UUB-Commissioning

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for SDEU task

Introduction

- we want to show that the commissioned UUB performs as expected and desired

- we will show different parameters to highlight performance

- where applicable, we refer to on-going actions or problems coming from other components

Timing

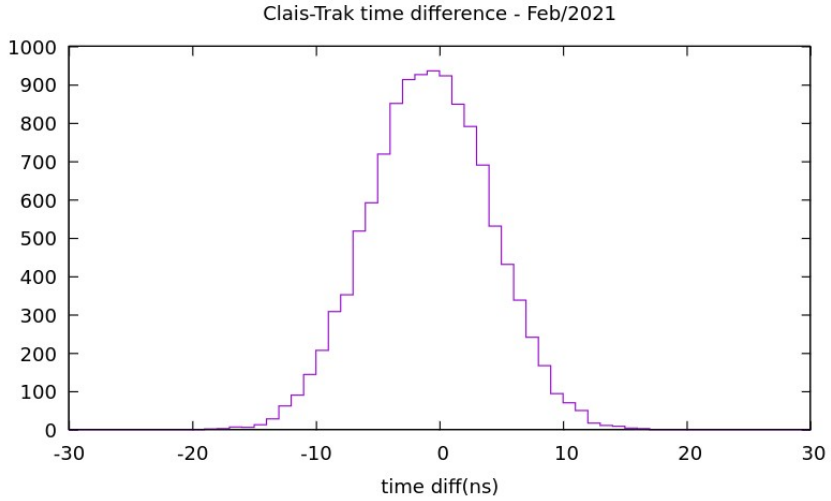
- UUB should provide GPS time with 5 ns accuracy → achieved

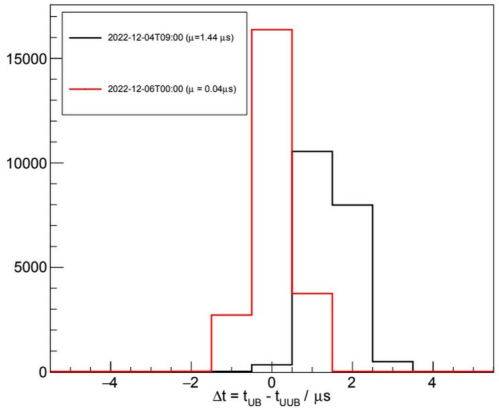
- all GPS information necessary available in data

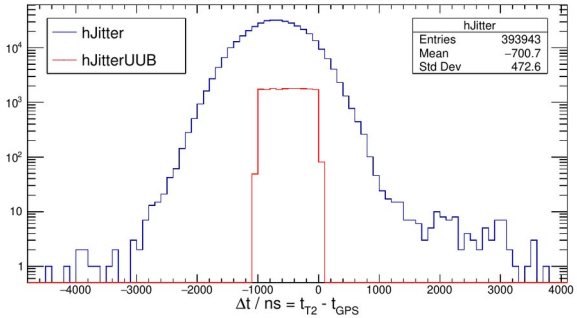
- GPS second offset is fixed (init., +GPS firmware)

- time jitter in T2-time tag reduced

- T2-time offset (trace-length) fixed



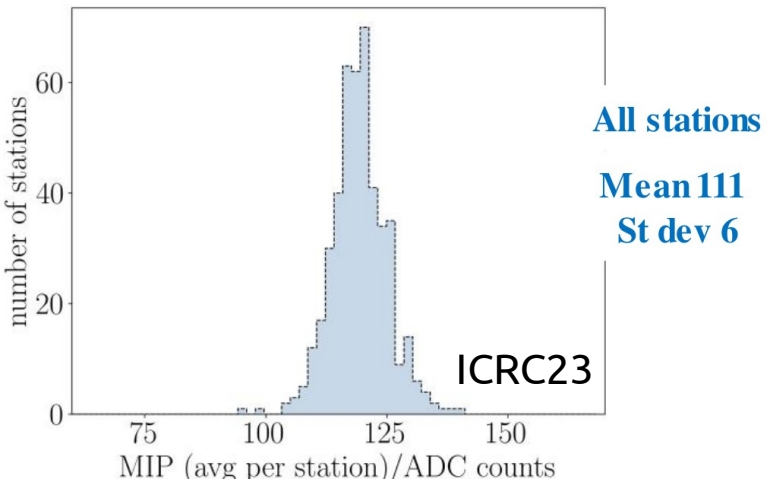


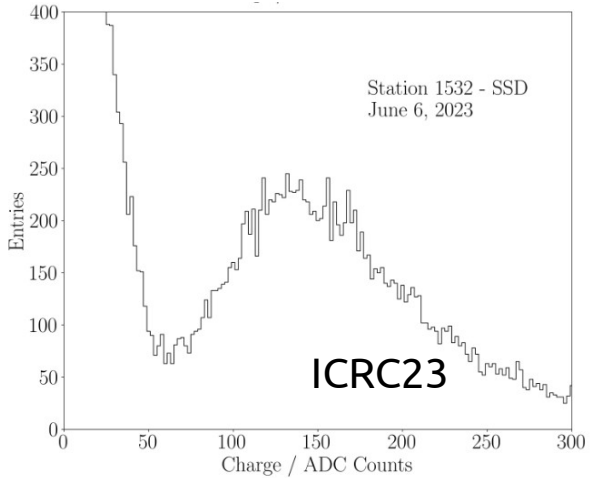


Signal/Calibration of SSD-PMT

- calibration of SSD also sets dynamic range

- MIP @ desired range, very uniform across detector



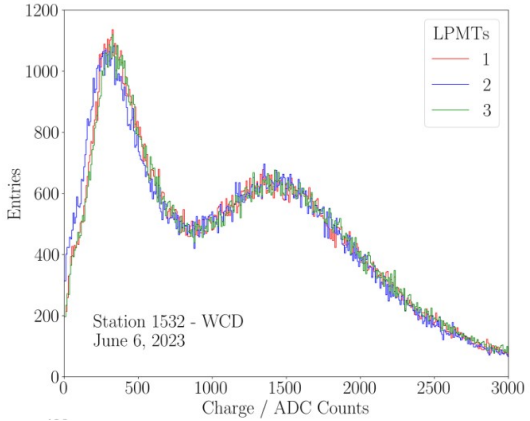


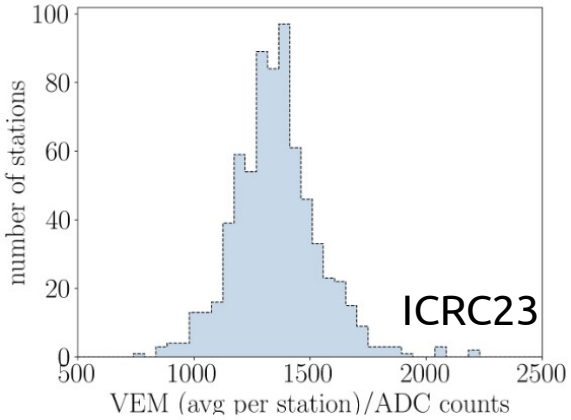
Calibration of LPMTs

- UUB has to record calibration histograms for offline calibration
  → provided, close to 100% of functioning PMTs

- uniformity: within 20% before detailed PMT-cuts

- interface for sPMT calibration provided, c.f. later





Online Calibration of LPMTs

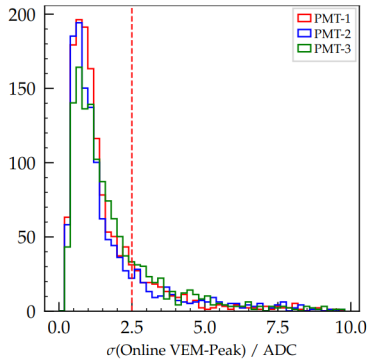
- for triggering, an online calibration of the LPMTs is necessary

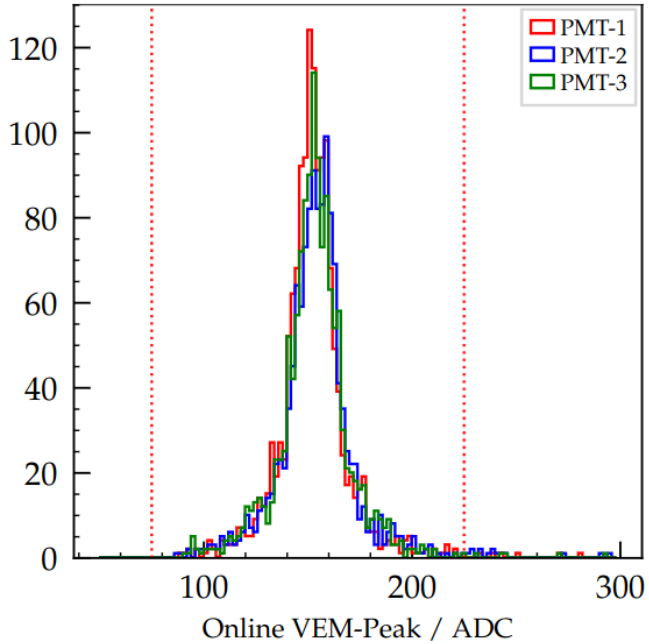
- the UUB provides an online calibration of the VEM-peak for the compatibility traces

- in the field: 150 ADC as mean, ~20 ADC sigma

- instabilities from unstable PMTs as with the UB (otherwise, variation < 1 ADC per day)

- online charge calibration:
  Not strictly necessary,
  in debugging





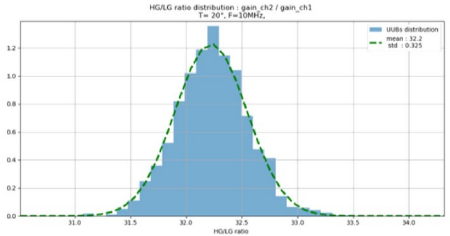
LG calibration

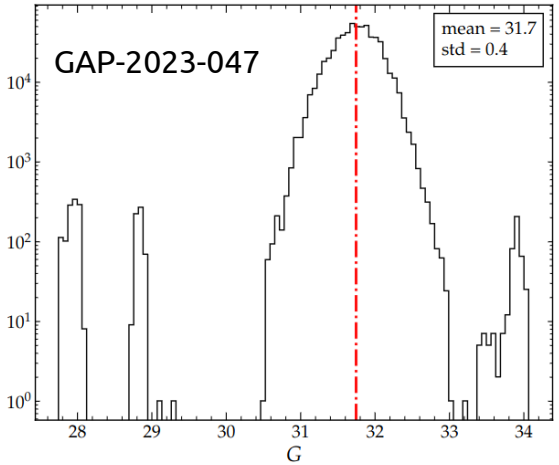
- now provided by the electronics: measured in the lab
  32.2 +- 0.3

- confirmed in the field

- the lab value is to be used in reconstruction

- outlier station: 1739 from UUB-EA

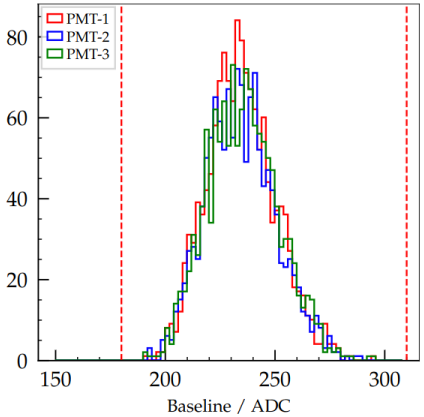


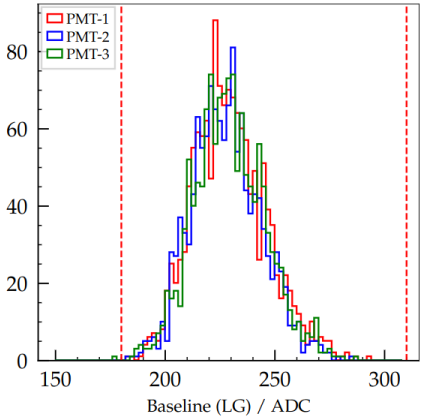


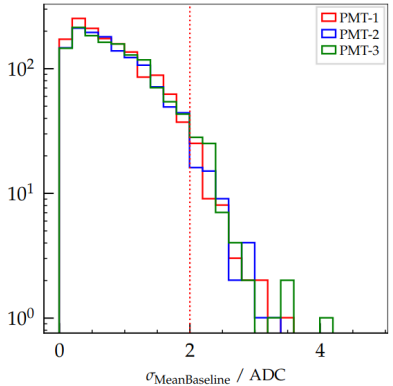
Baselines

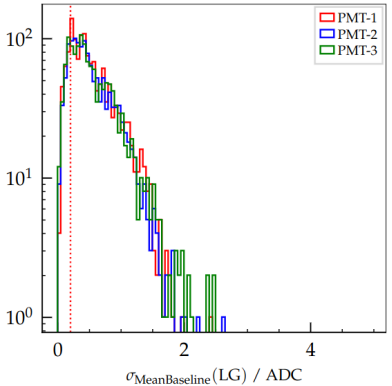
- baseline values and their variation over time are within expected ranges

- both in line with lab measurements





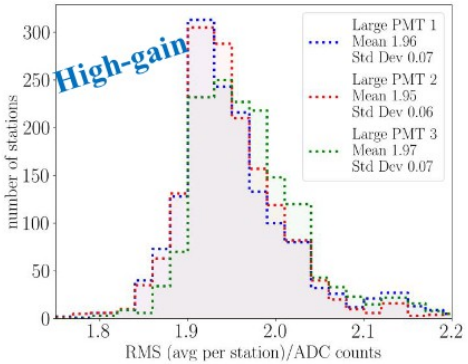


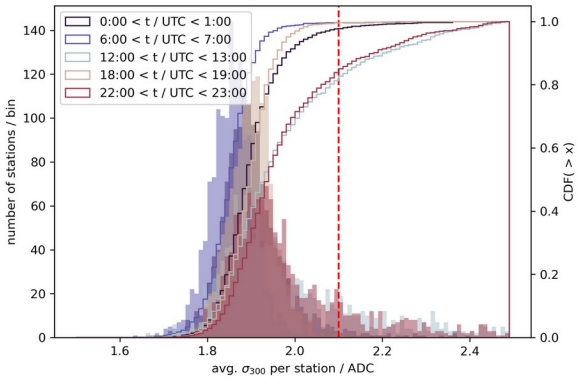


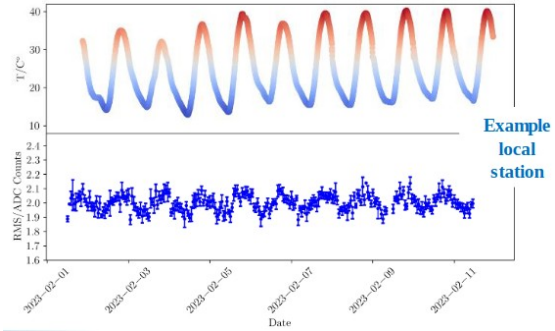
Noise Levels

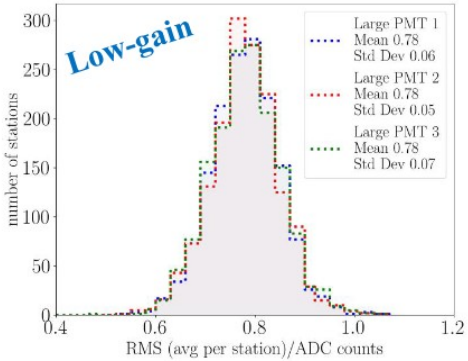
- noise levels generally within expected range < 2 ADC

- issues with a fraction of PMTs in given times of day
→ on-going mitigation:
    modification of TPCB
    correction of bad cabling









ICRC23

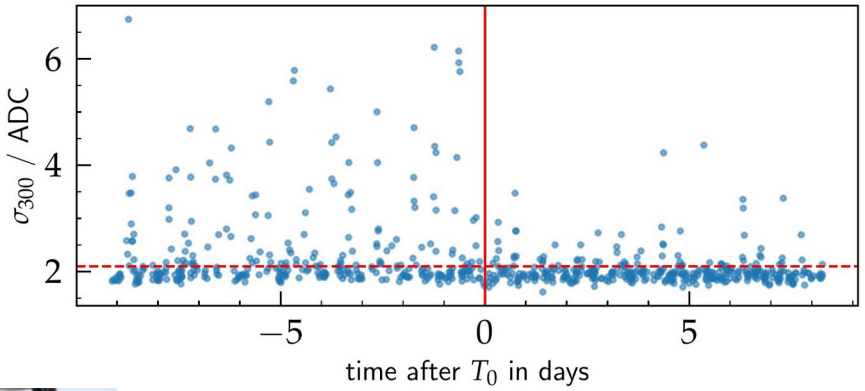
LPMTs Noise

- field campaign (Corine, Antonella, Juan Pablo, Patrick, Tiina) during Malargüe meeting: visit selected stations (1499, 1415, 1515, 1494) with PMT-1 noise to check cabling

- several problems with cabling identified

→ comparison of noise levels before / after shows clear reduction

Fixing cables is 'easy' and effective



Tiina

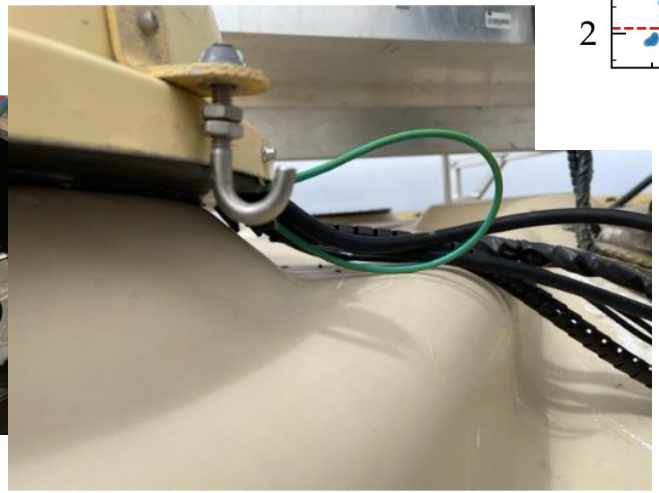
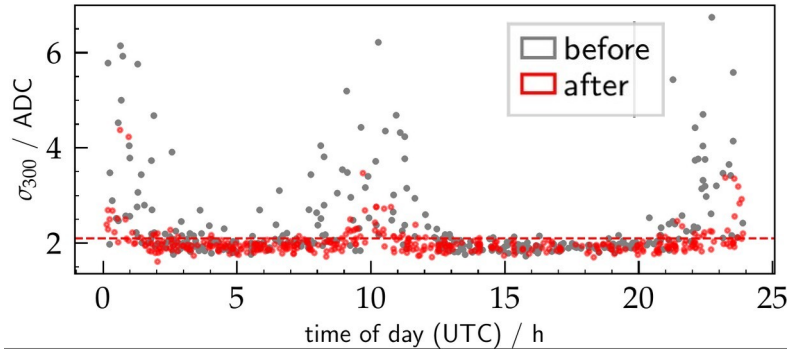


Figure 3: Grounding cable loop in The Nameless PhD

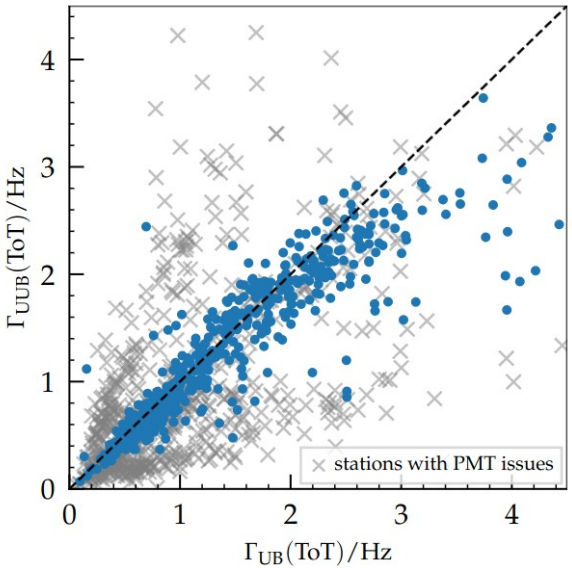


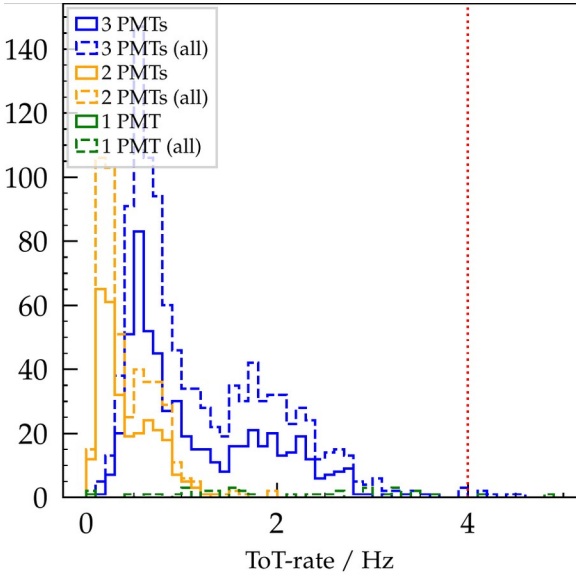
Trigger Rates

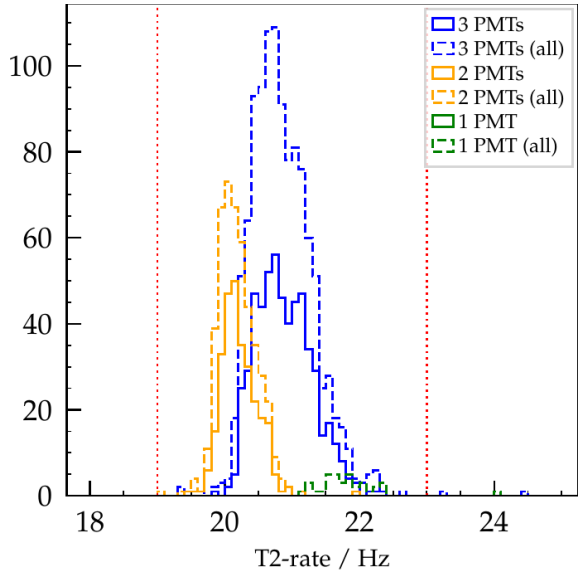
- rates for standard triggers in compatibility mode are similar to UB

- cases of non-working PMTs do **not** lead to extreme trigger rates either

- MoPS and ToTd still in commissioning due to transient noise problems







Summary

- main features of the UUB commissioned and ready

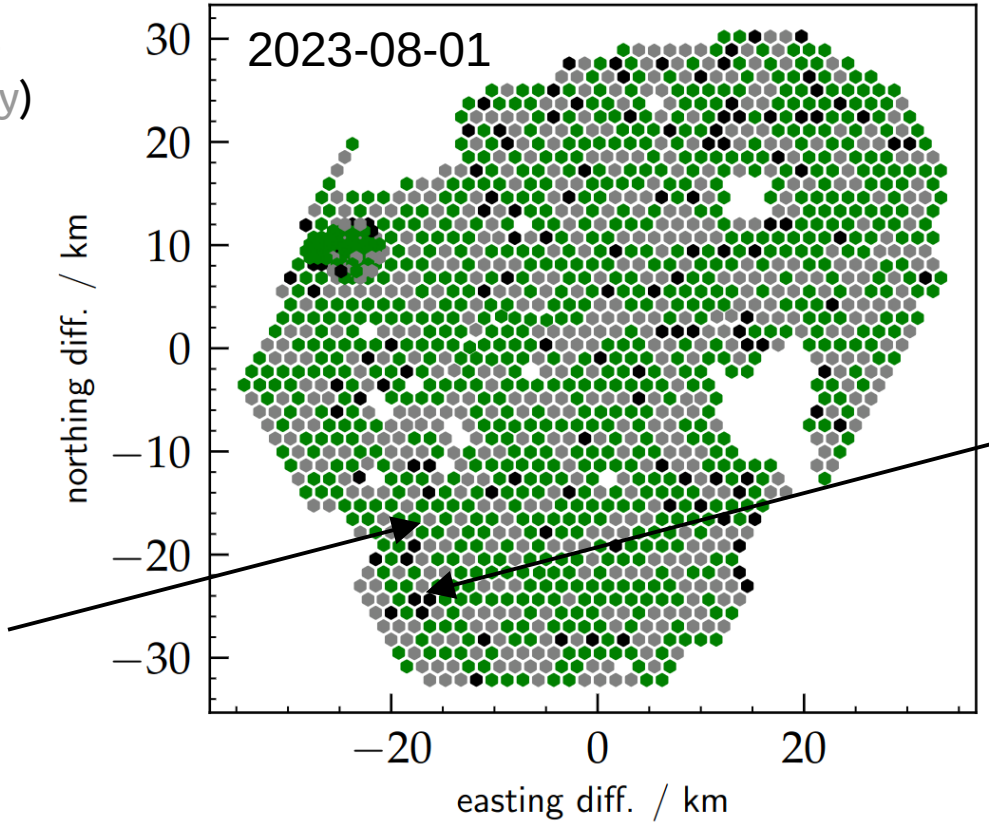
- on-going actions/mitigations for remaining issues (noise bursts, ToTd/MoPS)

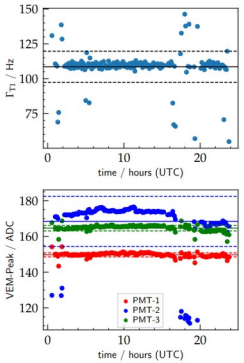
- all relevant data for analysis is provided

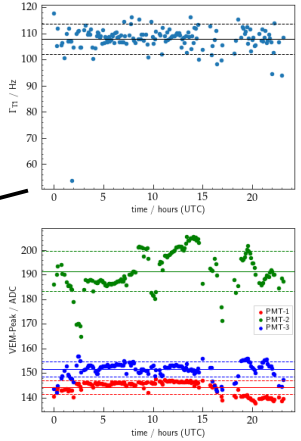
- next step: ‘physics commissioning’ with higher level analyses

LPMT-Status

- overall good situation:
  848 no problem (green)
  591 (> 1) PMT okay (gray)
  125 rejected (black)



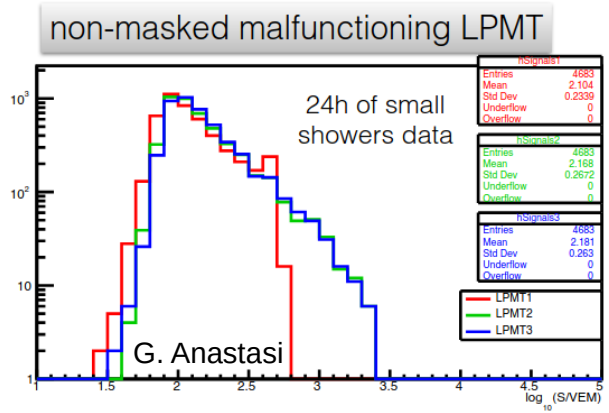


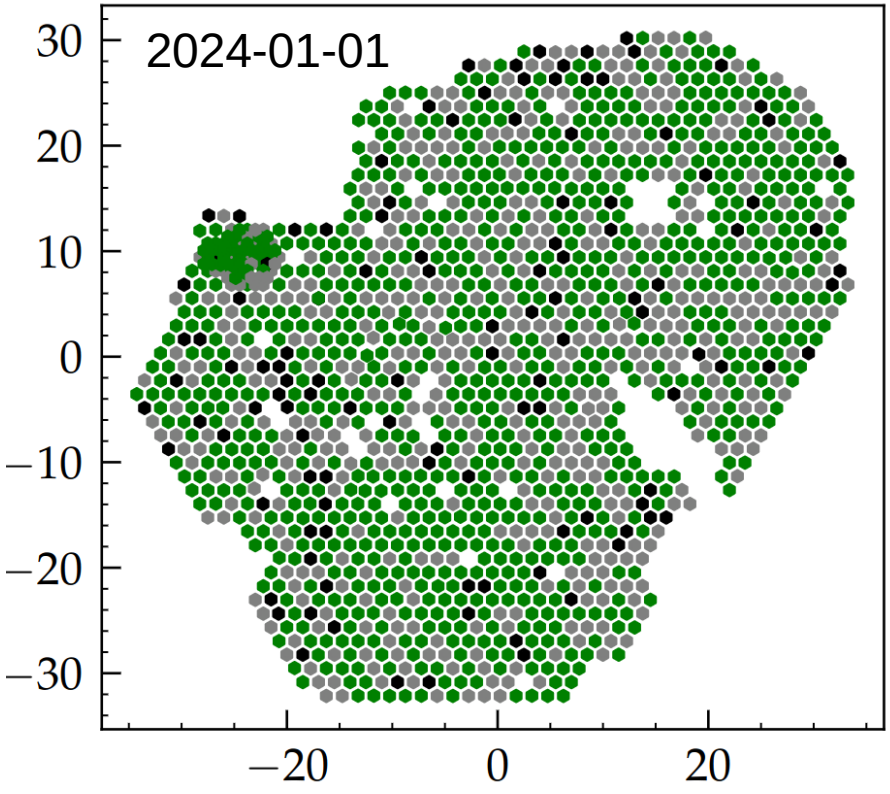


LPMT-Status

- overall good situation:
  911 no problem (green)
  511 (> 1) PMT okay (gray)
  115 rejected (black)
→ no significant change in austral summer!

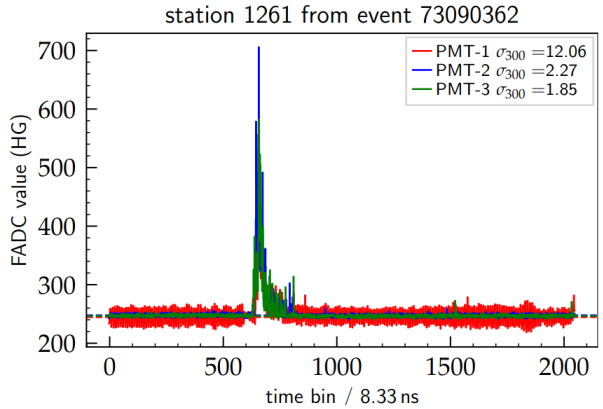
- needs improvement with false positives & analysis suitable for quality cuts on data
- important for sPMT-calibration!

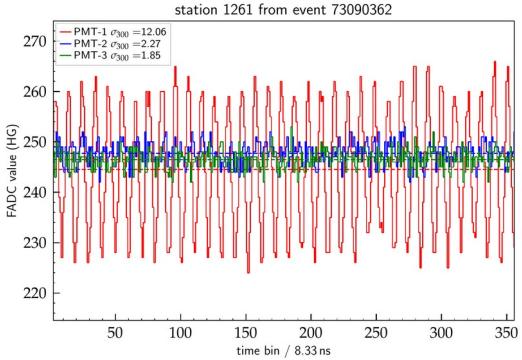


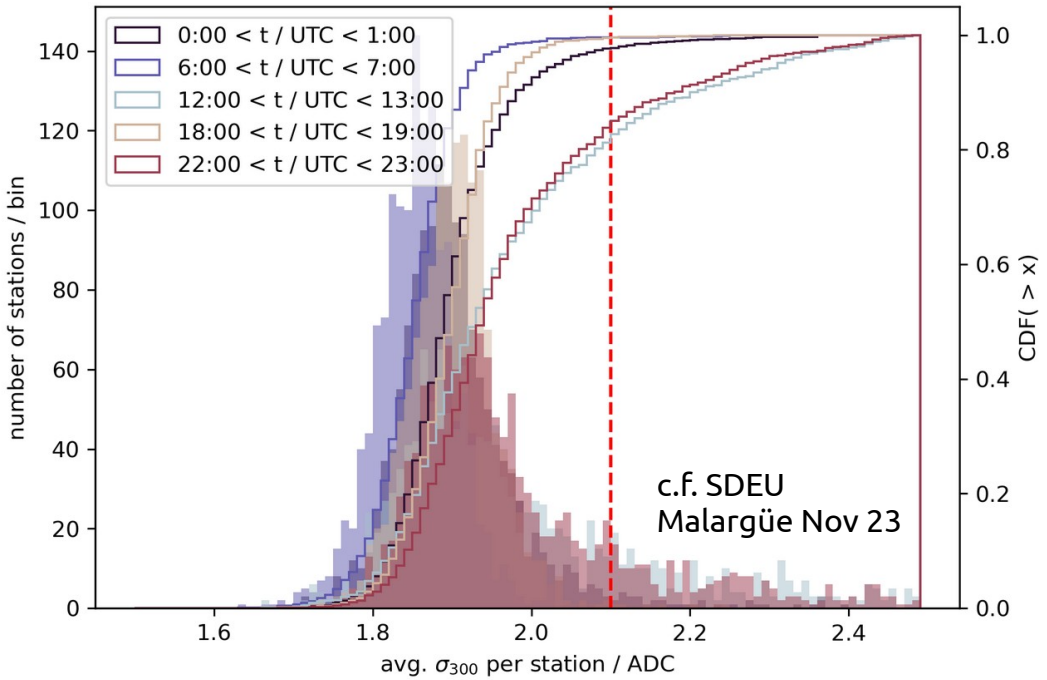


LPMTs Noise: Situation Nov ‘23

- Observe significant tail of pedestal fluctuations in trace data affecting ~20% of PMTs

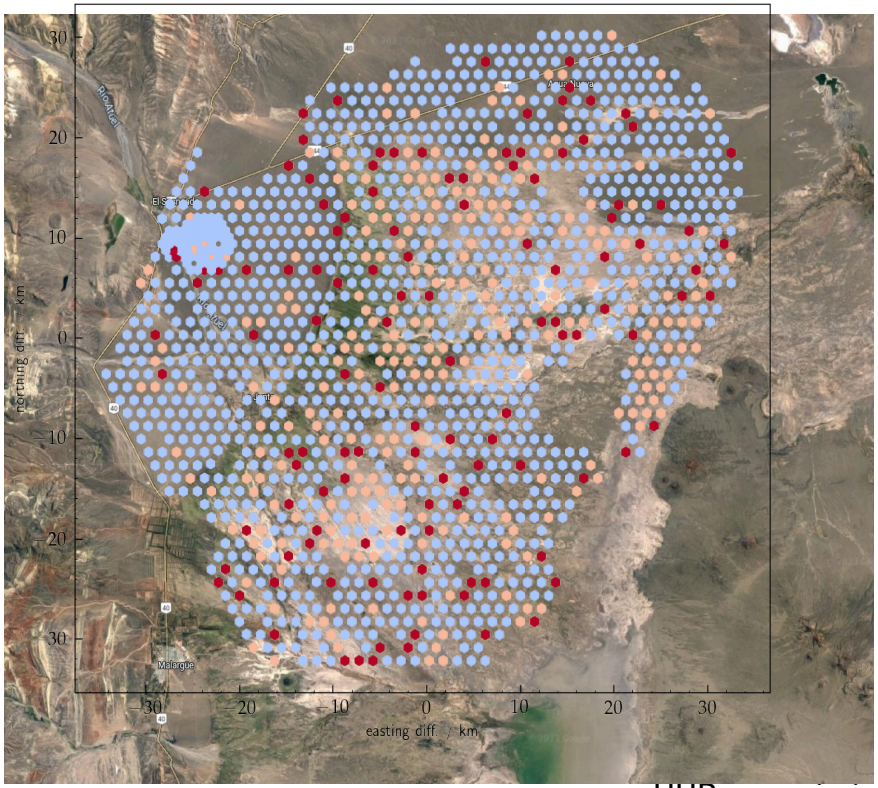


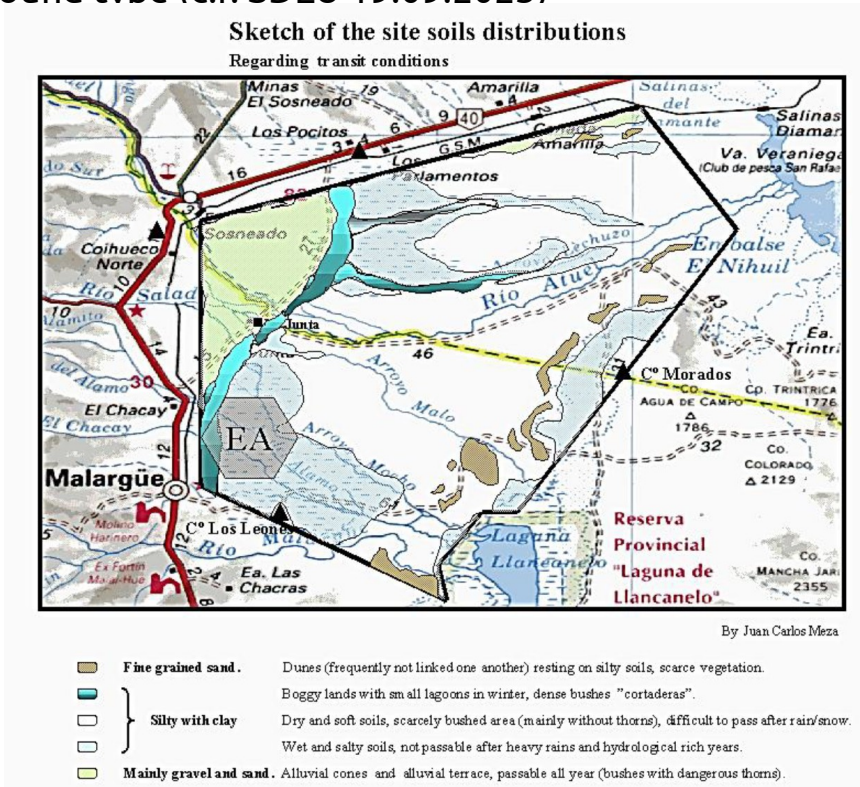




Hint: Grounding

- we see a ‘visual’ correlation of noise problems with ground type (c.f. SDEU 19.09.2023)





Hint: Grounding

- we see also a correlation with soil-water index (SWI) [provided by F. Frau (Instituto National del Agua)]

- in timeline the correlation is only present in parts of the year, so maybe just an accidental correlation but hinting towards grounding issues?