

Accelerator Complex Status

End week 42 (Tuesday 24 October 2022)

Technical Infrastructure (Jesper Nielsen):

Statistics:

- About 2'700 alarms.
- 530 phone calls (389 incoming, 141 outgoing).
- 94 ODM created.

Events worth mentioning:

- Sun 23.10:
 - Fault on pumping station in GigaTraker cooling station in NA62. After checking on the supervision TI call CV-DC Piquet about an anomalous level in tank YLT1401 that cause the trip of pumping unit. Faulty sensor, could not be fixed during the night, around 10AM the problem was fixed by changing an analog input card.
 - Stop of cooling station Gigatracker NA62. TI informs piquet detector cooling of possible electrical fault. Electrical specialist NA62 on site and found EMD2.09/A85 is off and not possible to re-arm, maybe a fault upstream. EN-EL piquet called in, but could not do anything, the interlock was on the experimental side: an interlock on the Canalis supplying the pumping station. No reason for the interlock to be active, inhibited to restart experimental activities.

Details: <https://wikis.cern.ch/display/TIOP/2022/10/24/TI+Week+summary,+Week+42>

LINAC 4 (Jean-Baptiste Lallement)

Almost a perfect week at Linac4 with 99.9% availability.

A 6 min trip of PIMS 9-10 on Thursday, a 1 min chopper and a 5 min pre-chopper faults over the weekend made it just "almost".

PS Booster (Alan Findlay):

With an availability in excess of 99%, it was another good week for the PSB, with no issues to report.

The beam preparations for the upcoming HiRadMat run were done according to the specifications received during the week. Two intensities of $140E10$ and $180E10$ protons per ring we set up in the PSB, giving $830E10$ & $1000E10$ in the PS. The transverse emittances were measured at PS extraction giving $\epsilon_x 2.55-2.7$ mm.mrad & $\epsilon_y 2.35-2.5$ mm.mrad, close to the requested 2.5 mm.mrad in both planes.

Following a review and discussion at the Impedance WG #65 on Thursday which was dedicated to the RF bypasses, it was recommended to stop high intensity MDs (above $1e13$ ppr) in the PSB until the end of the year. This is a precaution to avoid having a similar problem with the PSB vacuum to the one we had a few weeks ago. A program to repair and/or replace damaged RF bypasses with upgraded versions is being prepared for the upcoming YETS.

ISOLDE (Jose Alberto Rodriguez):

It has been a pretty busy week at ISOLDE. Most of the work has been related to experiment IS711 ($92Kr22+$, $94Kr22+$, $96Kr23+$ at ~ 7.5 MeV/u to the ISS experimental station). Most of the week was needed to set-up the separator and the post-accelerator. On Friday, we started delivering the first beam ($92Kr22+$) to the ISS. The users have been taking beam since then.

Here are some of the details for the GPS separator:

- Target #782 was installed in the GPS front end on Monday afternoon after the previous experiment finished. Heating up was done overnight
- The initial setup of the separator and the proton scan was done on Tuesday
- Collections (not related to the ISS experiment) were done in the GLM line that same evening and night
- The target team did some yield measurements on Thursday
- A new proton scan was done on Friday

On the REX/HIE-ISOLDE post-accelerator side:

- We worked on the phasing of the linac using $^{129}\text{Xe}^{30+}$ ($A/q=4.3$) on Monday, Tuesday and Thursday.
- On Wednesday, we finished the setup of the low energy side (separator, REX-TRAP and REX-EBIS) using ^{78}Kr
- On Friday, we linked all parts of the facility and started delivering the $^{92}\text{Kr}^{22+}$ radioactive beam to the ISS

The HRS separator has not been used for ISOLDE Physics this week. We did however irradiate a MEDICIS target on Tuesday and Wednesday. Apart from that, target #781 was installed on Wednesday afternoon in preparation for the target's MD and the physics experiment that will take place this week and next. Unfortunately, we found out that the target was not working well during the initial setup on Thursday and we decided to remove it to inspect it. In the meantime, we installed a plug target (#753).

PS (Matthew Fraser):

The PS is in general operating smoothly with the exception of the repeated trips of POPS due to a problem on the GE front-end electronics. The PS operated with an availability of close to 80%, with the only other major issue being an access needed to fix the gap relay on C10-91. This access was delayed because of the time needed for the access system to synchronise with a new IMPACT form (at least 30 mins). POPS was also put temporarily in degraded mode this week to fix the water leak on DC6. The POPS downtime so far this week is over 20 hours and increased on last week to allow the EPC experts to follow up a list of tests after trips to improve the understanding of the problem.

In other news, LHC tested the mixed 8b4e and BCMS filling scheme. The HiRadMat beam has been played and is ready for next week's experiments with emittances of close to $2.5 \mu\text{m}$ at 1.5×10^{11} ppb. The single bunch early ion beam was sent to SPS for FT commissioning. The barrier bucket was implemented on the operational SFTPRO beam and successfully operated over the weekend. The core has been reported with a large emittance and optimisation of the splitting is on-going, but unrelated to the barrier bucket system itself. Ion beams at 500 and 750 MeV/u are available in the East Area for the CHIMERA dedicated MD testing different techniques to reduce the intensity at extraction via scraping and TFB excitation, and controlling the resonance crossing with the LEQs. As planned, the AD started its intensity increase plan with a step of 100×10^{10} ppp on Friday to 1700×10^{10} ppp.

PS - East Area ():

No report.

AD - ELENA ():

No report.

SPS (Francesco Velotti):

Pretty good week for the SPS, even though the PS and POPS compromised the over availability (basically ~3h every day of downtime) - 80% at the time of writing.

Very productive with many activities carried out:

- BQM problem identified on the pattern check and solved. Fix propagated to all users. Still under investigation the root-cause
- The BI team installed a first ALPS version in TT10 for future installation. At the same time, an update on the SBDS FESA class was released to try to catch the invisible spikes on MKDV/H
- Filter changed on MSE/MST6 and now consign is to switch off the converter and the cooling every time there is no need for some time
- EBC was tested again after the fix was put in place, and indeed it looks better in terms of initial intensity spike and overall impact on the spill. The main issue found though was related to the non-reproducibility shot-to-shot and mainly after a SC change. Hysteresis and eddy-currents seem to impact significantly the alignment with the resonance and fix takes quite some time. It was decided not to deploy operationally. This is unfortunate as we still have the 100 Hz running out of the correction and modulating the spill significantly
- HiRadMat started the preparation for this week. First the beam requested was checked in the injectors. Then, a series of access in the shadow (mostly) of LHC fills made it possible to almost finish the installation of the 2 experiments foreseen for the upcoming week. The last information available says that still a few hours access is still needed which it could happen Monday morning
- The LHC was filled with a mixed 8b4e+BCMS scheme successfully. The only complaint was about the intensity of the first bunch (already with BCMS) but this was traced back to the PS and addressed.
- Intensity on T6 reduced to 100 units but it will need to go up again on Wednesday. On Thursday, we switched to the barrier bucket version of SFTPRO (MTE) to reduce losses in the PS - rather smooth except for horizontal emittance of the core ~3 times larger than the island. The PS crew worked on it and managed to reduce it a bit, but it still needs to be improved.
- Ion commissioning continued with very good progress. 2 batches brought to flat top but still too long for the LHC. SW is needed (~1h) and it should take place next week as soon as a slot is available. Then, it was decided to move to SFTION on Friday. Good progress was made, also there some issues were encountered and decided to make use of the MD1 cycle to be completely parasitic also during normal operation. Still, some time will be needed also this week, if possible, to address this issue in order to be ready for the SFTION.
- A test to assess the response of the PMT-OTR to steering was carried out
- Finally, the 8b4e with about 1.8×10^{11} p/b was taken at the end of the week to assess its availability for the LHC MD block 2 after the issue encountered last week. It was shown that with large batch spacing, even 2 batches could be accelerated to flat top with no issues. The limit seems to be 250 ns, but related to the injected beam quality. It should be continued as soon as possible.

For the upcoming week, the main points to look at are:

- HiRadMat access to finish experiment installation (early Monday as soon as LHC at flat top)
- 8b4e high intensity to see if 3 batches $> 1.7 \times 10^{11}$ p/b are possible (2 tested) \Rightarrow ideally done during the HiRadMat access Monday morning
- 1h with no beam to deploy RF upgrade to proceed with ion commissioning
- If possible, dedicate some time (to be clarified how much) to the RF team for ion commissioning in case possible
- HiRadMat up to 1.3×10^{11} p/b with max of 288 bunches. Need to verify new 0.25 mm optics on Monday when beam to HiRadMat available (1h needed with beam, single bunch)
- Consigne to shift crew: when MTE/MSE6 are not needed, switch off the PCs and the cooling (septa circuit in 6)
- Verify and reduce to minimum difference in H emittance on SFTPRO with BB. Also losses in TT20 have to be checked after intensity reduction as emittance may be too small now.

SPS North Area ():

No report.

AWAKE ():

No report.

LINAC 3 (Rolf Wegner):

It was a very good week for Linac3 with a stable beam production of typically 35 uA out of the Linac. On Wednesday around lunchtime a number of power converters tripped and had to be reset to resume beam production.

Linac3 beam energy measurements have been performed daily.

LEIR (Nicolo Biancacci):

Main activities

- No faults. Continuous operation above 9e10c for NOMINAL.
- Delivered beam to SPS for slip stacking on Wed, Thu and Fri.
- Energy scans performed daily in LEIR.
- Stripper foil monitoring suggests we are getting close to the next foil exchange.
- Schottky MDs.

Fixed issues

- Identified issue in energy scans performed by Linac3: a PPM quadrupole current was not restored, affecting EARLY performance. Being followed up by Linac3 team.

CLEAR (R. Corsini and P. Korysko):

Last week was dedicated to the experiment on VHEE focusing in collaboration with L. Whitmore of Manchester University. Beam was also granted during evenings and on Sunday to Cherenkov Diffraction Radiation bunch length monitor tests (with C. Davut, BI/Manchester U.). A few hardware issues (with MKS15, Laser synchronization and screen/camera BTV0420) were rapidly solved by RF, laser and BI experts. Most of the activity was dedicated to experiments in air, for which a clear beam waist was found and measured with the corresponding peak in longitudinal dose deposition. Attempts were made to overlap dose peaks to create a flat dose distribution over a region. The data collected are still to be examined. On Sunday, the first attempt to find a waist in water was carried out, with no conclusive results.

On Monday, after installation of the week's experiment, a visit organized by the CERN Press Service in occasion of the World Cancer Congress in Geneva and featuring several journalists from different countries and members of the Union for International Cancer Control, took place. As in last week, thanks to the voluntary effort of the CLEAR Operation Team, operation was extended to a few evenings and to Saturday and Sunday.

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

LHC (LHC Coordination webpage):

From Monday 8am to Wednesday 8am MD1 with mixed availability and success.

On Thursday, first test of the mixed 8b4e-BCMS filling scheme with 2365 bunches (~100 less than pure BCMS 36b train). The heat load is roughly 17% lower for only 5% fewer bunches. That first fill was dumped by a **quench of RB12 due to a large UFO in 17R2**. A BCMS fill was dumped by a **UFO in 6R1** over the weekend which was very efficient with back to back long fills. The temperature limit of [MIK8D](#) was increased at the end of one of the fills, more adjustments to come.

Friday evening, after more delays, finally the first VELO insertion fill with 300 bunches (2 hours of stable beams).

UFO dump count: 29, UFO quench count : 2