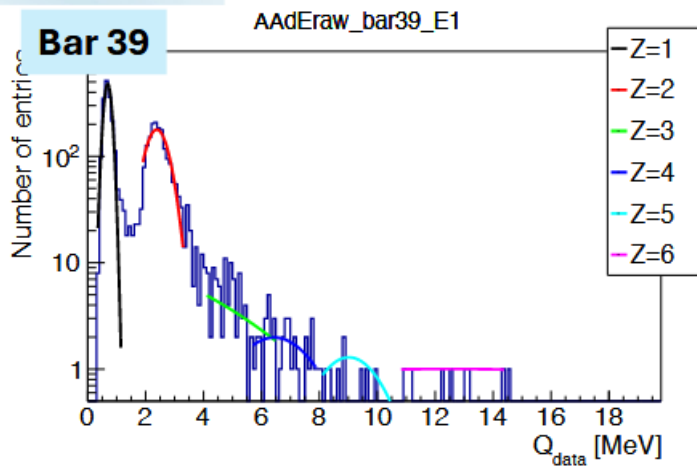
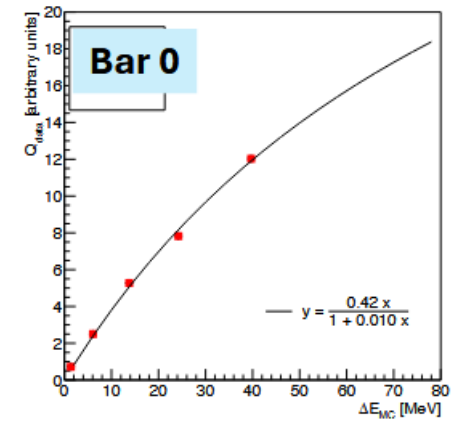
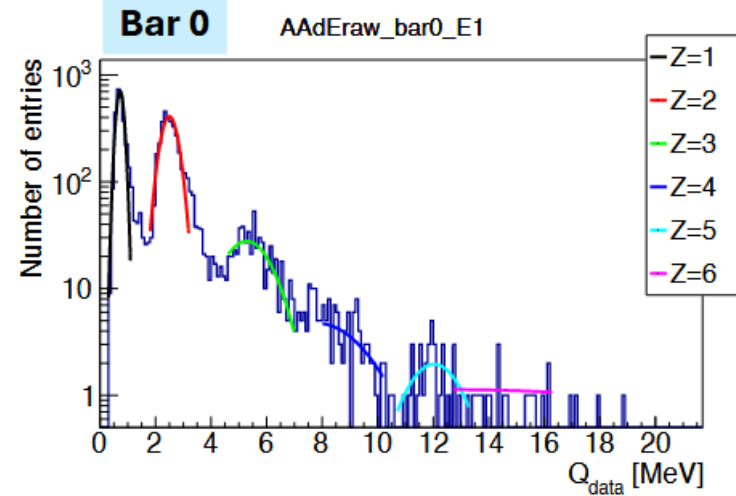
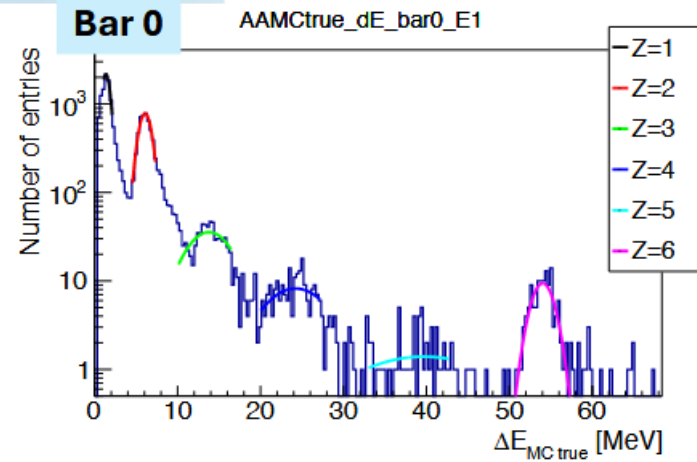
CNAO 2022 Calibration

Examples of bars with good statistics



CNAO 2022 Calibration

Examples of bars with bad statistics

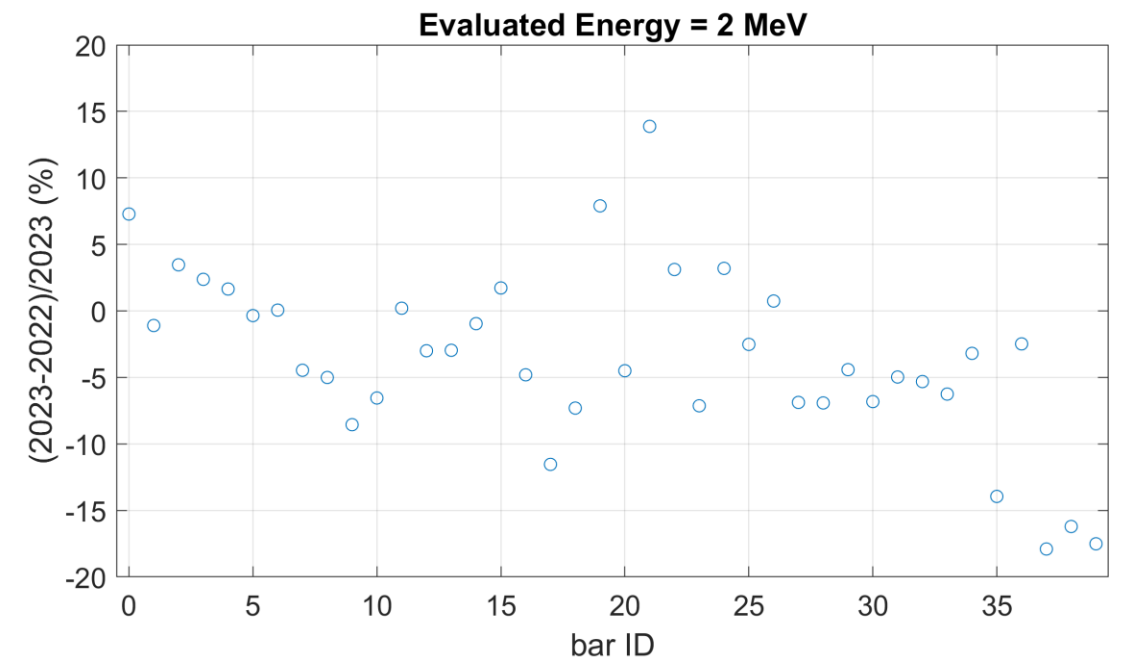
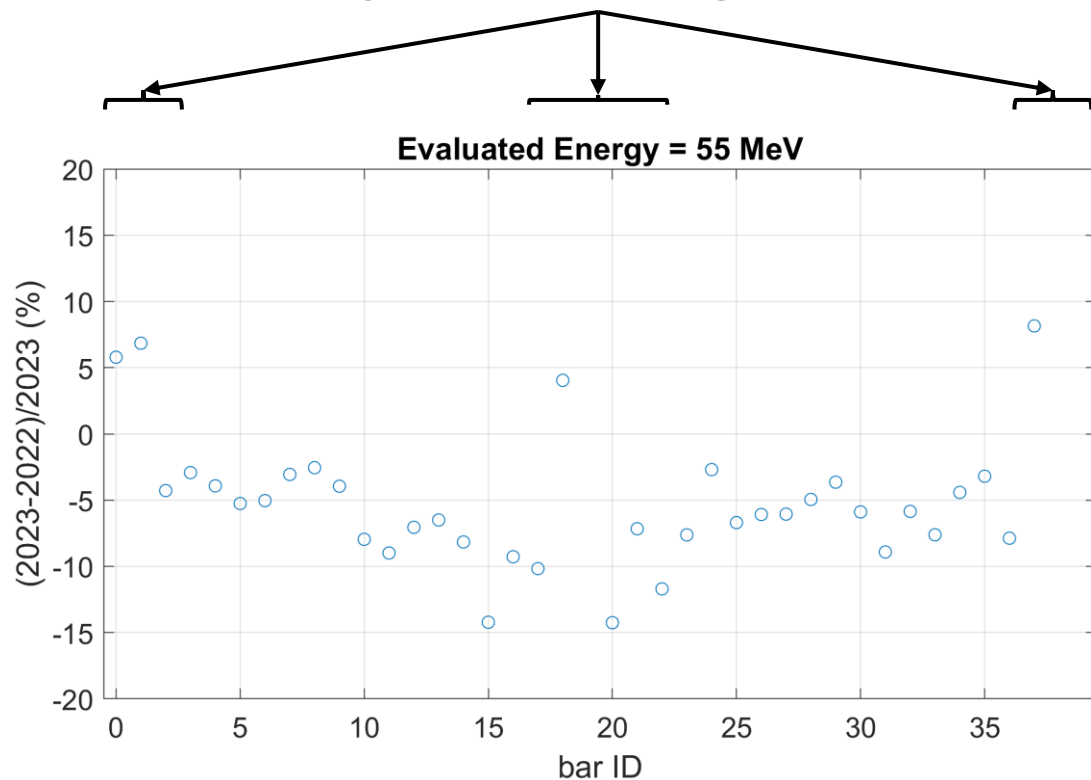


CNAO 2022-2023 Calibrations comparison

Comparison between the two calibrations evaluating the expected signal for each bar at different energies

This gives an idea of the behaviour of the detector, but may not reflect in a difference in the Z identification performance.

No good calibration @ 55 MeV



Future works

- Understand if some improvements can be obtained from the TW scan in the calibration
 - In the past Aafke showed that the bar-per-bar calibration did not bring a degradation of the performances compared to the position-per-position calibration
 - However, we have a scan with Carbon in the 2023 campaign that can be used for this purpose
- We have a new Master student (Lorenzo Pierfederici) that is beginning now his thesis, working on the HIT data taking analysis