TOF status: July and August summary

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After YETS cavern closure

Failure on HV CAEN Main Frame

May 15th: CAEN SY1527 Main Frame (alitofhv2) **powering half of TOF MRPCs went down** in the night

➢ **power unit replaced** in the morning but this and other 2 got **burned** in the following days

➢ May 17th: **Main Frame replaced** with one borrowed by CAEN and now OK

➢ requested funds to INFN for new main frames

SY1527 Main Frame

A1531 (power unit)

Crate 57: unstable DAQ

Crate 35: no way to **power properly** the readout **(3.3 V)**

3.3 V on crate 35 (100 Amps full load)

June Technical Stop (TS1)

Crate 35 back ON
Hardware intervention involving CAEN technicians
→ LV cables replaced (June 11th)

Bad or missing insulation ecc.

OK

Stable at 3.3 V
(DRM/LTM/TRMs in READY)
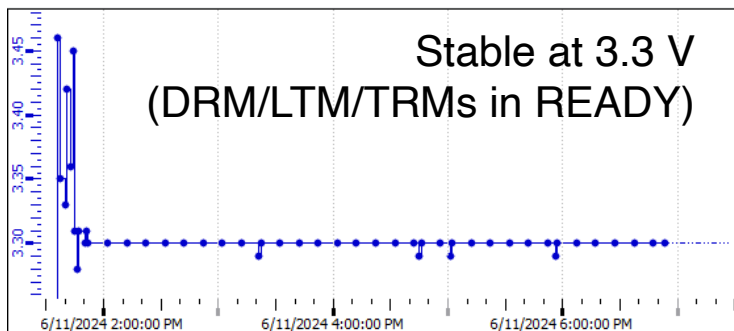
We were forced to stay OFF from Tuesday night until Friday because the 18 kV **harmonic filters** (filtering glitches on the main electrical network) **were disabled** for maintenance.

→ If filters are off, **the switching-on of a power converter** of a machine magnet near P2 **can cause voltage drops** (TOF is sensitive to this)

→ **This action is NOT allowed when filters are off,** but taken in June, because of a misunderstanding. **ALICE RC reported to the LPC coordinators to avoid** the same "accident" **in the future**

Crate 57 re-included in readout → it didn't show problems **for a couple of weeks**, now removed, because not stable again

Other minor fixes

Failure on HV CAEN Main Frame (July 8)

All **HV channels of alitofhv1 went down** around 5:30 PM (while running)

**A1532
(power unit)**

Access in CR4:

→ **Replacement of both power units** of main frame

Most likely the issue was on the 48V power converter i.e. CAEN A1532.

Reboot the OPC server of both alitofvn1 and alitofvn2 (TOF back ready to take data at around 7.15 PM)

Replacement of alitofhv1 (July 15)

alitofhv1 going in «overtemp»

→ **we were not able anymore to switch back ON any HV channel**
 (which stayed OFF) unless we rebooted the entire main frame
  → This happened twice

Access done:

→ Problem solved by **replacing alitofvn1 (CAEN main frame)**
  (180→117)

(In 2 months we had to substitute both HV CAEN mainframe)

Replacement of a CAEN LVPS (July 12)

48 V of channel 02 (powering crates 70 and 71)
going systematically in **Undervoltage** (it didn't manage to go above 24 V)

→ **LVPS CAEN** A3485A ("Maciste") on Rack I31 **replaced**

→ OK after the replacement

Reboot of a mainframe (July 17)

alitofcaelv1 (RackO32) not responding (run 554316).

Access done:

→ Problem solved by **hardware reboot of the Mainframe** on the balconies

→ 1 Run (run 554323) without 1/4 of TOF links.

Unclear event affecting several detectors (July 30)

https://ali-bookkeeping.cern.ch/?page=log-detail&id=101714.https://ali-bookkeeping.cern.ch/?page=log-detail&id=101713

- Run 554772, TOF suffered from a significant **drop in data rate**

- TOF **QC changed** significantly

Some more info | Two FEELIGHT objects (active channel map) for a single run. This occurred in the previous run, 554768.
The second map was loaded at (Sun Aug 25 09:59:26 CEST 2024), 2 minutes before the end of the run (10:01:22).
Run 544772 started at 10:10:30.

Broken circuit breaker (August 20)

The **main circuit breaker in EXD107/25 was broken** → power cut
→**Loss of power supplies (1/4 of TOF)**

A few circuit breakers for 220V had to be **re-enabled manually** for TOF in racks I32-31-30

→ **After turning them back ON everything is fine**

2 fans not working
- Right fan of the top-notch filter on rack I32
- Central fan of the top-notch filter on rack I31

The 18kV harmonic filter at P2 tripped off in the morning

Since that moment TOF experienced **many glitches**:
- (5:15) 10 crates went down (5V, 3.3V, and all LV off)
- (6:15) whole side A down (crates going in Unplugged)
- (6:42) some crates on both sides A and C

LHC switching off / ramping down their magnets (operating the related power converters at P2) in correlated times
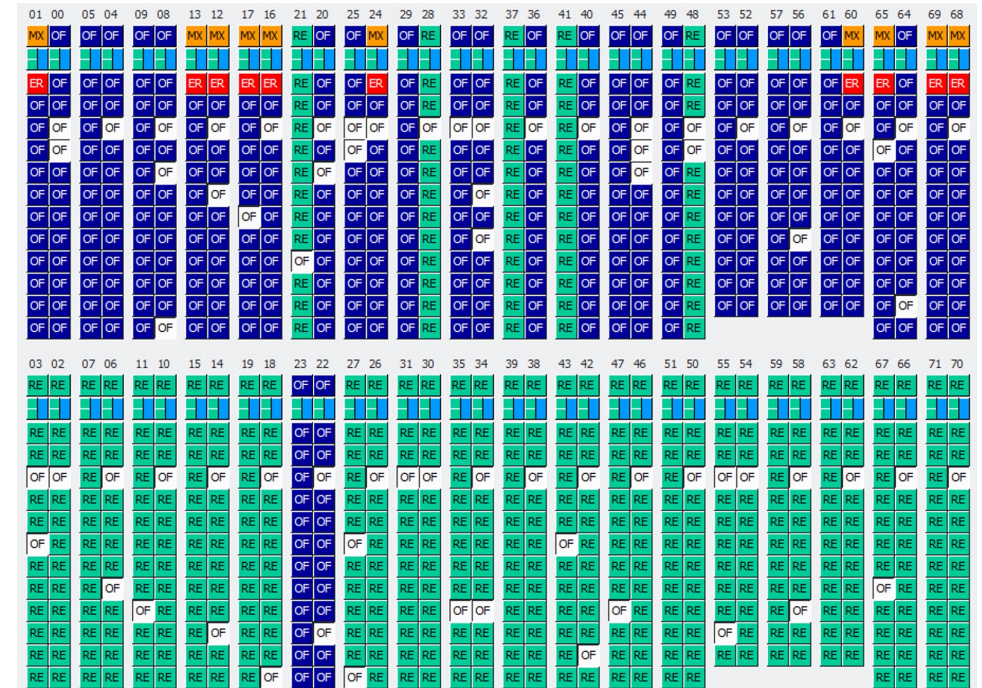
After the glitches the crates were again reachable and we could turn them back again

«What we could propose is to <u>include in the procedures for the CCC that ALICE is informed in case of a trip of the filter</u>. In this case we can take preventive measures before LHC will operate their power converters.
At the same time we will try to implement an <u>alert in DCS</u> to warn the shift crew when the filter goes off.»
is there a <u>state TOF could be brought</u> to make it less sensitive to these perturbations? → **TOF off?**

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Crate 8: cannot be powered on (August 26) LTM not going READY and 4 TRMs not responding at boot

To be investigated

```
Every 1.0s: /SOFT/TEST/scancrate -c 0

ALICE - TOF Crate Test Facility on Crate # 0
Slot # 02 LTM Present (Got VME data 0x55555555)
Slot # 03 TRM/LTM/CPDM Absent (BERR detected)
Slot # 04 unknown (Got VME response 0xAAAA2AAA (Status:0))
Slot # 05 TRM/LTM/CPDM Absent (BERR detected)
Slot # 06 TRM Present (Got VME data 0xAAAAAAAA) (FW: 0x7221 ACQ: 1)
Slot # 07 unknown (Got VME response 0xAAAA2AAA (Status:0))
Slot # 08 TRM Present (Got VME data 0xAAAAAAAA) (FW: 0x7221 ACQ: 1)
Slot # 09 unknown (Got VME response 0xAAAA2AAA (Status:0))
Slot # 10 TRM Present (Got VME data 0xAAAAAAAA) (FW: 0x7221 ACQ: 1)
Slot # 11 unknown (Got VME response 0xAAAA2AAA (Status:0))
Slot # 12 TRM/LTM/CPDM Absent (BERR detected)
```

we could turn them back again

ALICE is informed in case of a trip of the filter. In this case we can take preventive measures before LHC will operate their power converters. B.t.w., is there a state TOF could be brought to make it less sensitive to these perturbations?
At the same time we will try to implement an alert in DCS to warn the shift crew when the filter goes off.»

CURRENT SITUATION

Crate 5: All 2.7V channel (except those powering FEAC 1 and 2) in HVMAX (July 29)
A1396 to be replaced
→ displacement of a TOF SM

Crate 57: unstable DAQ

Crate 8: LTM not going READY and 4 TRMs not responding at boot (August 26)
To be investigated

Crates 22 and 23: **48V in Undervoltage** (July 22) → Maciste (CAEN LVPS) to be replaced
→ **Access will be asked next week** (repaired spare returned at CERN)

Conclusions and plans (to be decided)

✓ 21st March: First SB @ injection
✓ 5th April: First SB @ full energy
✓ 19th April: Start of production (10 days in advance)
✓ 16th April: vdM scan
✓ 10th June: TS1

⭐ 21st October: TS2
• 24th October: Start of pp-ref
• 6th November: Start of Pb-Pb

• 25th November: Start of YETS

TS2

Crate 8
▪ To be investigated **replacement of 2 Notch Filters** (fans not spinning in l31-32)

YETS

Crate 57
▪ Some non conclusive tests done during last TS
▪ Stable for some time when switched on – we can try to reinclude it during Pb-Pb

Crate 5
▪ Displacement of a SM needed

Conclusions and plans (to be decided)

Introduction of a fix related to the compressor (Francesco)

→ Protection to avoid a possible crash of the processes due to a pointer of the encoder

«Many processes crashing after throwing instance of 'boost::interprocess::lock_exception'» *https://its.cern.ch/jira/browse/O2-5231*

Scan in luminosity in pp

- Already analyzed
- Plot generated

EOR failure

- Investigate why recently it is so frequently
- Implement a button for the shifter

OTHER

TS2

Crate 8
- To be investigated
replacement of 2 Notch Filters
(fans not spinning in l31-32)

YETS

Crate 57
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Crate 5
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BACKUP SLIDES

Notch Filters refurbishment

26 Notch Filter units (CAEN A3000NF) in TOF
- filtering the three-phase input (400 V)
- supplying TOF 48 V power supplies (CAEN A3485A)

Dec & Jan: **all units were refurbished** in Viareggio ←
- some capacitors reached the EOL (End Of Life)
- in ATLAS they caused start of fire twice

✓ Replacement of **capacitors at EOL**

CAEN reported that:
- ALICE-TOF: 50% capacitors intact (but degraded), 50% visibly deformed (heat)
- ATLAS (2-3xTOF power): 10% capacitors intact (but degraded), 90% visible deformed

✓ Replacement of **fans** and addition of **overheating protection**

All units were re-installed in the cavern (Jan 26th)
→ **operational** from Jan 27th
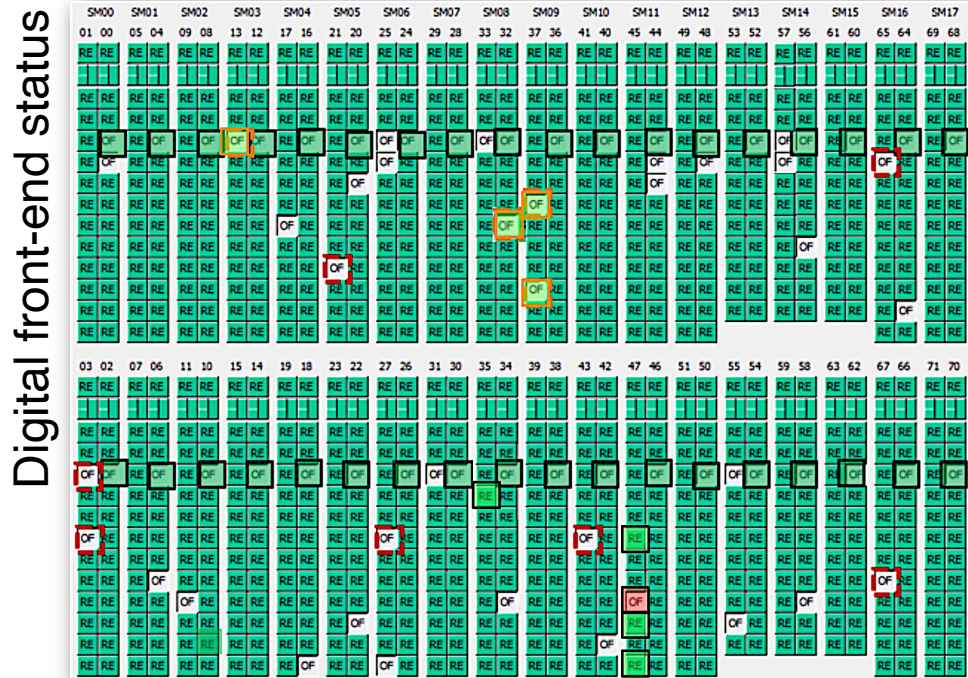
TOF crates heat-exchangers unclogging

11 TOF crates unclogged using phosphoric acid (5-10% conc.) left to act for 1 or 2 days as in the previous YETS (Dec 2022-Feb 2023)

⮡ TOF crates are water cooled → **obstruction** in the cooling plates, causing the water flow to stop, **causing overheating of the crate**

Heat exchangers unclogged (A side): 12-R, 13-R, 32-L, 37-R

Heat exchangers unclogged (C side): 02-L, 22-R, 27-R, 38-R, 66-R, 67-R
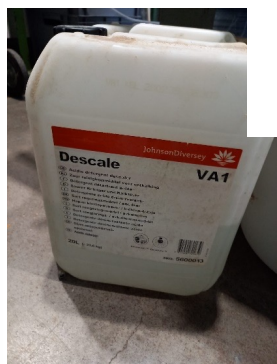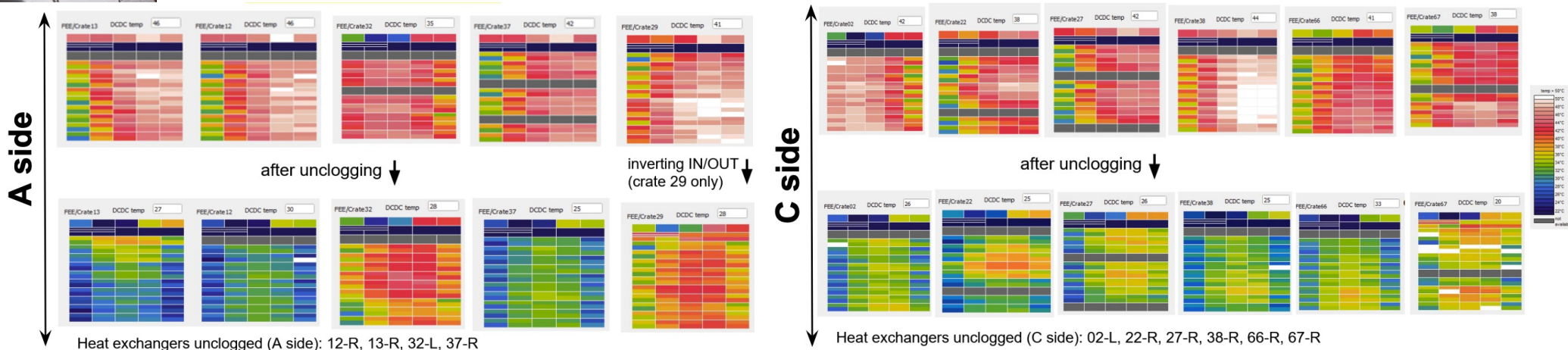
Corrosion inhibitor injected in the cooling plant to prevent the galvanic corrosion (Copper and Aluminium). Waiting analysis outcome of TS1 water samples.

TRM replacement campaign

Digital front-end status

TOF MRPC map
→ stable since LS2

▭ **HV unipolar cables disconnected** (broken connector on the sector side)
→ Partial inefficiency

TRMs disabled in 2023:

⬚ **8 TRMs** due to **instabilities**

☐ **4 TRMs** to limit the **overheating**
   → back ON after crates unclogg. (+960 ch)

■ **Crates 31, 57 out** of data taking
   → crate 31 back (+ 2160 ch)

News in 2024:

■ **TRM 35-4 replaced** (some ch disabled) (+219 ch)

■ **TRM 47-6-10-11 replaced →** (+720 ch)

■ **TRM 47-9 replaced,** but issues when HV ON

+4059 ch back in readout (~ 2.7%)