



Quest digitization

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1. Introduction

Introduction

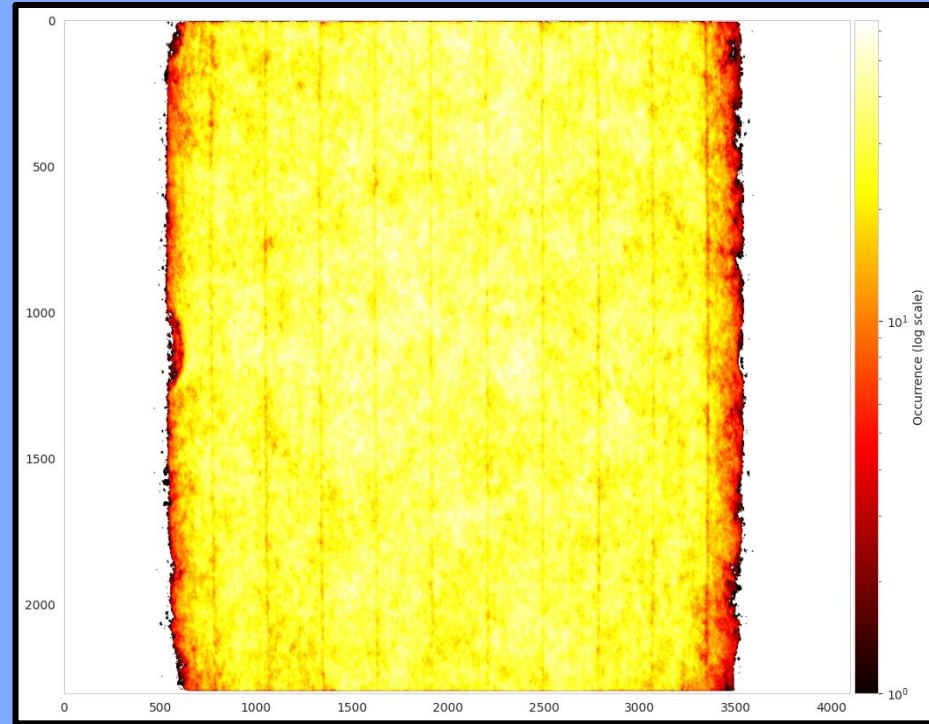
- The **trigger algorithms** using **machine learning** methods used on **Fusion** data were **trained** using **simulations**.
- In order to check their **efficiency** on **Quest** camera, the **same methodology** will be used.
 - **Low energy** simulation to **train models**.
 - **Real data** to check **high energy performance**.

A large blue geometric shape, resembling a stylized arrow or a corner, is positioned on the left side of the slide. It has a diagonal edge from the top-left to the bottom-right.

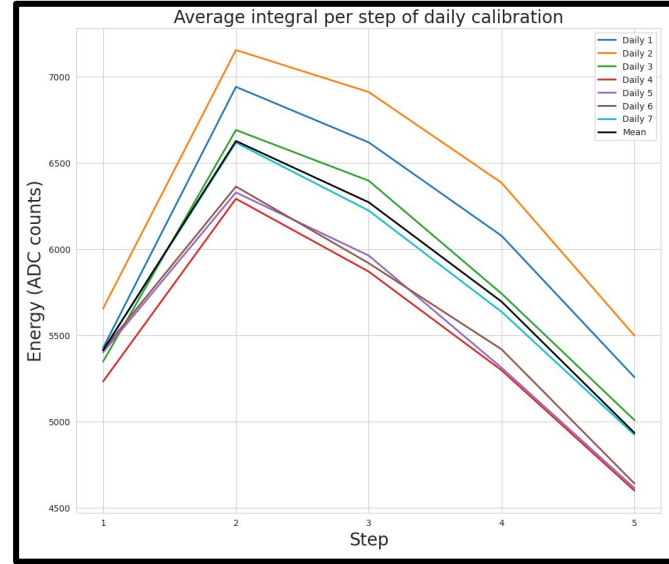
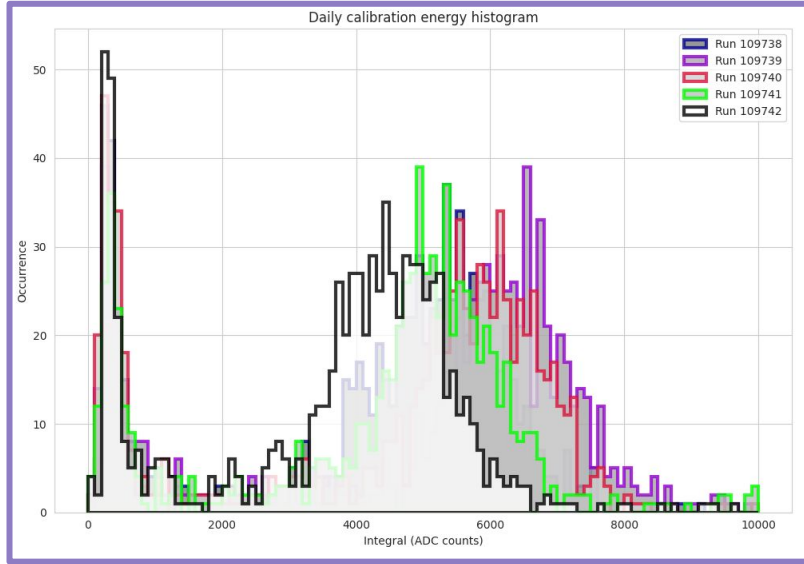
2. Quest digitization

Dimensions

- The **Quest** sensor installed on **LIME** has a **part of it not pointing** to the **GEM plan** (in the X axis).
- The **region** with **non noisy clusters** (integral > 2000 ADCs) goes from **~500** to **~3500 px** (equivalent to **33 cm**).
 - **x_dim: 451 mm.**
 - **y_dim: 253 mm.**
- The other parameters should be tuned comparing **digitization** with **daily calibration**.



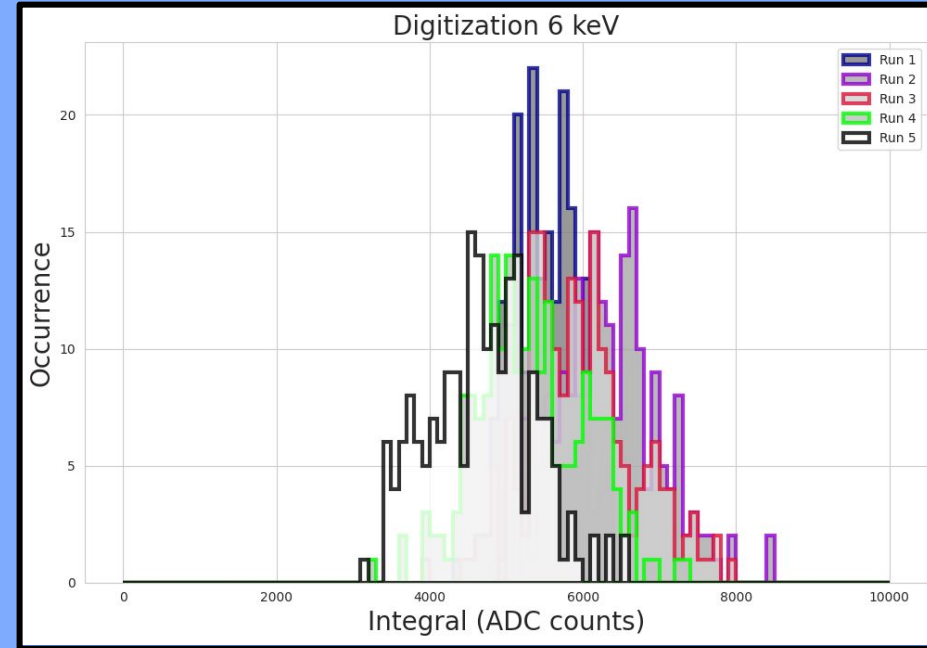
Daily calibration data



- Daily calibration runs from 108910-108914 to 110354-110358 were selected (low gain).
- The **daily 5** was chosen as target (three similar daily calibration ADC results and lower levels).

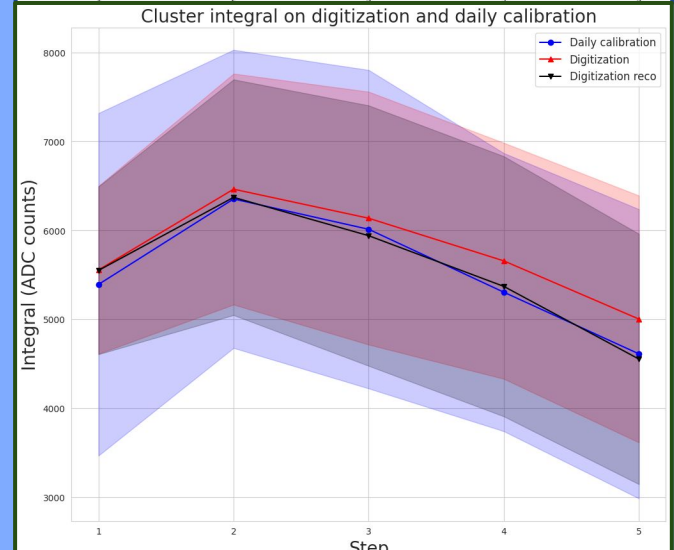
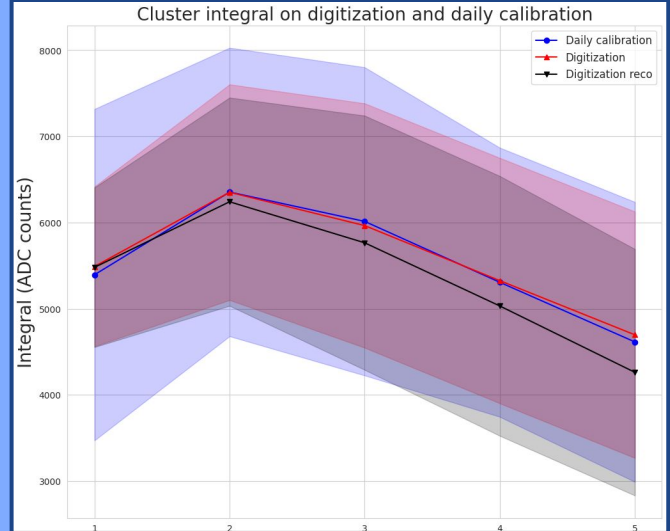
Digitization

- A 6 keV simulation (provided by Pietro) was used on digitization following this [guide](#).
- Single GEM gain, beta (saturation) and absorption length were tuned to achieve real data results.
 - GEM gain: proportional to ADC count energy on all steps.
 - beta: its increase reduce early steps ADC energies (especially step 1)
 - absorption_l: it increases later steps ADC energies (especially step 5).



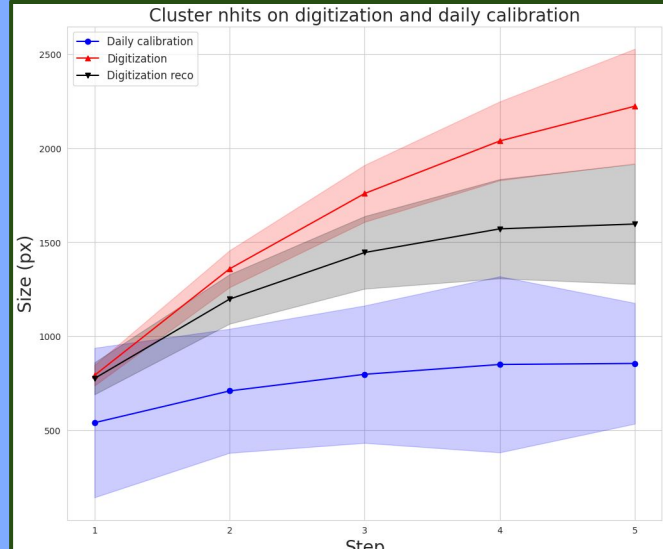
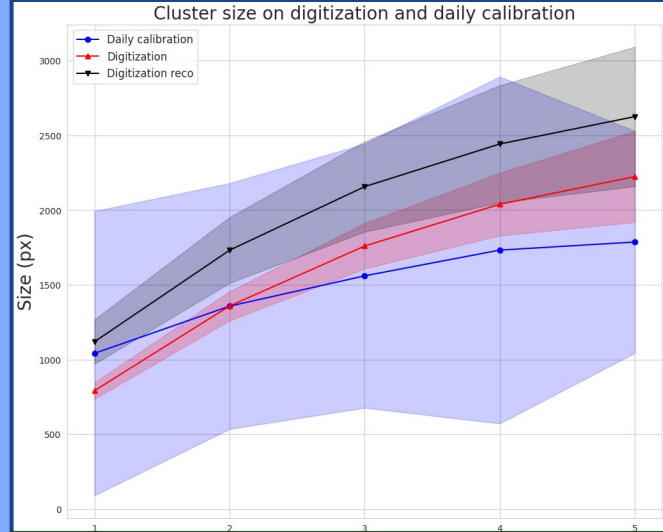
Digitization

- The **simulation** was **combined** with **pedestal images** to be used on the **reconstruction**.
- A **discrepancy** between **truth** and **reco** results on **later steps** was **discovered**.
- **Absorption length** was slightly **increased** to **fix** that **discrepancy** on **reconstructed** data.



Digitization

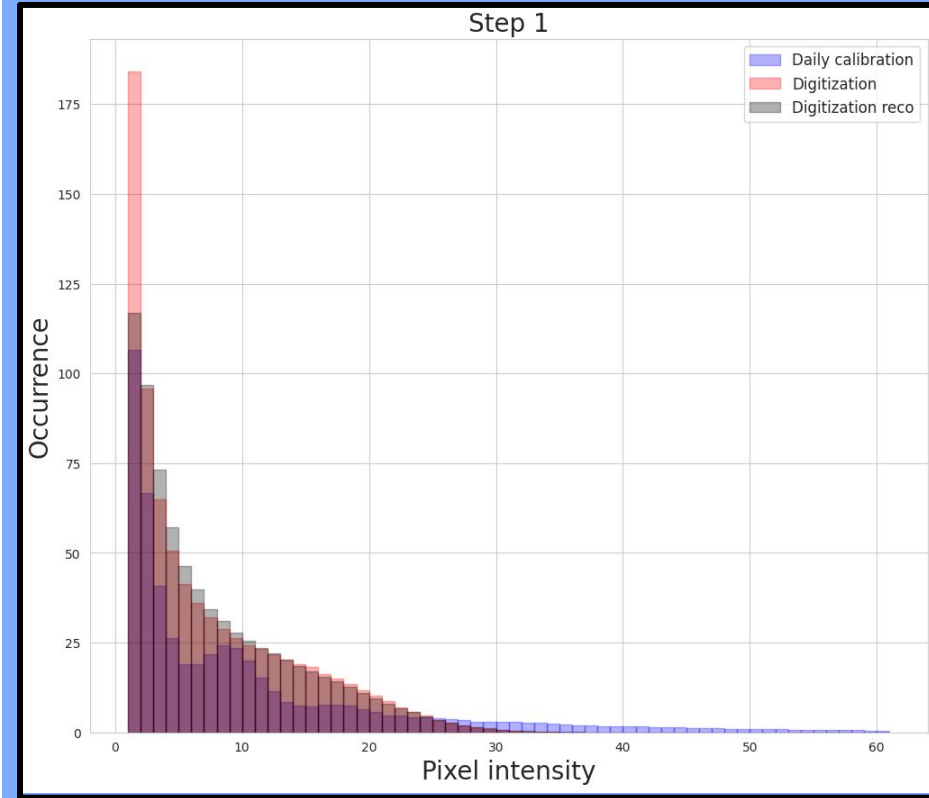
- There are some **discrepancies** on the **size** and **nhits** between **real data** and **digitization**.
- **Noise pixels** added to the **clusters** on **reconstruction** create the gap on **size**.
- Pixels with **1 ADC intensity** on **truth** information that are **lost after reconstruction** create the gap on **nhits**.



Digitization

- Real data has more pixels with high intensity compared to the digitization.
- The missing pixels between truth digitization and reconstructed digitization are between 0 and 1 (not shown in the histogram).

*make redpix_ix vs iy and iz





3. Conclusions

Conclusions

- The **digitization results** seems close to the **daily calibration** data on **ADC energy**, but the **distribution** of the **intensity across** the **pixels** is **slightly different**.

- These parameters seems fine to be used on the low energy simulation.
 - GEM gain: **0.027** (old: 0.03).
 - beta: **3.5e-5** (old: 0.8e-5).
 - absorption_l: **800** (old: 1350).

Thank you

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