

Towards an online MIP calibration

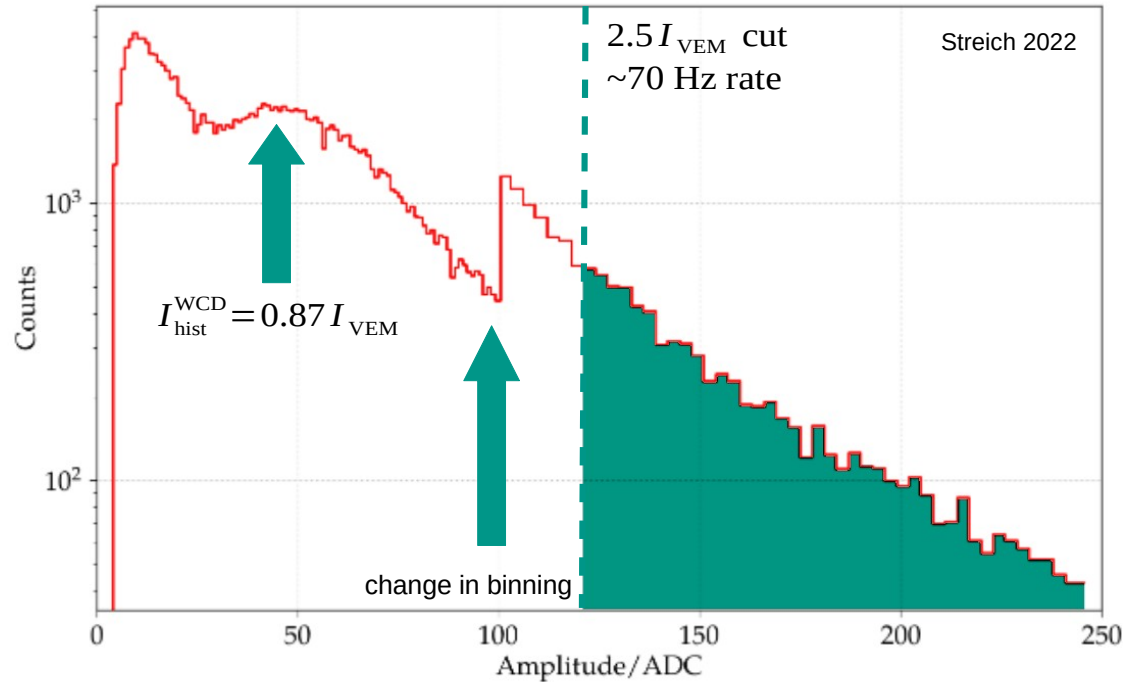
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Outline

- Overview of online (WCD) calibration
- `muonBuffer` vs. `showerBuffer`
- Integration test results
- Summary and outlook

Current (WCD) calibration

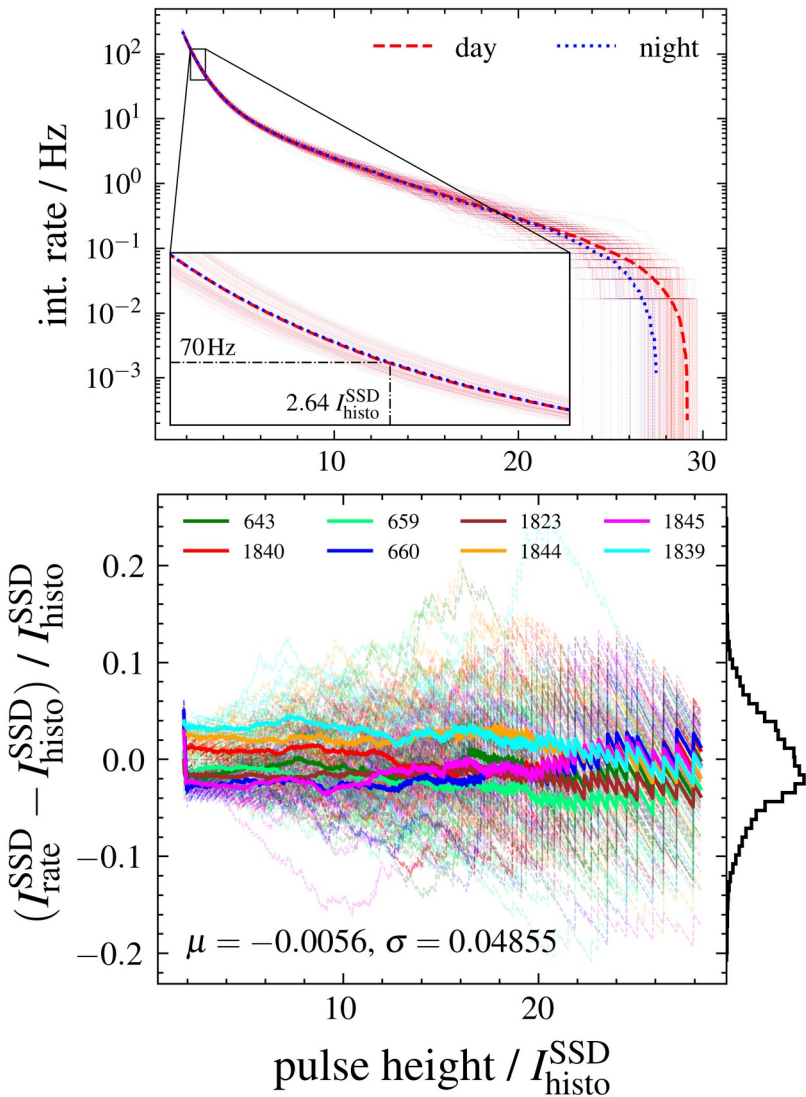
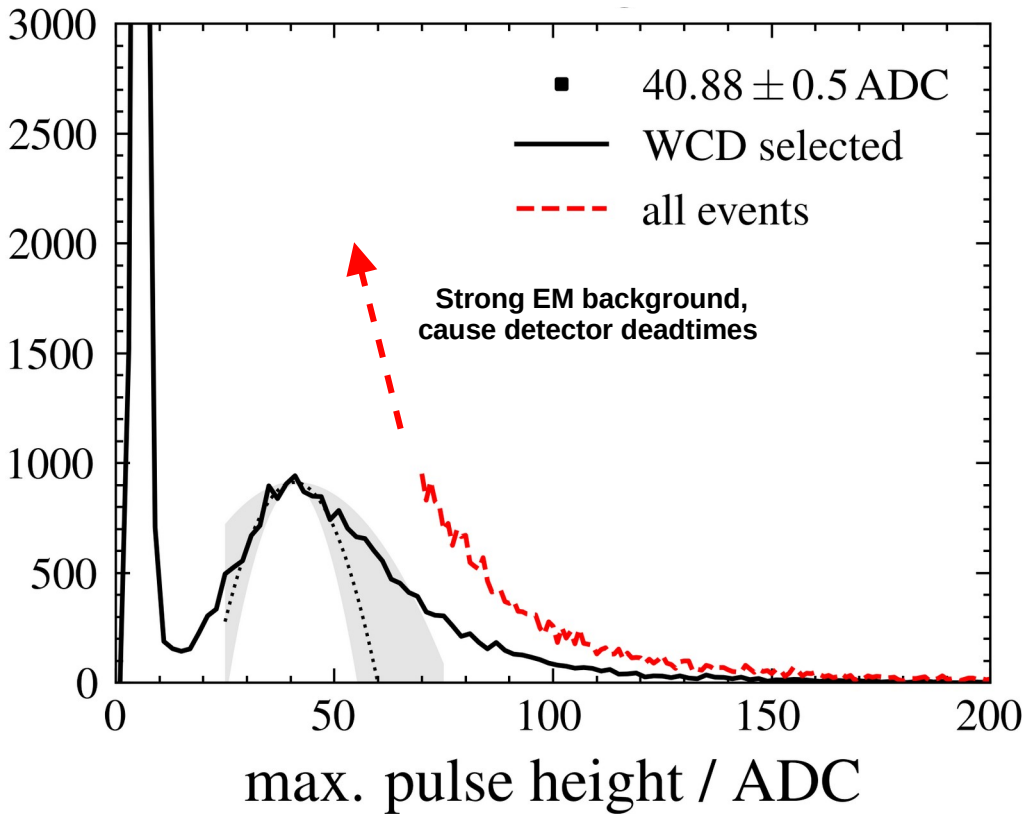
- WCD offline calibration
 - Fit muon hump in histogram



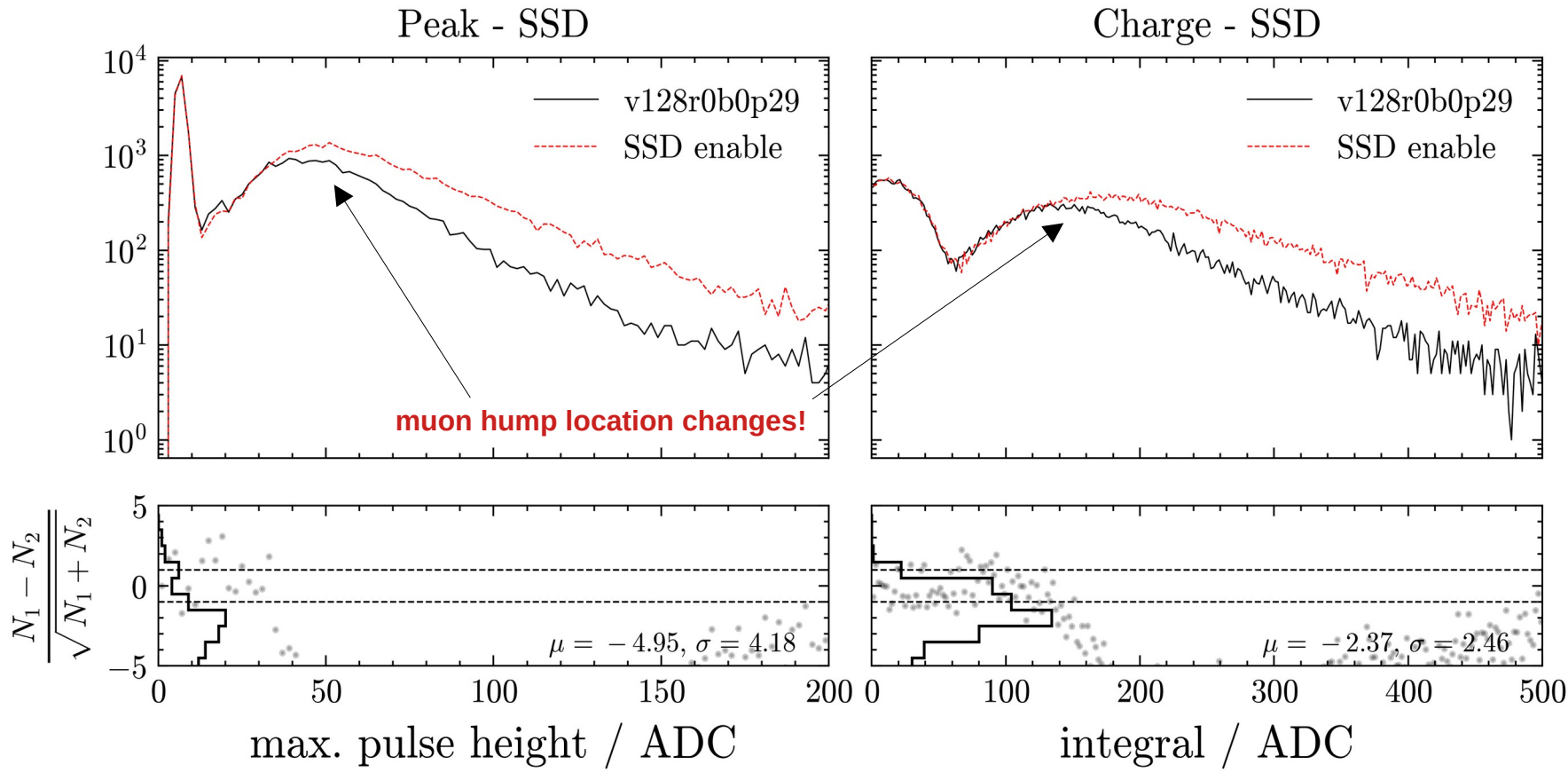
- WCD online calibration
 - Calibration trigger with threshold k , that satisfies:
 - Threefold coinc. of $0.7 k$
 - >1 PMT above $1.0 k$
 - Iteratively adjust threshold until 70 Hz rate is reached
 - Threshold equals $k \approx 2.5 I_{\text{VEM}}$
 - Accurate to $\sim 2\%$
 - See also GAP2023-049

Recap of past work

- GAP2024_065

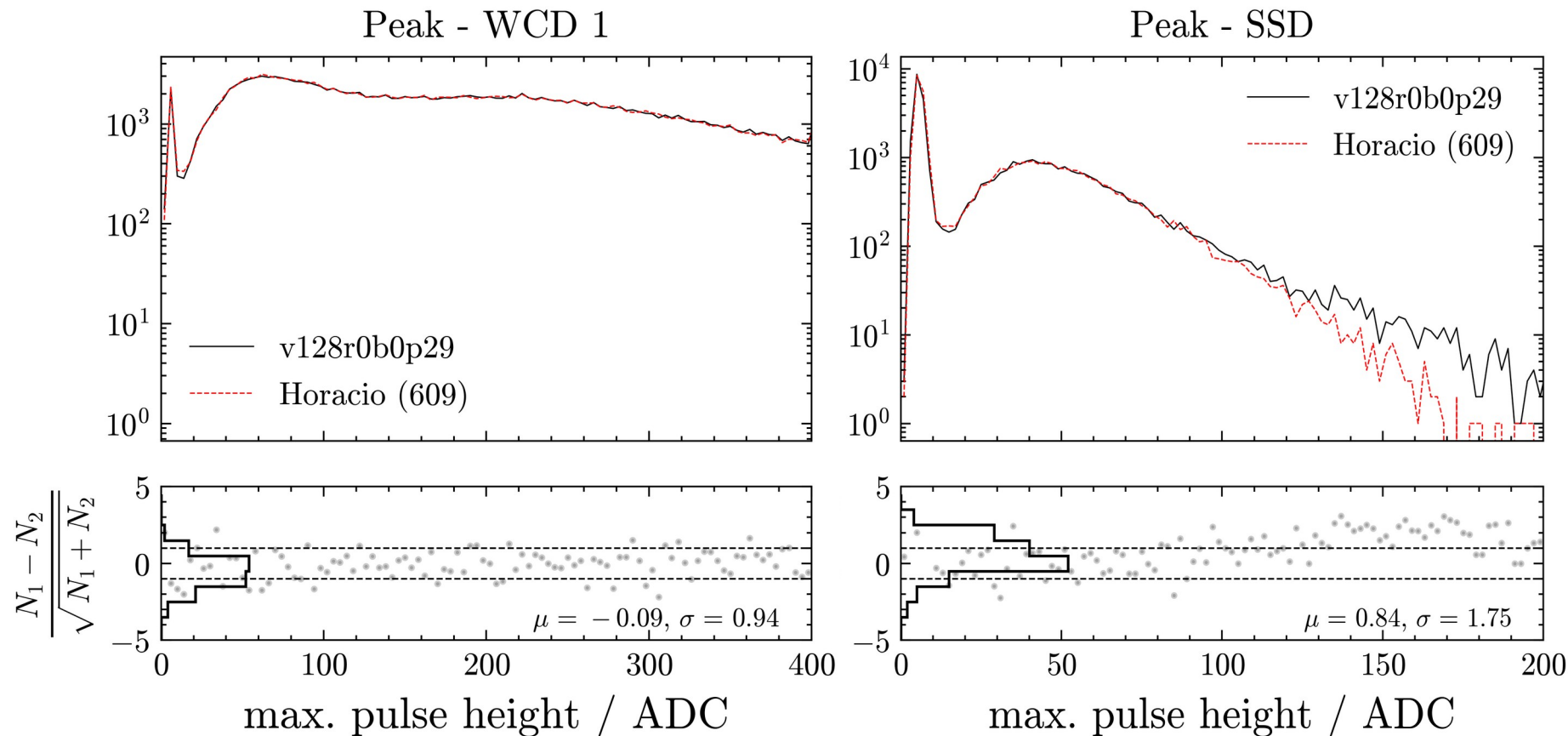


muonfill backwards compatibility



- Which peak to calibrate on? Muon? Or Muon + EM?

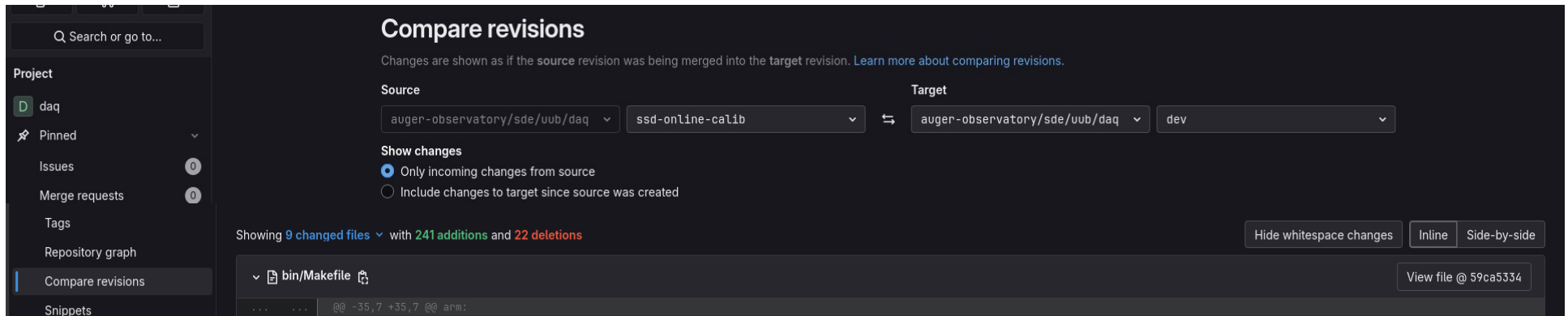
muonfill backwards compatibility



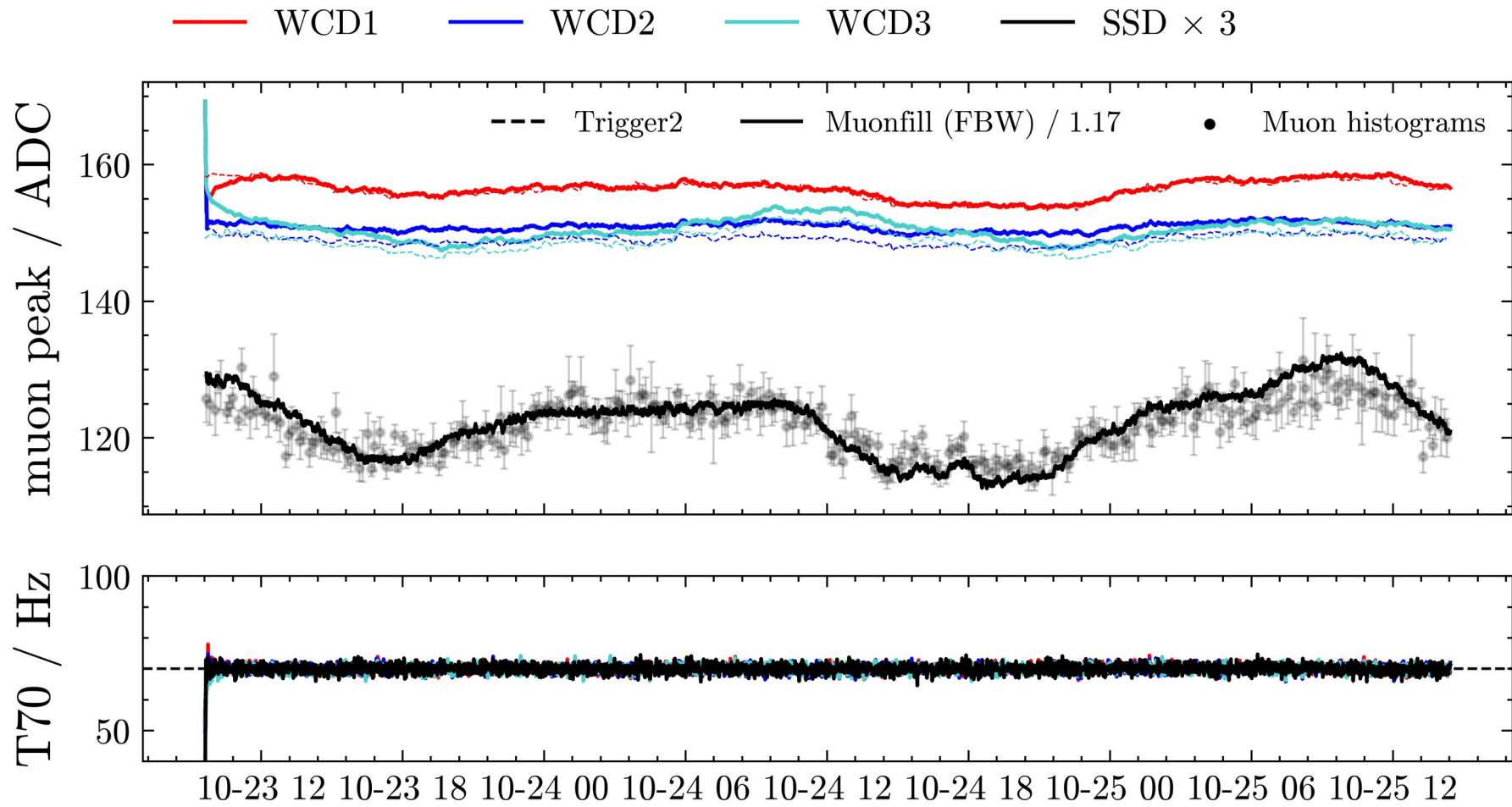
- Softer spectrum for SSD. Why? Significant? Detector deadtimes?

SSD online calibration

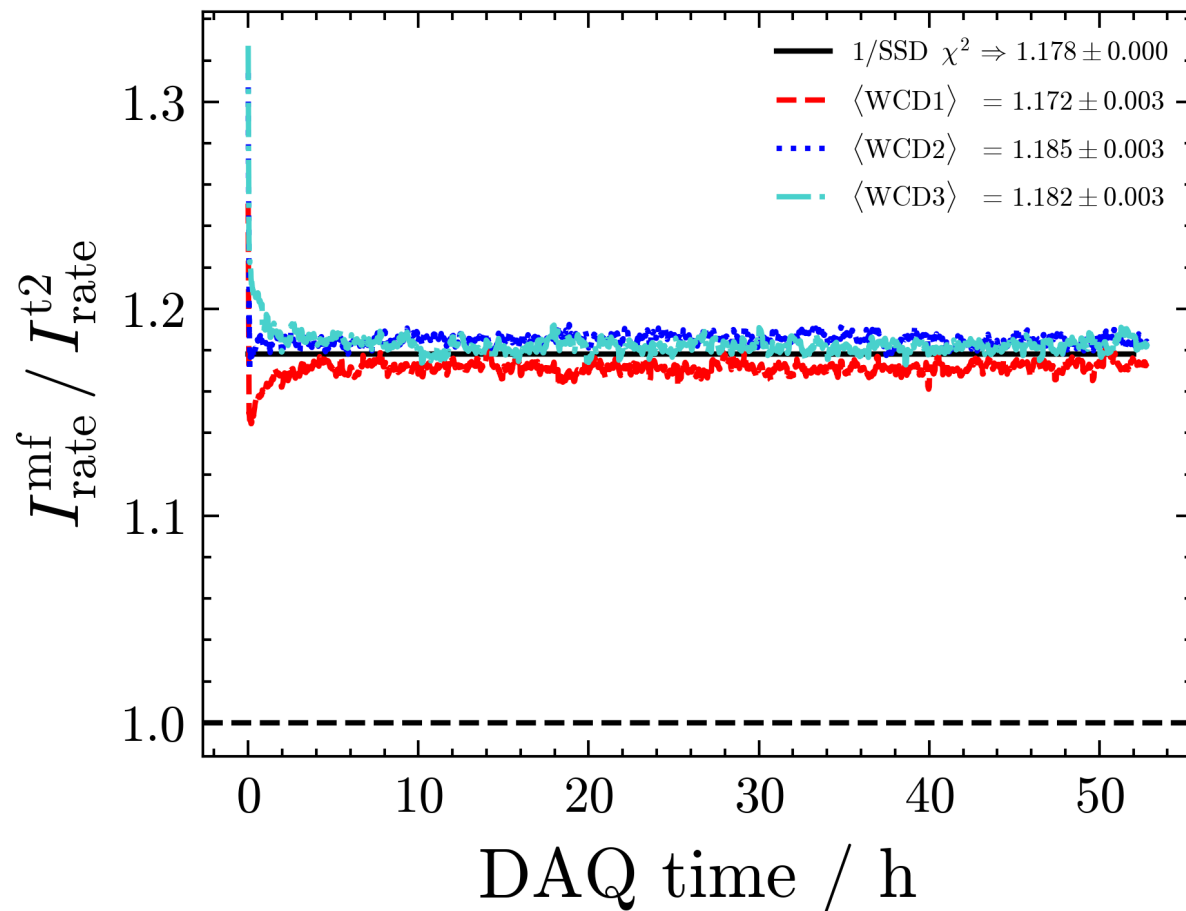
- Branch in SDE/uub/daq in development since Aug. 12th
- muonfill process iterates over each bin/PMT/trace in muonbuffer
 - For histograms: record max. pulse height and charge
 - **For online calib: check calibration trigger conditions**
- Evaluate trigger rate and reset trigger thresholds periodically



Integration test results



Integration test results



- WCD offset sensible
 - Issue w/ F&D vs. FBW
- SSD offset unexpected
 - Station fluctuations?
 - Problem exists between hair and keyboard?
 - Why 1/WCD offset?
- Further tests needed

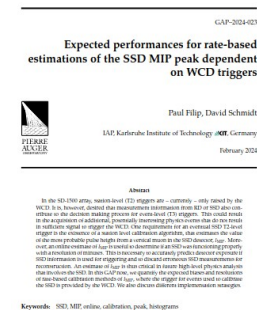
Summary and outlook

- New UUB DAQ version under development
 - running stable on test stations (Didi (136), Horacio (609))
 - get functioning online VEM peak calibration for free
 - Online MIP peak needs constant(?) correction factor, why?
- 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

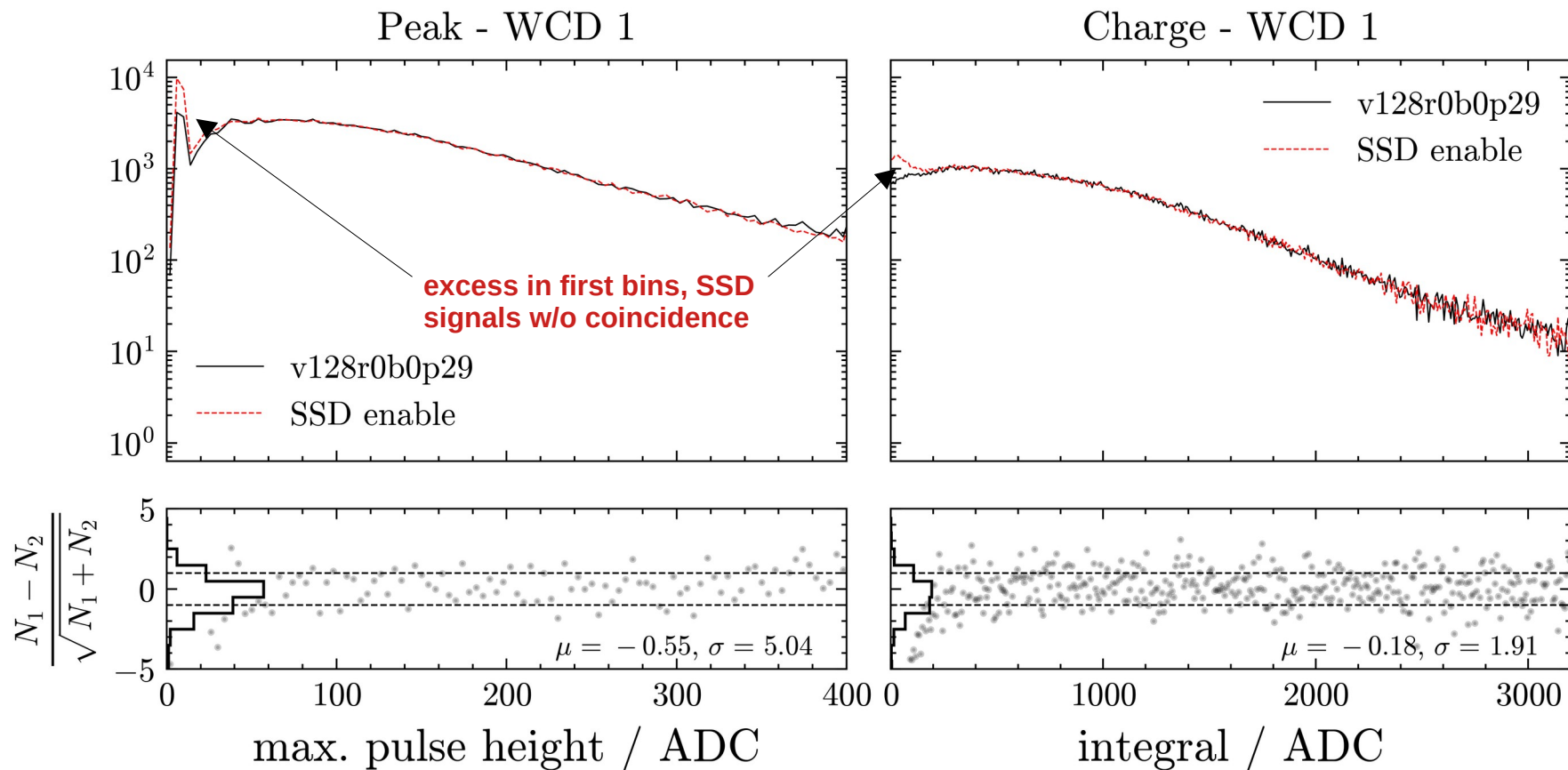
Backup

Recap of past work

- GAP2024_023
 - Analyze muon histograms to derive rate-threshold for SSD shower buffer events, predict MIP with it
 - Caveats due to implicit dependence on WCD calib.
- GAP2024_065
 - Run dedicated tests on Infill stations
 - WCD-independent SSD online calibration feasible
 - Error on rate-based MIP peak $< 5\%$ on average
 - $< 2\%$ for rate-threshold relationship < 5 MIP

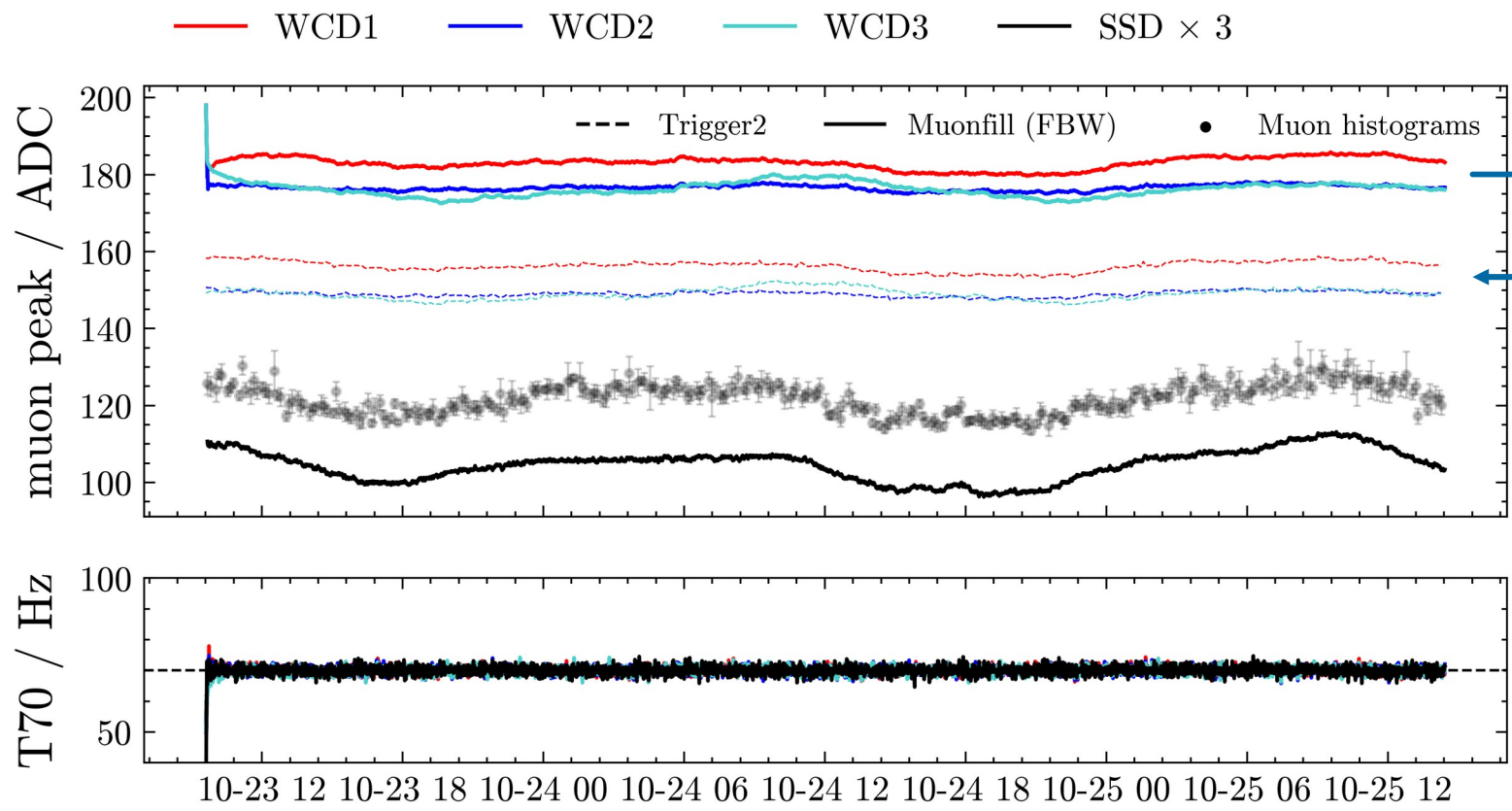


muonfill backwards compatibility



- Muon hump not present due to hardware(?) problems in Didi (136)

Integration test results



Use F&D rate-threshold relationship on FBW data
Need correction factor!

- Tested on Horacio (609)
- Running for <52h
- Stable VEM/MIP peak
- VEM \leftrightarrow Trigger2 VEM
- MIP \leftrightarrow T3 Histograms

