Accelerator Complex Status

End week 38 (Tuesday 26 September 2022)

Technical Infrastructure (Jesper Nielsen):

Statistics:

- About 3'600 alarms.
- 529 phone calls (351 incoming, 178 outgoing).
- 105 ODM created.

Events worth mentioning:

- Thu 22.09, Switch ON of the SEQ4 TCR after a cooling fault.

Details: https://wikis.cern.ch/display/TIOP/2022/09/19/TI+Week+summary%2C+Week+38

LINAC 4 (Eva Gousiou)

This has been a very good week for Linac4 with **99.8%** availability so far; the ~20min downtime was due to short trips:

- Power converter of the L4L.RCH.111 steerer magnet [11min]
- Power supply Einzel Lens [7min]
- Pre-chopper spark [3min]

Finally please note that the Source is still settling after the Sep 16th valve intervention; few preventive gas adjustments were needed this week.

PS Booster (Gian Piero Di Giovanni):

It was an eventful week for the PSB, but with a final good availability of ~94.6%.

On Wednesday, we experienced a couple of POPS-B trips of different nature:

- One trip (~30 mins) due to the flat bottom MD cycle at 160 MeV which since a few weeks trips POPS-B. The cycle was introduced by mistake in the supercycle. Understanding and fixing this issue is part of an ongoing investigation of POPS-B experts.
- The second trip (1h10m) seemed due to the opening of one of 3 doors of the fenced area in B271 (old MPS) where the configuration switches are installed. Keeping in mind that the old MPS will be dismantled at the end of the year, we still have available the option to switch to the old MPS until then. Somehow the POPS-B PLCs registered an alarm due to one of the doors opening and triggered an interlock. A visit on site showed that none seemed to have accessed the area, so now the EPC experts suspect a vibration or similar events. Additional mitigation measures have been put in place: plastic colliers to better lock the doors and a panel close to the lock to remind not to open them without contacting EPC experts.

On Thursday a bug in one of the PSB UCAP node delayed the beam to be sent to GPS destination for a couple of hours. At the time an FGC reboot fixed the issue. Later on, deeper investigations led to understand that the issue and Tibor will look into fixing the bug once and for all.

On Friday afternoon (always on Friday it seems...), once again, we started experiencing multiple interlocks from ring 2 due to H0/H- monitor. We never managed to understand the origin of the problem this year, as the events come and go. During the investigation on Friday with BI experts, we managed to catch a couple of events on ZERO users, i.e. no beam, pointing to some hardware issue. During the last weeks, BI experts had pro-actively developed a new interlock card which was then installed in R2 only for testing. After a couple of attempts, the card finally worked well and we have been running without issues since the exchange. We will keep a close eye on this topics.

On Sunday evening, all recombination kickers tripped due to an external condition, because of an issue with the oil plant which needed the piquet intervention to be restarted locally. Total downtime ~1h30 mins.

Worth mentioning is also a distributor trip which happened during the ongoing problems with the H0/H- monitor on Friday. The ABT experts recovered the situation, and requested for time without beam to retune it more finely. As mentioned in another communication to the FOM support, POPS-B experts have developed a new controller ready to address the issue with the cycle at 160 MeV. They would also like to do a final test to make sure that POPS-B does not trip after the EN-EL switch maneuvers on the EMD200*59. We could cluster all these interventions together in the week. The request is for 1h30 mins in total.

In terms of beam production, after the gas valve exchange and the completion of the source reconditioning on Monday, we recovered the pre-TS2 performance and we served all machines/facilities/MDs on demand. Special mention to the preparation and use of the Van der Meer beam for LHC, which has been tuned in the PSB according the LHC requests a couple of times during the week.

ISOLDE (Erwin Sielsing):

A busy but successful week at ISOLDE.

HRS has been in standby since last Tuesday when we took over the central beamline for the HIE ISOLDE run on Sn to the SEC chamber at the end of the XT03 line.
Stable beam was delivered to the experiment during the week in parallel and as of Friday we have been running 108Sn28+ at an energy of 4.9MeV/u to the XT03 setup IS698. During the week we also prepared the HIE ISOLDE ISS run later this week for which all 20 SRF cavities needed re-phasing.
Very good yields from this #779 LaC target for the 108Sn (Tin), a factor 5 better than expected with very good suppression of the Indium (better than 1%).
Unfortunately, their own target started to perform poorly on Saturday-evening and it was decided to install three extra spare targets on their movable target holder. For this the vacuum vessel at the end of the XT03 line needed to be opened and RP piquet was contacted for opinion and advise. With 30uSv at contact and dealing with a solid material target this was not a problem.
Pumping the target took until Sunday-afternoon when physics on 108Sn continued.
Today change to 110Sn foreseen and if time permits a possible test on 106Sn before the run stops on Wednesday.
Very happy users (Karl will report on that during the FOM I guess).

Few issues:
Friday we had no protons for 3 hrs due to an interlock issue at PSB (no NORMGPS beam could be injected into their rings)
Saturday the described unforeseen change of targets at the experiment side.
Sunday-afternoon a trip of the line heating which was recovered shortly after.
One trip of the 9-GAP REX RF amplifier during the week and several trips of the 4th Cavity in CM2.

PS (Denis Cotte):

Une semaine assez bonne pour le PS avec une disponibilité des faisceaux de l'ordre de **89%** jusque-là.
La principale cause d'arrêt des faisceaux venait majoritairement des injecteurs du PS.
Pour le reste du « downtime », on retrouvait les systèmes RF avec plusieurs petites coupures suites aux déclenchements des cavités 10Mhz tout au long de la semaine.

Un accès au PS fut même nécessaire mardi après-midi pour effectuer le remplacement de l'amplificateur de la cavités 40MHz (C40-77).
Ce même jour, un faux contact introduisait une erreur de phase de 90° à l'injection des certains faisceaux, le piquet LL-RF solutionnait le problème en reconnectant les câbles au « centre anneau ».
Enfin, POPS nécessitait l'intervention du piquet SY-EPC (échange d'une carte de control) pour redémarrer Lundi matin pour environ 1h de « downtime » .
Notre problème de pulses manquants sur les DFAs/BFAs reporté les semaines précédentes est maintenant résolu. La longueur du pulse du trigger était trop courte pour le Hardware -> problème identifié et solutionné par SY-ABT. Nous n'avons pas enregistré de mauvais coup depuis la correction effectuée mercredi dernier. Le « transverse damper » du SPS devrait maintenant être moins sollicité.
Pas de problème d'eau à rapporté cette semaine sur les alimentations de TT2. L'inspection effectué par CV et EPC pendant le TS2 au bâtiment 269 et l'ajustement du débit d'eau sur les différentes alimentations semblent avoir rendu les systèmes plus stables en attendant un nettoyage approfondi des filtres des différents circuits lors du prochain YEST.
Coté faisceau, un drift lent (sur plusieurs jours) des pertes en TT2 était visible sur certaines BLMs ces dernières semaines. La régulation du septum d'extraction (PE.SMH16) semble en être la cause. Les experts EPC ont travaillé sur cet équipement mais l'amélioration de la situation reste difficile notamment due à l'âge de cet équipement. L'équipe d'opération reste attentive aux variations que retourne l'acquisition de cet équipement afin de compenser les éventuels drifts.
Le PS a fourni ses différents clients MTE (Nominal, Core Only et version « Barrier Bucket » vendredi matin), TOF, EAST, AD tout au long de la semaine.
Le LHC a pris la version LHCINDIV (Van der Meer) et il est resté une bonne partie du week-end en « stable beam ».
Vendredi, nous avons aussi envoyé nos premiers ions depuis la machine PS vers le SPS avec succès.

PS - East Area ():
No report.

AD - ELENA (Bertrand Lefort):
Some problems indeed but also a very good efficiency FOR AD/ELENA. in fact the best efficiency of the run so far !
This can be seen on https://bpt.web.cern.ch/ad_elena/PBAR/month/

AD
No down-time on AD but few annoying glitches, some of them already solved.
When injecting the nominal intensities (1550) the radiation alarm in AEGIS is triggered. This is a side effect of the averaging of the RP monitor dose rate when the PS supercycle is very optimised (AD repetition rate is small). The Mean dose rate RMS is below the 10µS limit but the injection spike reach 11µS. An email has been sent to RP to change the radiation warning level by 10% (from 10µS to 11µS) TBC !
Vacuum spikes detected in the E-cooler region (one every 10 injection). The spikes were due to sparks in the collector, every spikes killing one beam. The collector voltage had to be adjusted (raised by 100V). This value is still in the range of the operational values and the problem disappeared.
Since Sunday early morning we have losses at the end of the 2GeV ---> 300MeV ramp. No clear indication of what is the cause but PS has switched to a spare cavities and 2 of the 4 bunches are skewed. This will be investigated tomorrow morning in detail.

ELENA
Some E-Cooler issues made us lost several hours of beam (7 hours on Monday and most of the Tuesday).

Monday the E-Cooler Filament went OFF with no apparent reasons.
Changing the power supply for a spare was inefficient and after few hours the filament went OFF again.
After investigation the filament contacts had suffered from the high temperature in this area. The tin solder dried out and the resistance went up causing the failure of the power supply. .

SPS (Kevin Li):

First week after the technical stop week, with a very full program at the SPS. LHC is back online, dedicated and long parallel MDs scheduled, together with the standard parallel MDs. In addition ion hardware commissioning took place. On top of this, aperture measurements to understand potential bottlenecks in arc 1 as well as fixed target beam tests - barrier buckets and empty bucket channeling - have all been carrier out this week. The availability is back to more reasonable ~80%.

Faults started off right on Monday morning with a longer downtime of a TT20 power converter (MDAH2303) which prevented extraction for NA physics, resulting in a NA physics downtime of more than 7 hours. The fault could finally be traced back to a broken capacitor, which could be patched. A replacement of this capacitor has been ordered and is expected to be ready for installation in 2 weeks time. Further faults such as MKP and a spark on the ZS2 tank caused further downtimes on Monday before the situation stabilised. The NA physics beams suffered further availability issues along the week , these now coming mainly from the pre-injectors (i.e. wrong septum current causing frequent dumps at injection in the SPS). The NA physics beam availability continuously improved and stabilised towards the end of the week. The SPS is still delivering record intensities at 4.1e13 ppb per spill. This leads to very high dose rates along the full extraction lines. The matter has been raised and is being looked at. An update on the situation and the future strategy will be given in the coming weeks. The 50 and 100 Hz correction seems to loose track every so often and has been documented over the weekend in the logbook. This should be looked at. Moreover the switch to the new 100 Hz filters and the corresponding setting up of the noise suppression had to be aborted as it perturbed the measurements of COMPASS. The coming week, COMPASS is probably offline on Tuesday or Wednesday and the setting up could be repeated; this still needs to be checked with the physics coordinator.

LHC has been taking beam back since Tuesday. The VdM beams had been prepared the previous week in the injectors and were ready for delivery and being taken throughout the week. The mixed 8b4e + BCMS beams had also been prepared the previous week and are ready in principle but have not yet been taken this week by the LHC. Tails studies for the LHC beams has been ongoing throughout the week, partly during MD time. Tail repopulation in the SPS has not been observed so far. However, there are some hints towards a correlation between emittance and tails population. Studies are ongoing and will continue in the coming weeks.

The dedicated MD on crystal channeling had suffered from a TT20 power supply trip (MAL.2512.M) right at the beginning of the MD. Due to the resulting loss of time, the MD was prolonged until 15:00 before the LIU MD was started. TT20 optics studies took place in parallel.

On Friday barrier buckets were taken from the PS in there morning, and extraction with empty bucket channeling was done in the afternoon. Both tests were very successful and gave promising results. Further analysis is taking place offline now. In addition, the ion beam was taken to the SPS for the first time this year and set up after a first iteration of ion hardware commissioning done on Tuesday using the new LLRF firmware. Energy matching was done, and after initial issues, the beam could be taken though transition crossing all the way up to flat top. A rough cycle setting up was done and slip stacking was already tried but was not yet successful, mainly due to minor issues with settings which will need to be revised. A still remaining issue is a large injection phase jitter between

the PS and the SPS which prevented further progress on Friday and will need to be followed up next week.

Aperture measurements took place all along the week; initial measurements were distorted due to poor beam quality. After this was fixed, a full measurement campaign was carried out over the weekend. The data is saved and is ready for analysis.

The HiRadMat experiment was installed during LHC stable physics times last week. The experiment is ready to take beams as of Monday morning.

SPS North Area ():
No report.

AWAKE ():
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LINAC 3 ():
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LEIR ():
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CLEAR ():
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LHC (LHC Coordination webpage):
The cryogenic system was reconfigured for high heat load on Monday, ready around 8pm. First dry cycle tests in the night of Monday to Tuesday.
First beam was injected on Tuesday, but the beam emittance in H was over 20 um in the SPS initially. Delay also due to need to recondition the SPS MKE extraction kickers. Setup of LHCf run between Tuesday and Thursday, including alignmnet of the AFp and ALFA roman pots. On the low beta cycle the TOTEM roman pots were aligned.
The LHCf run began Friday late afternoon with a short 50b fill. The first nominal LHCf run fill with 150 bunches in the night of Friday to Saturday, ATLAS levelled to pile-up 0.02 (L ~ 4E29 cm-2s-1). This fill became the **longuest LHC fill in stable beam with over 46 hours** of collisions.