Calibration of testbeam FEB - B0 results

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Plan of the presentation

1. Method of calibration
2. Example of calibrated results

Calibration method

Using a simple single-channel injector, it was possible to inject same charge for each channel.

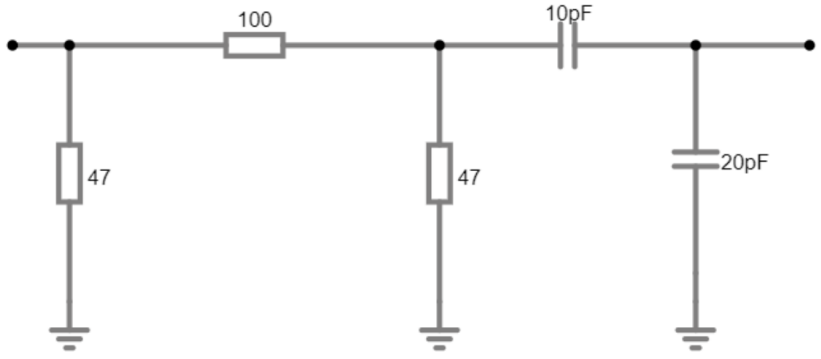

Fig. 1: Injector circuit

Injector calibration

Using an external measurement setup with known gain, it was possible to calibrate our injector.
Injector calibration: $Q_{in}[fC] = 0,4628 \cdot U[mV] + 0,5148[fC]$

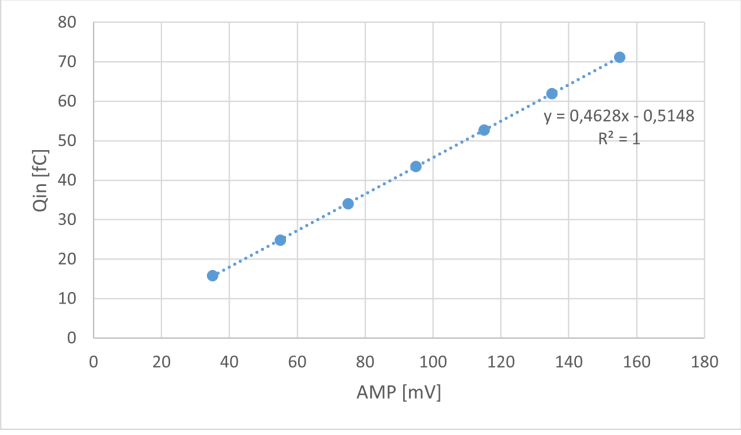

Fig. 2: Charge in function of generator amplitude - injector calibration

Linear regression

After calculating MPV for each channel and charge linear regression was applied (4 channels was classified as bad)

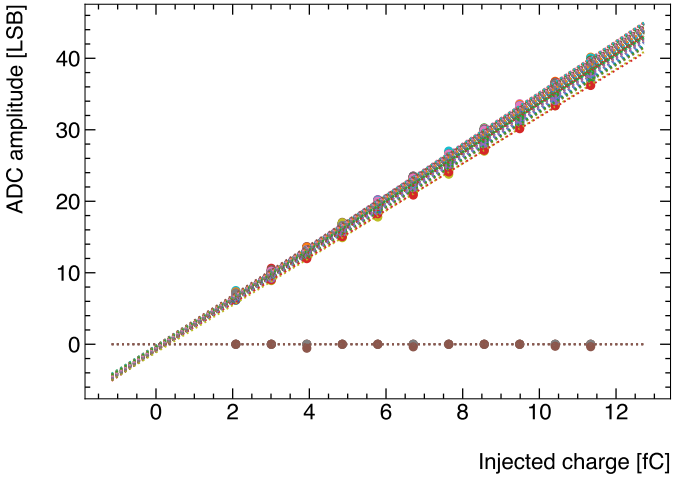

Fig. 3: Fit to raw data reconstruction with linear regression applied

Linear regression - gain

From linear regression we can read information about slope and after performing injector calibration we have absolute gain value.

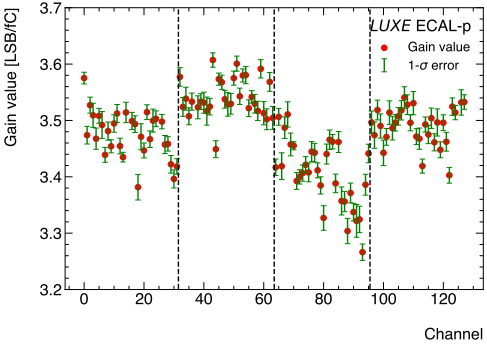

Fig. 4: Absolute gain

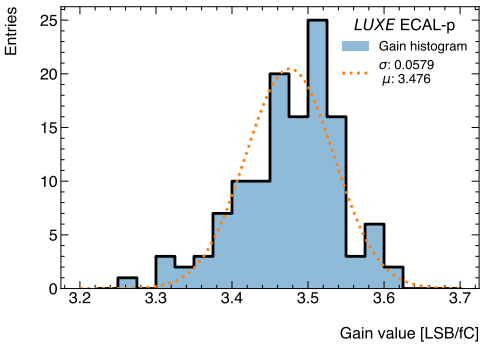

Fig. 5: Absolute gain - histogram

Linear regression - relative gain

From linear regression we can read information about slope and after normalisation to mean slope value we have relative gain values.

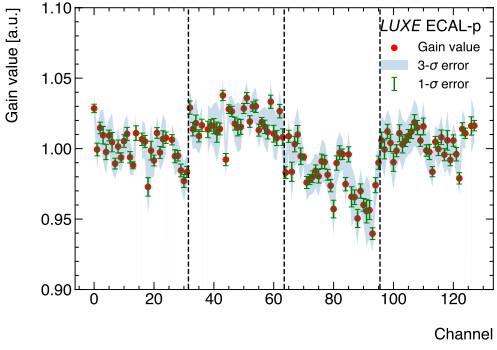

Fig. 6: Relative gain

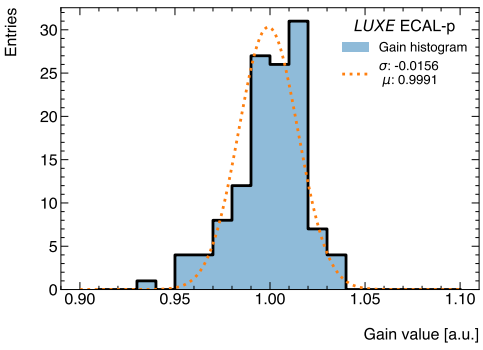

Fig. 7: Relative gain - histogram

Linear regression - intercept

From linear regression we can read information about intercept which can be interpreted as validation of baseline calculation.

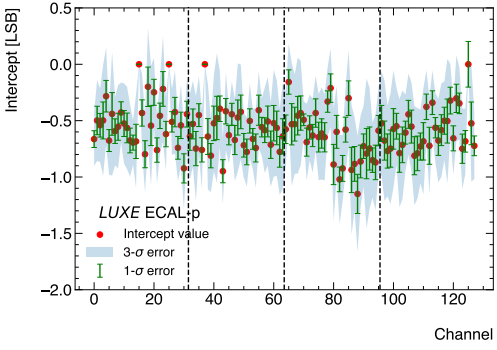

Fig. 8: Intercept - fit to raw data

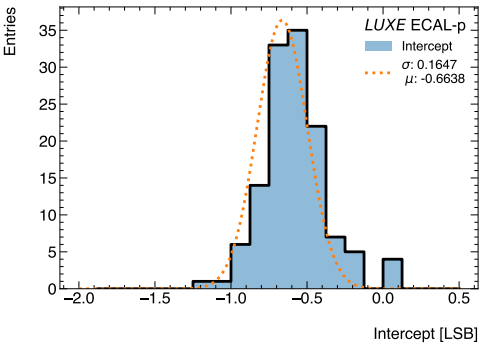

Fig. 9: Intercept histogram - fit to raw data

Linear regression - R^2 value

From linear regression we can read information about R^2 value which describes error of output linear parameters in relation to the measurement data.

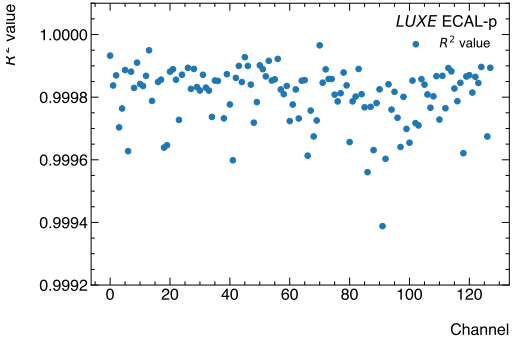

Fig. 10: R^2 value - fit to raw data

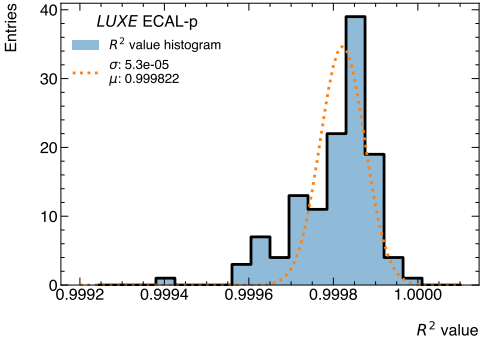

Fig. 11: R^2 value histogram - fit to raw data

Example of calibrated results Calice

Taking account relative gain for each channel we can perform gain correction for B0 board. As you can see gain difference has no significant influence on MPV position.

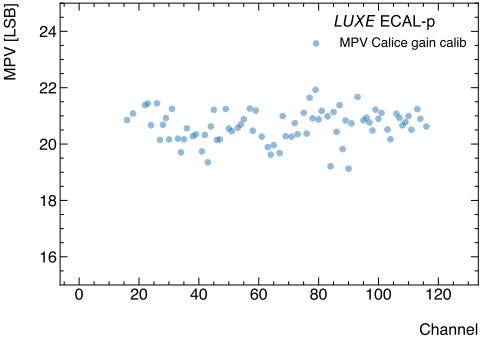

Fig. 12: Calice corrected MPV position - online reconstruction

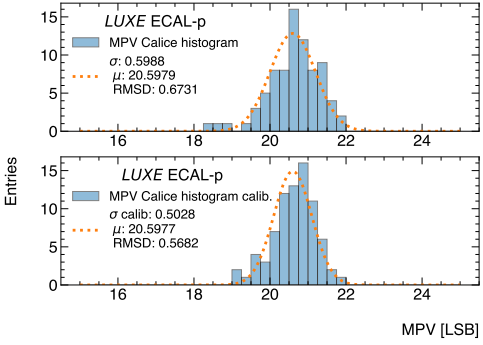

Fig. 13: Calice corrected MPV position histogram - online reconstruction

Example of calibrated results Yan

Taking account relative gain for each channel we can perform gain correction for B0 board. As you can see gain difference has no significant influence on MPV position.

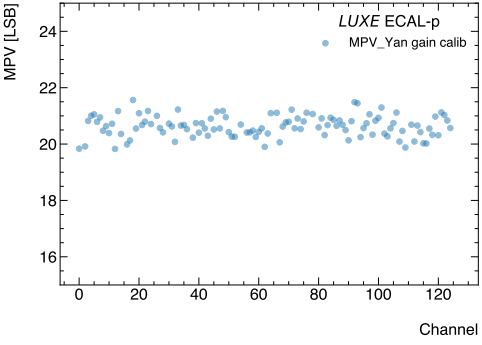

Fig. 14: Yan corrected MPV position - online reconstruction

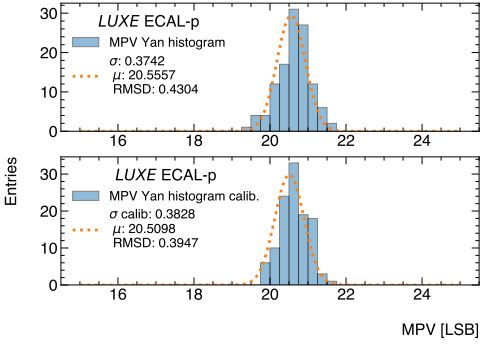

Fig. 15: Yan corrected MPV position histogram - online reconstruction

Conclusions

- Absolute gain 3.47 $[\frac{LSB}{fC}]$
  σ 0.0579
- Relative gain 0.9991 $[a.u.]$
  σ 0.0156
- Intercept value now are close to 0

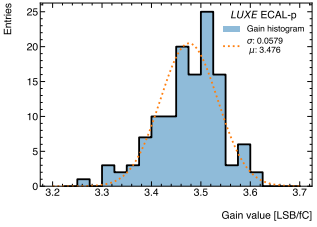

Fig. 16: Absolute gain histogram - fit from raw data

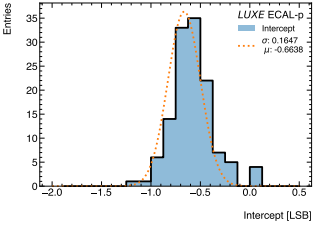

Fig. 17: Intercept - fit from raw data

Thank you for attention