

Towards a rate-based online MLP peak

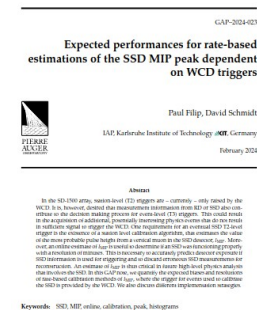
Paul Filip, David Nitz, Ricardo Sato, David Schmidt

Outline

- Recap
- Changes in LS software
- DAQ integration tests
- Summary and outlook

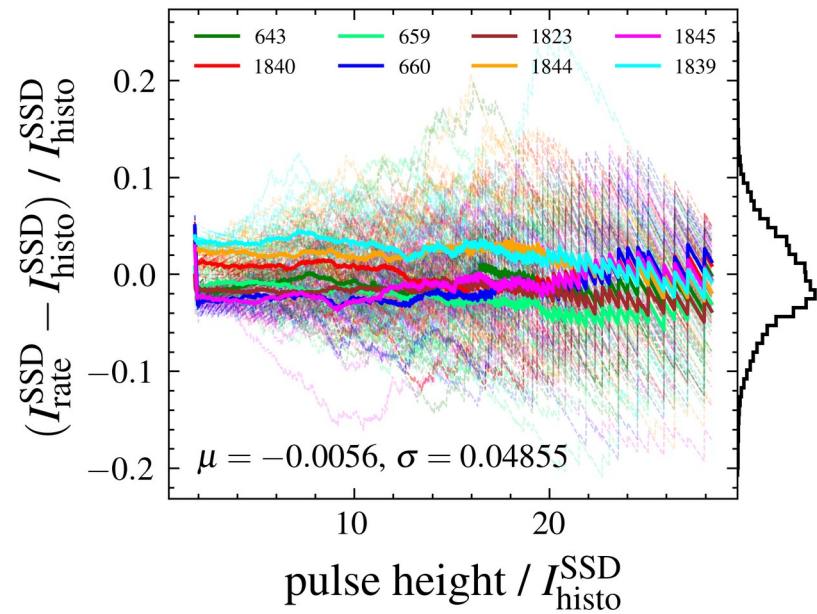
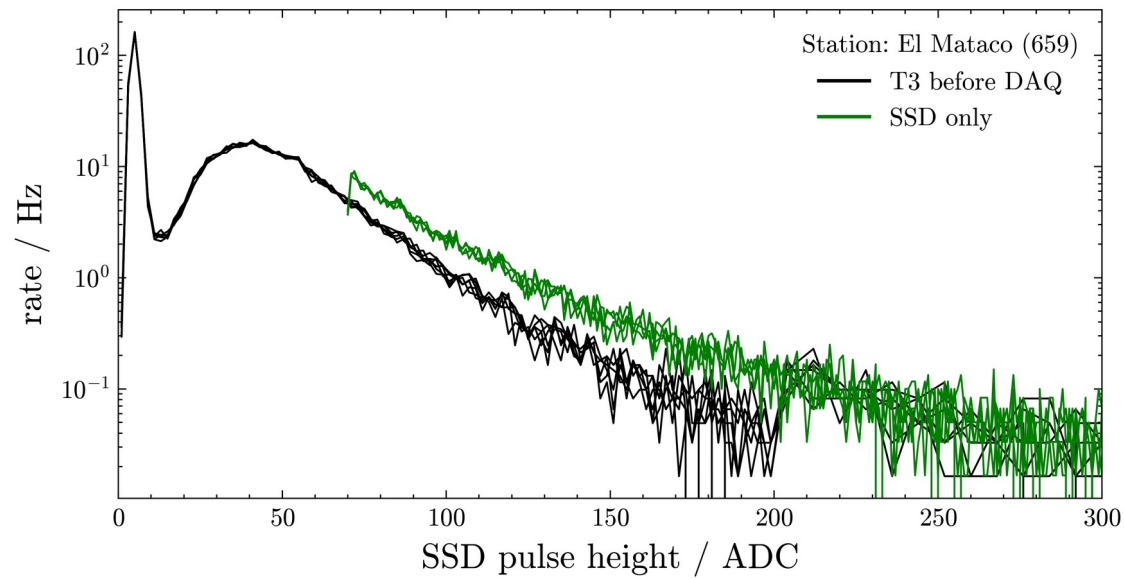
Recap

- 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_0XX (pending...)
 - Run dedicated tests on Infill stations
 - WCD-independent SSD online calibration feasible
 - Error on rate-based MIP peak $< 5\%$ on average



Recap

- GAP2024_0XX (pending...)



Changes in LS software

```
Mem: 63880K used, 449204K free, 42000K shrd, 0K buff, 42372K cached
CPU:  0.5% usr  1.0% sys  0.0% nic 98.4% idle  0.0% io  0.0% irq  0.0% sirq
Load average: 0.19 0.07 0.06 2/62 23367
```

PID	PPID	USER	STAT	VSZ	%VSZ	CPU	%CPU	COMMAND
6304	6303	root	S	2560	0.5	1	0.6	gpsctrl
48	2	root	SW	0	0.0	0	0.3	[kworker/0:1]
23361	23354	root	R	2948	0.5	1	0.1	top
6307	6303	root	S	135m	27.0	0	0.0	trigger2
6306	6303	root	S	7088	1.3	0	0.0	feshwrread
23353	867	root	S	2952	0.5	1	0.0	telnetd -i
6311	6303	root	S	2064	0.4	0	0.0	monitor
6309	6303	root	S	130m	26.0	1	0.0	evtsvr
1093	1	root	S	5988	1.1	1	0.0	/usr/sbin/tcf-agent -d -L- -l0
6305	6303	root	S	3088	0.6	0	0.0	msgsvr
23354	23353	root	S	3048	0.5	0	0.0	-sh
867	1	root	S	3028	0.5	1	0.0	/sbin/inetd
6308	6303	root	S	2956	0.5	1	0.0	muonfill
6312	6303	root	S	2924	0.5	0	0.0	spmt_cl

- **trigger2** process
 - reads **ShowerBuffer** (= WCD-T1 traces)
 - Handles T2s, etc ...
 - **online calibration**

- **muonfill** process
 - reads **MuonBuffer** (now: 1 LMPT > 30 ADC)
 - Builds all histograms used for offline calibration

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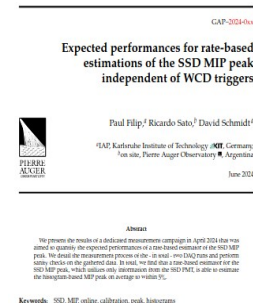


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Changes in LS software

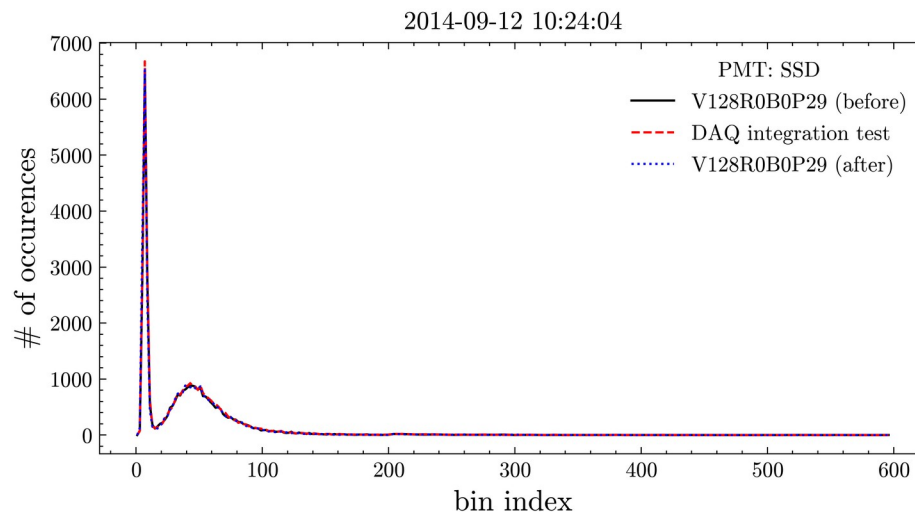
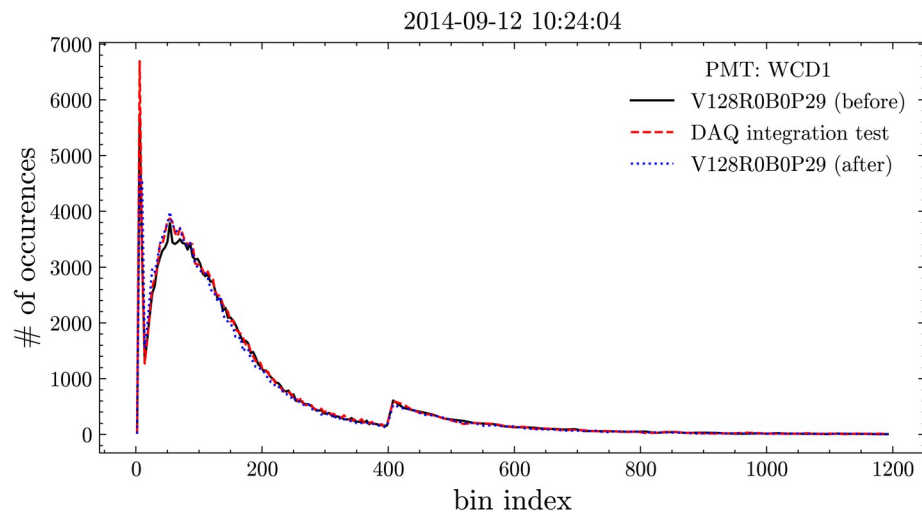
- Changes in **muonfill** program logic
 - Check for each trace & PMT if
 - It satisfies WCD T1 & PMT > 1.75 Peak (WCD)
 - It satisfies a SB trigger w/ PMT > 2.64 (SSD)
 - Add to T70 counter if conditions are met
 - Use T70 counter to set trigger thresholds



- Test new LS branch on Didi (136)
 - Verify histograms remain unchanged
 - Verify rate-based algorithm converges
 - Compare VEM estimates with **trigger2**

DAQ integration tests

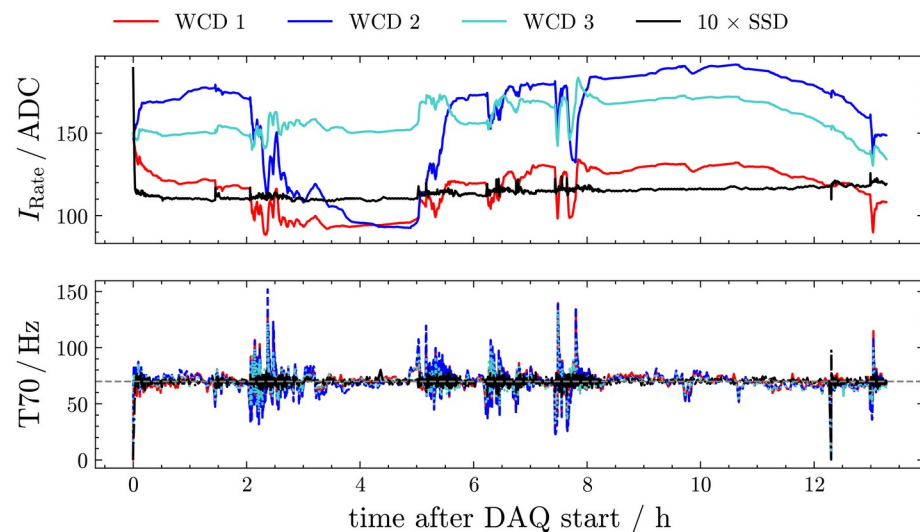
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offsets sometimes wrong! Fix developed, but not yet tested!

DAQ integration tests

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- Overnight integration test
- Recovery to 70 Hz rate even with drastic changes

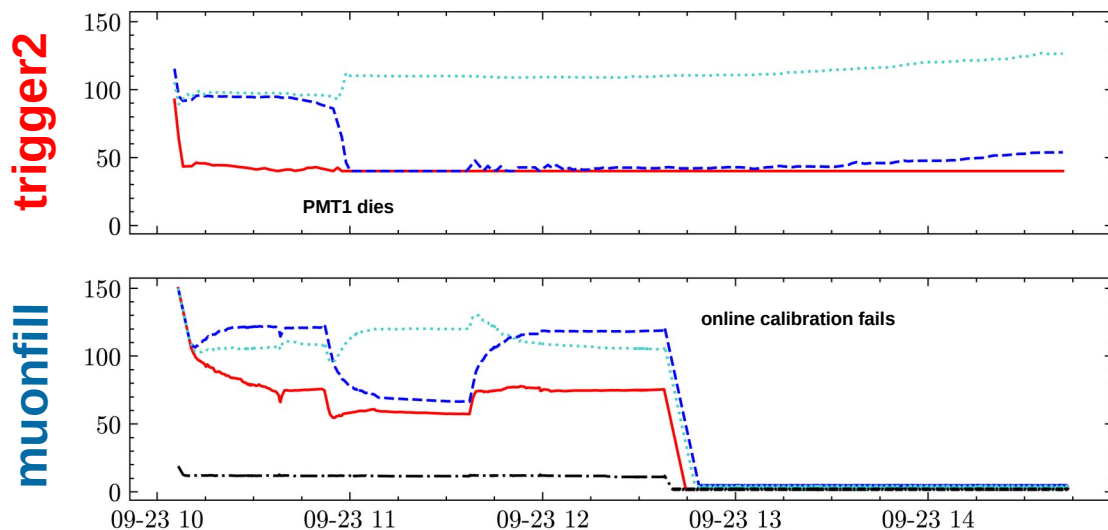
DAQ integration tests

- Test new LS branch on Didi (136)
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(✓)

✓

(✗)



- Dynamic reading of WCD tube mask not implemented yet
- ~30% difference between VEM peak from **muonfill** & **trigger2**
FBW ↔ filtered & downsampled?
- Problem with Didi PMTs?
- Further tests needed

Summary and outlook

- Have shown that rate-based online calib. of SSD possible
 - Independent of WCD; Expected errors $< 5\%$
- Implemented online calibration in **muonfill** process
- DAQ integration tests with new LS software
 - Stable operation for > 14 hours (longer tests needed, though)
 - Histograms remain unchanged (in some cases offset is wrong)
 - Needs to be tested on stations in field at some point
 - **Work in progress**

Backup

