Step by step TWIM Calibration

6. April 2022

0.1 Overview

For this calibration I used the data of Experiment S455 in March 2021, Run 273, subruns 1-48.

1. Alignment of the energy per Anode for each Section
2. Alignment of the energy per Section

Info: I always count from 0 to 15.

0.2 Alignment of the energy per Anode for each Section

For the Energy, you should first align all the gain per anode by plotting for each section:
Eraw[anode i] vs Eraw[anode ref].
anode ref = the 5th anode
I plot these 2D histos only for events where the 16 anodes per section have seen an ion. (no specific tpat selection needed).

0.2.1 Computing

First run the program "small_script_hist.C" for all subruns. Then use "hadd" to add up the .root files. The combined .root file can then be used for the scrip called "retrieve_fits_hist.C ". This one makes nice canvases for the plots anode[i] vs anode_ref and stores the fit parameters under parameters_twim_anodes.csv.
In this directory you find the parameters_twim_anodes.csv I retrieved from this first calibration step. The offset (=gain) should be near to 1.

Design of parameters_twim_anodes.csv

It stores section(s), anodenr(i),slope,offset
$E\_sum\_ref * slope[i][s] + offset[i][s]$
To calibrate you have to do it the other way round:
$E\_cal\_anode[i][s] = E\_anode[i][s]/slope[i][s] - offset[i][s]/slope[i][s]$

0.3 Alignment of the energy per Section

- you should select event where the ions loss their energy in one section only
- then you should select a limited range in ToF (100 ps range)
- then you should calculate for each section Esum[s], the sum of the 16 anodes (using $E\_cal\_anode[i][s]$ from the previous step).
- you should see a small shift between the four sections
- correct from this shift by pol1
- as result you get: $Eal\_step2final[s][a] = OffsetPerSection[s] + GainPerSection[s] * E\_cal\_anode[i][s]$

0.3.1 Computing

Run the macro "twim_sum_energy.C" using all subruns as input parameter. As output you get a .root file with 1D histos with the summed TWIM energy for each section. Use this output .root file as input file for the macro "e_sum_cal.C".This uses TSpectra etc. to (linearly) calibrate the E_sum energy for all sections. The according fit parameters are stored in the parameter file "sum_anodes_parameters.csv".
Now you can use the macro "twim_final_cal.C" (as input parameter the name of the subruns). This macro uses both parameter files "parameters_twim_anodes.csv (anode fit) and "sum_anodes_parameters.csv"(summed energy fit). Now E_sum is calibrated.

0.4 Preparation of the MWPCs