

Accelerator Complex Status

End week 43 (Monday 31 October 2022)

Technical Infrastructure (Ronan Ledru):

Statistics:

- About 3'500 alarms.
- 688 phone calls (468 incoming, 220 outgoing).
- 101 ODM created.

Events worth mentioning:

- Mon 24.10, Electrical Glitch due to a fault on the 225kV between Genissiat and Cornier Cruseilles (-9,03% during 90ms) - LHC beam dumped
- Fri. 28.10:
 - Stop of NA62 detector due to a fault on the Gigatracker cooling circuit. A flow sensor was sending a false information, the piquet has forced the value
 - No power on the BLM rack at SR5. The circuit breaker EOD308/5E tripped because of a faulty supply in the rack
- Sat. 29.10, Stop of the Power supply BA3 cooling circuit. The main pump has tripped and the spare has started (7 seconds for the switchover)
- Sun. 30.10, PLC down for all the cooling circuits in UW85.
- EN-CV and BE-ICS went onsite to replace the CPU and the memory card.
- The lift was stuck, so they access by the stairs with the firefighters to quickly switch the cryo circuit on the raw water.

Details: <https://wikis.cern.ch/display/TIOP/2022/10/31/TI+Week+summary%2C+Week+43>

LINAC 4 (Luca Timeo)

The availability of Linac4 during week 43 was ~99.6%. The downtime was because of

- [~7 min] PIMS0910: a discharge on the HV tripped the equipment. A reset sufficed;
- [~37 min] Pre-chopper: the industrial controller CFX-400-PRECHOP stopped communicating with the equipment. That required rebooting the control chassis.

The degraded beam delivery was due to

- [~10 min] CFV-400-BGRIDLN4B: the device was unreachable. That shortened the maximum beam's length. Only users longer than 100 turns were affected.

On Wednesday morning, BE-OP performed emittance measurements. Horizontal and vertical profiles in L4Z did not differ too much from those taken in March.

PS Booster (Gian Piero Di Giovanni):

it has been a good week for the PSB with an availability of ~99%.

Most of the PSB downtime was driven by an issue with the BT2.BVT20 at the beginning of the week (~33 mins downtime) and a reboot of one of the FECs of the PS RF system on Thursday which made all the extraction/recombination kickers to trip and for a couple of them we had to wait for the Thyratrons warm up (~23 mins downtime).

We profited from POPS tests on Wednesday to perform a few accesses in the PSB (a visual inspection of the BI.BSW area and another one close to the LIU WS to see if we could install extra BPMs in R1 during the YETS) and allow the EPC experts to work on the regulation of the BR.XNOH0.

Thanks to the ISOLDE team, who had conveniently planned to perform REX-TRAP and REX-EBIS LHe and LN2 refilling at the same time, the PSB interventions were transparent to the physics program.

Other than that, we supported the physics and MD programs at CERN as usual, with the notable work done in the week-end to prepare and check the users for the LHC MD block 2 which will start this upcoming Saturday.

ISOLDE (Miguel Lozano):

It has been a very challenging week at Isolde.

On the GPS side the idea was originally to continue with the IS771 experiment until Friday delivering 92Kr and 94Kr to ISS at 7.5 MeV/u.

Unfortunately, the target production was lower than expected and the 94Kr counts were not enough to carry on with the experiment, so the experiment ended one day ahead schedule.

Then, we moved to GLM for Xe and He collections during Thursday and over the weekend. On Saturday night users called because the target line heating had dropped and couldn't be restarted. After some investigations we discovered that the target had developed an open circuit in the line.

HRS was supposed to stay on standby this week. Some investigations about the problems we had for cycling the HRS separator magnets were carried out and it seems that the problem was found and solved.

On Thursday we had a very problematic target change. During the intervention the target clamps didn't work properly and had to be recalibrated. After the recalibration, the target robot got stuck and we really struggled to install the new one. An access to the HRS separator area is scheduled today to check the electro valve controlling the clamps movement as it is suspected to have developed an air compressed leak.

On Friday we started heating up the HRS target and just as we were setting up the target developed a short circuit in the ANODE1 circuit.

PS (Ana Guerrero):

This week the availability just overpassed the 90%. Until the intervention on Wednesday there were frequent POPS trips during the night causing around 8h of beam down. There was also one quick stop on Tuesday to try and improve the situation for the night without success. It was only the intervention on Wednesday morning that reverted the situation. Since then, no POPS trip has happened. Not clear why 3 power supplies showed the same behaviour now. Further tests foreseen to get more insight. The most plausible explanation is that, randomly, the voltage level on 5v was dropping too much and that caused some surveillance circuit on the CPU card to command the shutdown via either the SYFAIL or SYSRESET lines in the vme bus. The intervention lasted 3h30 with 2 other interventions in the shadow: 1 access for measurements and 1 check of bumpers 14 & 22. Three power supplies of the VME crate were exchanged by external ones which eliminated the ripple and as it proves today the issue. Also the FGC version was upgraded and more diagnostics added.

Ongoing actions:

Try a different crate with a better power supply from BE/CEM. First tests yesterday are positive, but some issues are still to be solved.

Purchase a set of power supply to replace the current solution with a proper installation. The procurement will probably take more than 6 months.

Purchase additional control card spares and test them with GE at the end of the run during the three days dedicated to pops test with magnets.

Longer term. See if it is possible to replace the MC with CERN electronics.

On Friday night PIPO was called for F16.QDN180 (waterflow issue) and PE.BSW22 with 1 and 3 hours respectively beam down towards TT2. A module was exchanged for the later but the bumper cannot pulse at the nominal value and needs another intervention. The CCV value of BSW22 on the MTE beam has been slightly modified.

On the beam side, a mistake was made in the sequence sending for tens of pulses a mix of ions and protons to T8. A follow up to avoid such an error to happen in the future is being done.

For the rest, all beams requested were provided. All the week the new barrier bucket beam was sent and the intensity increased. The emittance initially a bit too large in the core was reduced to a value comparable to the precedent MTE beam. On Thursday, once HiRadMat finished, SPS took the mix 8b4e and BCMS beams with an intensity of $1.8e11p/b$. Later on ions were sent for FT preparation. The CHIMERA MD with very low intensity ion beam was successful despite the short time of ions delivered. Finally, the EAST beam was optimized to reduce losses in the ring during the allocated time just after the MD.

PS - East Area ():

No report.

AD - ELENA (Lars Joergensen):

It has been a very good week for the antimatter world.

AD:

Radiation alarms from PAX604 near the AEgIS experimental area did not go completely away, but were increasingly rare as the week went on as things were better optimized.

A couple of minor stochastic cooling amplifier drop-outs were fixed by simple resets.

Tuesday a drop of the C10-25 voltage towards the end of the plateau was observed and was solved after advice from expert to increase the control function by 5%.

Wednesday during the about 3 hours of MD that was left over after intervention in the injectors, a study was made to better understand the sources of the PAX604 alarms in preparation for YETS by steering the proton beam onto the target.

Thursday and Friday the C10-26 cavity is still causing problems from time to time. Resets solve the problem.

On the ELENA side:

The BASE experiment completes the requirements to get their beam permit. We discover that all three SEMgrids in the BASE line does not respond. An inspection in the area find that the two grids in the BASE area were unplugged and the one in the ELENA area had the breaker on the wall switched off. After powering them all they all worked as expected. The BASE line was steered.

GBAR requests Hminus to help set up their experiment. Several problems were incurred during this start up of the source. By Friday we lost the filament power supply after a few cycles of normal operation after start up of the source. It was clear that there was a serious problem and by Friday afternoon it was necessary to shut it down for the weekend as experts would not be available to have a look and help before Monday at the earliest.

It has been a lovely and quiet weekend!

SPS (Michael Schenk):

The plan this week was delivering beams to LHC (LHCb VELO & physics fills), SFTPRO, HiRadMat run 4 (Monday to Friday), and short parallel MDs (Monday & Tuesday).

The availability at the time of writing is ~82%. Downtime was dominated by POPS faults (first half of week only), an issue with a remote-reset cable for a power converter in the NA (6.5 h), a PS

extraction bumper fault (3 h), and an SPS 200 MHz C1 fault (1 h).

LHC: LHCb VELO fills with 600b and 1200b were delivered at the beginning of the week. From Wednesday onwards, physics fills were delivered with 5x36b BCMS at up to 1.45E11 ppb. Fillings generally went smoothly.

SFTPRO: barrier-bucket beam was delivered throughout the entire week. Thanks to efforts on PS side, reduced difference in horizontal emittances between islands and core to factor ~ 2 (islands: 4 μm vs. core: 8 μm), similar to what is known with standard MTE beam. Upon request by NA physics, increased intensity on T6 from 100 back to 135 units from Tuesday evening onwards, which went very smoothly. Sharing as of now is 32/75/135 on T2/T4/T6, with 3.3E13 ppb extracted. Throughout the week, occasionally received feedback that 100 Hz ripple on spill was perturbing NA62 experiment — did not always manage to reduce it efficiently. On Monday, a collimator was found stuck open in the H2 line. Currently this is not blocking, but will have to be resolved before the SFTION run (plan expected on Monday).

The irradiation of a foil stack installed temporarily in T10 was performed on Wednesday for BSI calibration (~ 100 spills under stable conditions). The stack has been removed for analysis in the lab right after irradiation to allow beam to NA62 again.

HiRadMat: two experiments (SCcoils & RaDIATE) took place. The SCcoils experiment finished early Tuesday morning and RaDIATE was successfully completed on Wednesday afternoon, well ahead of time.

Thanks to the time freed up by early completion of HiRadMat 4, and as agreed with the physics coordinator, two additional important items could be addressed on Thursday and Friday:

1. **8b4e high-intensity test:** reached intensity of $\sim 1.8\text{E}11$ ppb at flat top and studied vacuum activity near 800 MHz cavities depending on bunch length and batch spacing (in view of LHC MD block 2). Test was also done with 8b4e + BCMS hybrid scheme. Findings, see [logbook](#).
2. **SFTION commissioning:** continued Thursday late afternoon and Friday all day. Reached transition crossing, but beam becomes unstable at start of second ramp and is dumped on losses, apart from a few shots that reached flat top. Worked on longitudinal and transverse parameters. To be continued on Monday.

MDs: short parallel MDs took place Monday and Tuesday on longitudinal Landau damping studies, tune shift measurements, and one-turn feedforward commissioning.

Interventions

In the shadow of the 4 h stop for POPS interventions on Wednesday (08:00 - 12:00), the following items were successfully addressed in SPS:

- RF upgrade for ion beams (A. Spierer)
- DCBCT 5 firmware upgrade (T. Levens)
- Work on power systems for 200 MHz and 800 MHz cavities (G. Cipolla)
- Genvolt supply repair (P. Van Trappen)
- Intervention for crystal in LSS4 (E. Matheson)
- Measurements on doors in BA3 and BA4 (P. Catherine)

Follow-ups & “consignes”

- Stuck collimator in H2: intervention to take place before NA ion run. Requires long RP cool-down. Proposed strategy expected on Monday.
- Keep an eye on NA spill ripple (mainly 100 Hz).

- LHC MD block 2:
 - Preparation, Friday: need INDIV up to 3E11 ppb (I. Karpov).
 - MD8404 (G. Iadarola): use PSB/PS users starting with "ID" 7464.
- For shift crew: power OFF MST/MSE6 whenever not in use.

SPS North Area ():

No report.

AWAKE ():

No report.

LINAC 3 (Giulia Bellodi):

It was a very good week for Linac3 with stable beam currents delivered to LEIR above 35uA . Oven2 started to be ramped up on Tuesday to be used for beam production. The next oven refill is planned for Friday 04/11.

There were daily energy measurements and one half day MD on Wednesday dedicated to optics checks in the MEBT and IH.

LEIR (Reyes Alemany):

Main activities

- AC dipole-like kick tests on Tuesday and Thursday
- test of effects of F16.QDN150 on stray field in LEIR

Fixed issues

- power module on e-cooler replaced on Wednesday
- circuit breaker on ETL.BHN10 broke on Wednesday
- extraction kicker ER.KHF34: one power electronic module was in fault and didn't trigger the main thyatron on Wednesday: exchange by expert.

CLEAR (R. Corsini and J. Bateman):

Last week beam time was given to the Manchester VHEE focusing experiment and to CHUV plasmids and chemistry irradiation (including a first attempt at varying the dose rate for chemistry studies as opposed to deliver just one dose rate for UHDR and one for CONV). After installation, beam preparation and rehearsal on Monday, the irradiations for CHUV took place on Tuesday and Wednesday. A good beam waist in air, and a very visible one in water were obtained for the Manchester experiment by intentionally blowing up the emittance inserting a screen in the beam path. A very reasonable predictive power by the optics simulations has also been achieved. Several longitudinal position scans and film irradiations, both in air and in water, were carried out, including some tests on obtaining a flat dose distribution by multiple irradiations while changing the waist position. Some beam time was also provided to C. Davut (BI) for his Cherenkov bunch length studies. An issue with the laser (balance of the two branches of the optical delay used for 3 GHz operation) was rapidly solved on Monday.

Full reports can be found as usual here: <https://indico.cern.ch/category/10682/>.

LHC (Jörg Wenninger & LHC Coordination webpage):

Completed the VELO full insertion ramp up fills with 600b (Monday) and 1200b (Tuesday). On the first attempt of 1200b fill, **UFO dump in 1R8** triggered also by the LHCb detector interlock. After the access on Wednesday, the first fill reached the target of $\mu = 54$ immediately at 60 cm thanks to an average bunch current of $1.42E11$ at the start of stable beams. With the exception of the number of bunches (2462 instead of 2750) the LHC has achieved its 202 design configuration. Another **UFO in 30R1** dumped one of the fills. The weekend was very efficient until Sunday midday,

MKI temperature thresholds were exceeded in [MKI2C](#), [MKI8B](#) and [MKI8C](#), but the interlock limits could be increased since the softstarts did not reveal any issues.

Midday on Sunday the water cooling was stopped in UW85 due to a faulty PLC. All circuits including the LHC dipole were stopped, fortunately cryo was not affected. The intervention was complicated by the fact that the PM85 elevator was out of order. The fire brigade had to be called to use the stairs until Schindler repaired the elevator during the afternoon.

During the night of Saturday and Sunday, first **successful test of operating LHC from the SPS island.**
UFO dump count: 31, UFO quench count : 2