Introduction

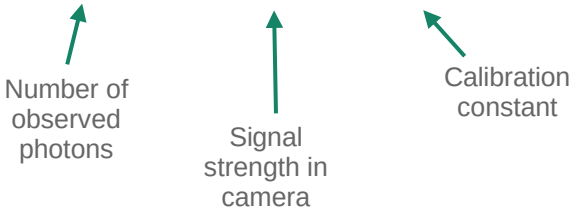
Paul Filip

Outline

- XY Scanner
  - Calibration procedure
  - To Dos (i.e. my work)
- SSD triggers
  - Online calibration
  - Upcoming work
- Other stuff

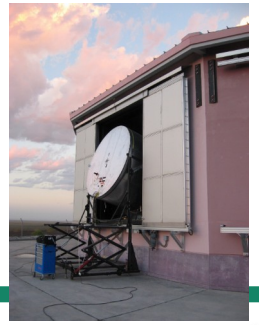
Energy calibration @ FD (and SD by cross calib.)

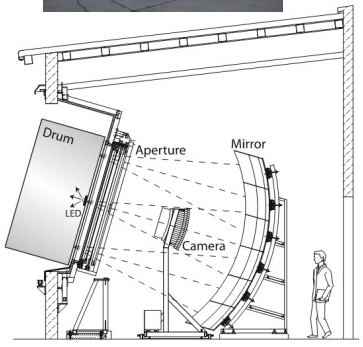
$$E \leftarrow N_\gamma \sim S_{FD}\ C_{FD}$$



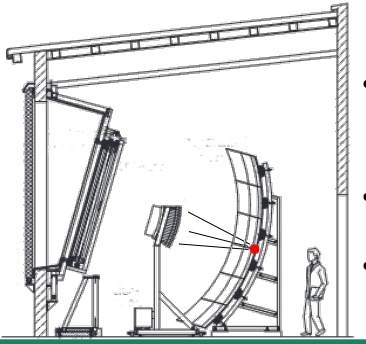
Energy calibration @ FD (and SD by cross calib.)

$E \leftarrow N_\gamma \sim S_{FD}$ C_{FD} → **require dedicated calibration measurements!**



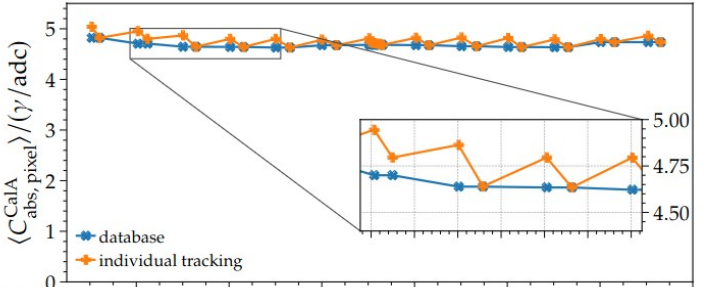


Expose telescope to lightsource and measure response to (known) signal



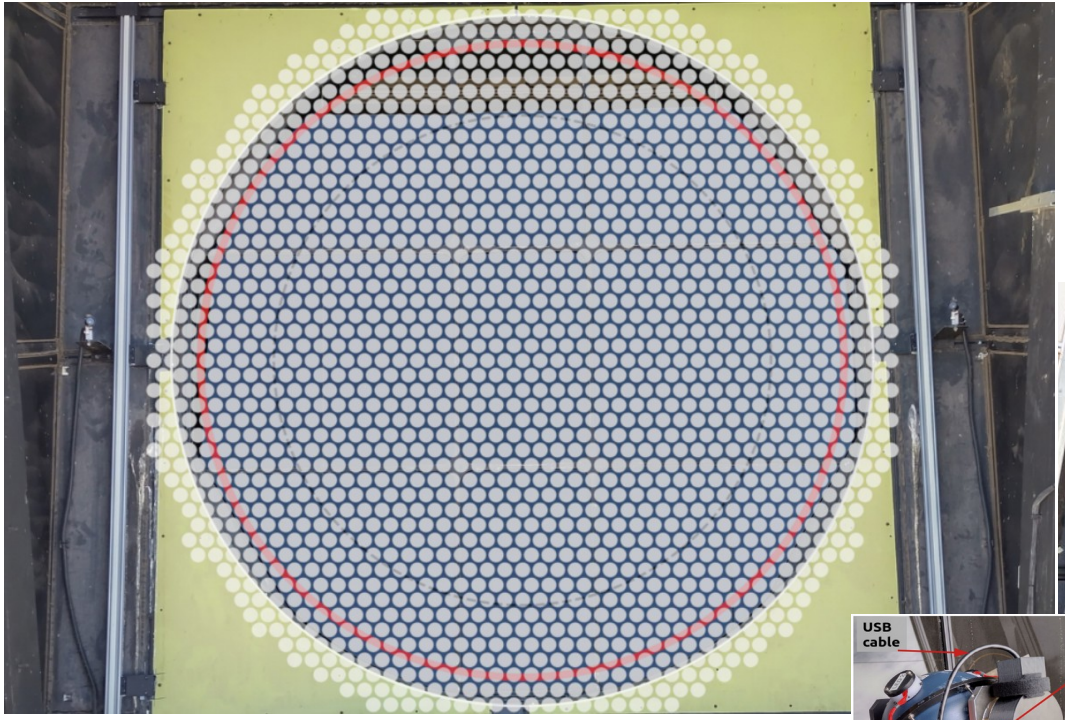
2013

- Track relative drift by exposing camera to known light source
- **Blind to changes in mirror/filter!**
- Combined calibration error of **~9%**

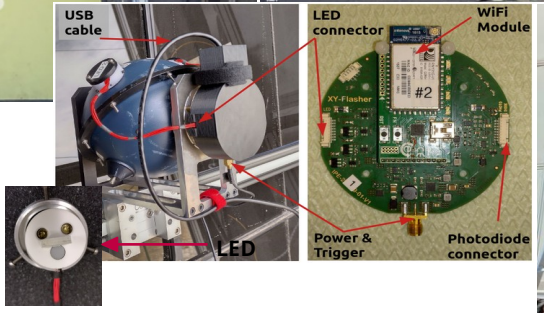


Mean pixel calibration constant for 2-week period in november 2022, from Calibration A

The XY Scanner – size matters



- Sum of many measurements at different positions mimic the drum
- Portable light source
- Absolute calibration is possible on- and off-site



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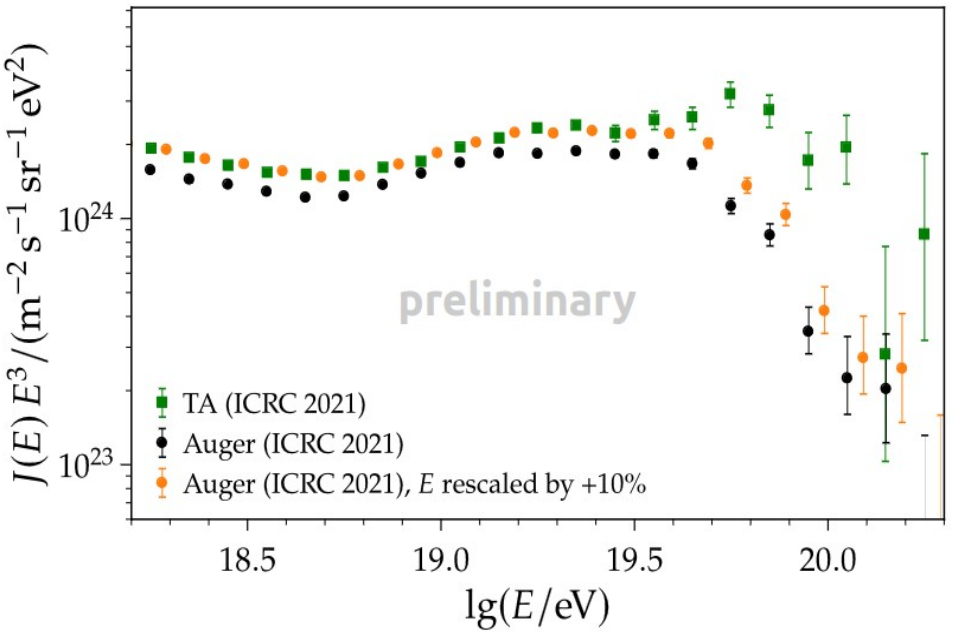
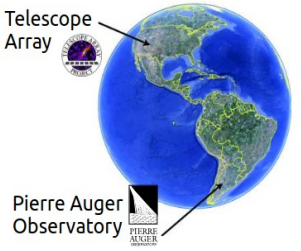
Novel absolute calibration for FD

- **~9%** uncertainty in FD from drum
- XY-Scanner: **<5%** uncertainty
- Easier handling → less personnel and DAQ time → more data

contribution	XY	Drum
Radiance of the light sources L_{src}	2.8%	~7%
Coverage factor f_{cov}	1.3%	-
Light source directional emission ξ_{pixel}	1%	~3%
Back-reflection on telescope camera $c^{\mathrm{sim}}_{\mathrm{pixel}}$	0.5%	~3%
Signal in the pixel-PMTs $S^{\mathrm{sim}}_{\mathrm{pixel}}$	0.2%	~3%
Statistical uncertainty (bootstrap)	2.1%	-
Unaccounted uncertainty budget	2%	~2%
Total	**4.4%**	**~9%**

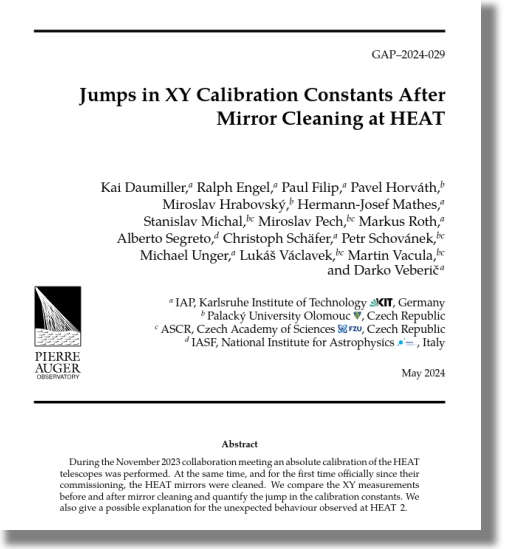


- Systematic bias (>20%) of XY calibration compared to Drum
- Could decrease discrepancy in spectrum from TA / Auger



To Dos (i.e. my work)

- Understand weird behaviour in some sites
  - Gather more long-term data
- Implement collaboration wide DB
  - How to do backpropagation (NSB? / Cal A?)
  - Standardize quality tests
- Understand difference in energy scale



GAP–2024-029

Jumps in XY Calibration Constants After Mirror Cleaning at HEAT

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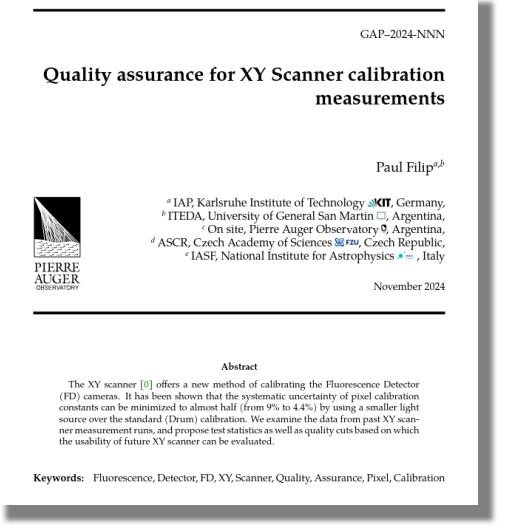
[d] IASF, National Institute for Astrophysics, Italy

May 2024

Abstract

During the November 2023 collaboration meeting an absolute calibration of the HEAT telescopes was performed. At the same time, and for the first time officially since their commissioning, the HEAT mirrors were cleaned. We compare the XY measurements before and after mirror cleaning and quantify the jump in the calibration constants. We also give a possible explanation for the unexpected behaviour observed at HEAT 2.



GAP–2024-NNN

Quality assurance for XY Scanner calibration measurements

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November 2024

Abstract

The XY scanner [0] offers a new method of calibrating the Fluorescence Detector (FD) cameras. It has been shown that the systematic uncertainty of pixel calibration constants can be minimized to almost half (from 9% to 4.4%) by using a smaller light source over the standard (Drum) calibration. We examine the data from past XY scanner measurement runs, and propose test statistics as well as quality cuts based on which the usability of future XY scanner can be evaluated.

Keywords: Fluorescence, Detector, FD, XY, Scanner, Quality, Assurance, Pixel, Calibration

SSD triggers

- Increase the SD aperture for *exotic* events by incorporating the SSD in the Phase II data acquisition

  - For event detection → need SSD triggers
  - For calc. of exposure → need SSD monitoring
  - For SSD triggers & monitoring:

→ need SSD online calibration!

Rate-based SSD online calibration

GAP–2024-065

Expected performances for rate-based estimations of the SSD MIP peak independent of WCD triggers

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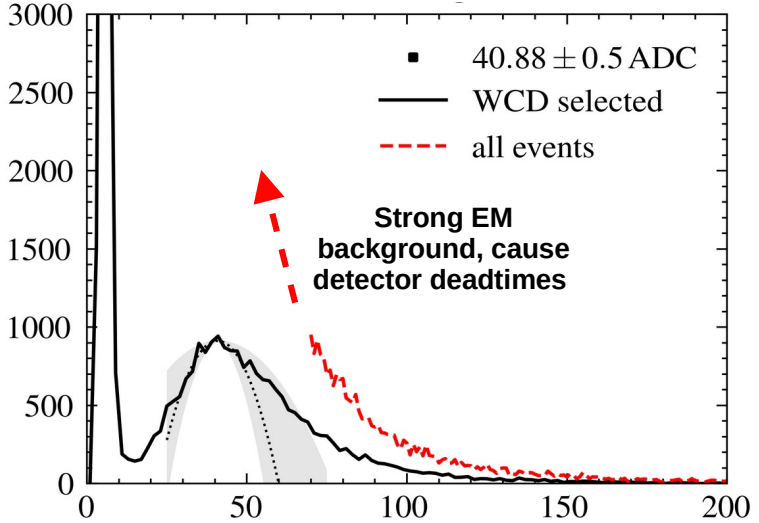
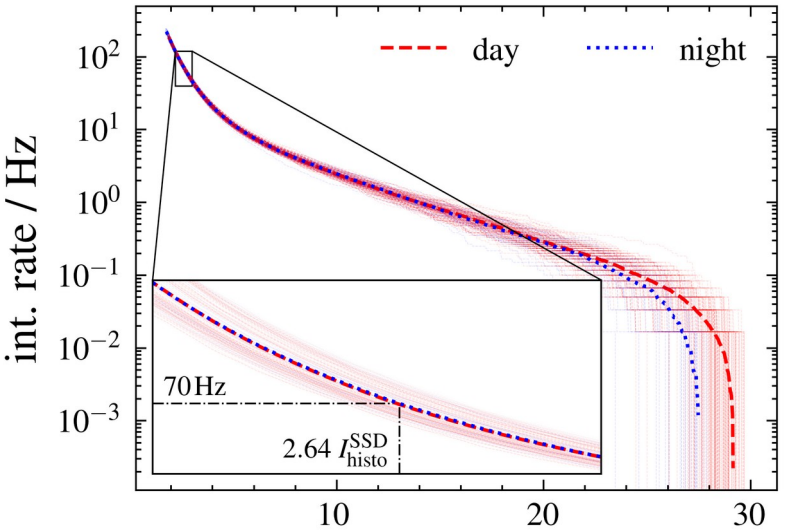
November 2024

Abstract

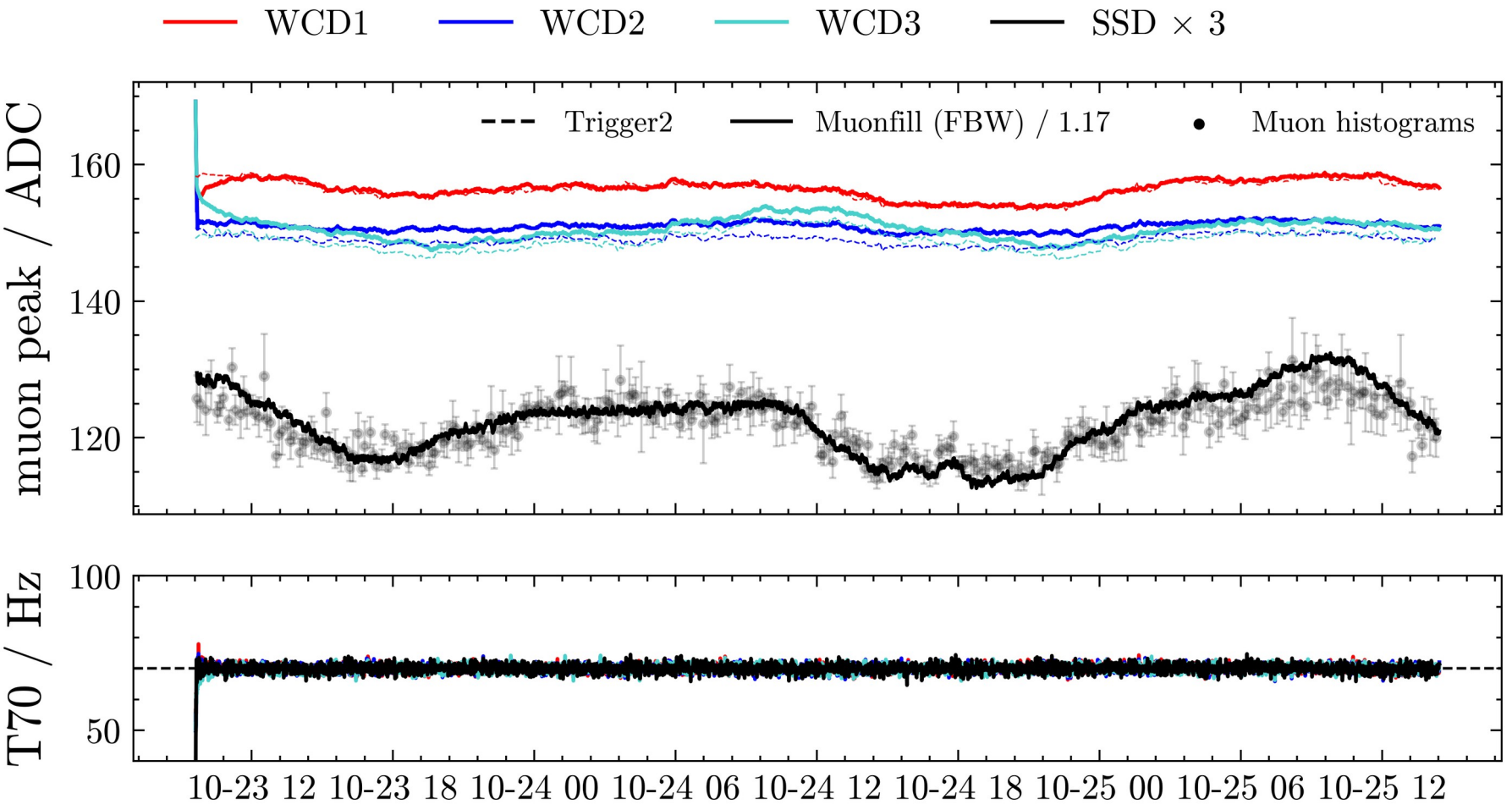
We present the results of a dedicated measurement campaign in April 2024 that was aimed to quantify the expected performances of a rate-based estimator of the SSD MIP peak. We detail the measurement process of the - in total - two DAQ runs and perform sanity checks on the gathered data. In total, we find that a rate-based estimator for the SSD MIP peak, which utilizes only information from the SSD PMT, is able to estimate the histogram-based MIP peak on average to within 5%.

Keywords: SSD, MIP, online, calibration, peak, histograms





Rate-based SSD online calibration



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Upcoming work

- More tests/work for final implementation needed
  - Larger scope for integration tests (more stations, more time)
  - Propagate online MIP (+ VEM?) peak to monitoring
  - Reflect changes in CDAS & lay ground work for SSD triggers
- Think about SSD trigger implementation
  - Purity? (→ must have acceptable T2 rate)
  - Efficiency? (→ need to be able to distinguish e.g. neutral particles)
- Make some cocktails for IteDA =p

Backup