

Accelerator Complex Status

End week 45 (Tuesday 14 November 2022)

Technical Infrastructure (Jesper Nielsen):

Statistics:

- About 3'700 alarms.
- 525 phone calls (371 incoming, 154 outgoing).
- 93 ODM created.

Events worth mentioning:

- Tue. 08.11, Level 3 alarm "Hydrogen leak" and evacuation of EHN1. Fire Brigade on-site, it was a false alarm caused by manipulations done by users of the experiment.
- Wed. 09.11, Evacuation alarms in SPS 4,5,6 et ECA5. Fire Brigade confirmed an alarm on one of the evacuation buttons in the tunnel. Since no access was given since a long time (nobody possibly present in the tunnel), the alarm was reset remotely, but the reset did not work. SPS interlock on a kicker magnet (fire alarm) seems to be a consequence of the evacuation alarm (interlock?). Alarm was reset locally by Fire Brigade, but the ventilation for the air extraction of the BA5 beam dump couldn't restart. This was due to a problem with a flow meter that didn't allow for the restart.
- Sun. 13.11, Fire alarm SFDEI-56504 in SPS PA6. Evacuation BA5, BA6, BA1 triggered. Ventilation of BA6 stopped. Only one sensor is in alarm. No other technical alarms in TI or the SPS. The fire brigade go on site. On site, 10 sensors are showing elevated readings but not enough to go into alarm. No evidence of smoke. The ventilation had a mechanical problem that caused the smoke, it was left off for the weekend and repairs will be planned as soon as possible.

Details: <https://wikis.cern.ch/display/TIOP/2022/11/14/TI+Week+summary%2C+Week+45>

LINAC 4 (Jose Luis Sanchez Alvarez)

Good week for the Linac4 with an availability of 99.5%.

We had problem with 2 equipment:

- Power converter of the L4L.RCH.111 steerer magnet tripped 8 times.
- Modulator HV of the RFQ tripped 3 times due to quick impedance increase leading to an over-voltage.

EPC and RF team would like to exchange the oil in the HT tank of the RFQ klystron.

The L4L.RCH.111 specialist also wants to exchange the control rack of the power converter.

On Tuesday from 14h to 18h there will be a planned stop for the complex to allow an RP survey.

They will use this window to exchange the oil and the control rack.

PS Booster (Jean-Francois Comblin):

Another good week for the Booster, with an availability of more than 99 %.

Most of the downtime came from the Linac 4. Just a few resets were needed on our side.

From the Booster's point of view, the LHC MDs and VdM scans ran smoothly. Tuesday, we quickly fulfilled a last-minute request for a Staggered beam for Isolde. As a matter of test, we prepared a TOF at 1.4 GeV and sent it to the PS. Otherwise, all operational and MD beams were delivered to the users as planned.

ISOLDE (Eleftherios Fadakis):

Short summary:

Beam ($^{131}\text{Sb}^{31+}$) was delivered from target #784 UC W, on GPS, for experiment IS697 (delivering to Miniball) one day ahead of schedule.

They unfortunately finished on Wednesday the 12/11 and not on Sunday, due to technical difficulties on their set up.

The HRS experiment IS702 finished on Tuesday the 8th. They were taking $^{130}\text{Sn}^{31+}$.

REX/HIE

- **Tuesday 8th**: Experiment IS702 finished in the morning. In preparation for the experiment IS697 ($^{131}\text{Sb}^{31+}$) an energy measurement was performed with $^{129}\text{Xe}^{30+}$. Beam was set up until the last FC before the experimental station. Slow extraction was used. Delivered stable beam ($^{22}\text{Ne}^{6+}$) to Miniball over night.
- **Wednesday 9th**: Delivered radioactive beam ($^{131}\text{Sb}^{31+}$) to Miniball.
- **Thursday 10th**: Users required assistance in optimizing beam position on their set up, through a collimator inside their chamber.
- **Saturday 12th**: Experiment decided to stop due to difficulties on their side.

GPS

- **Tuesday 8th**: Concluded the low energy set up using 39K. Followed by yield measurements and a proton scan.
- **Wednesday 9th**: Taking ^{131}Sb (Sb stands for Antimony) through REX-HIE and delivered to users. Users took beam until Saturday the 12th.
- **Sunday the 13th**: Collection on GLM for IS673

HRS

- **Tuesday 8th**: Experiment IS702 finished in the morning. EPC came to investigate an issue with our two HRS separator magnets. It turns out there was a faulty communication cable that was causing the issue. After being replaced we had no issue with either of them. Many thanks to N. Davide and J.P Lopez for their work. We had an issue with the HRS front end losing vacuum and power for the heating of both target and line. After much investigation it appears to be an issue with the placing of the target on the front end. It was resolved by C. Mitifiot, many thanks
- **Thursday 10th**: Yield checks
- **Sunday the 13th**: ISOLTRAP took beam to their experiment.

[PS \(Denis Cotte\):](#)

A very good week for the PS in terms of beam availability with 98.3% until now.

Apart from injectors, the PS suffered only brief beam interruptions due to :

_problems with KFA71 modules (mainly m11 and m12)

_10 MHz cavity trips

From time to time, these issues also produced radiation alarms.

The longest beam interruption this week came from a water fault on a bending magnet BHZ167 in TT2.

EPC piquet was called and adjusted the power converter water flow. (around 1h15 without beams)

Finally Friday afternoon, a small beam interruption (10 minutes) during SIS rollback to previous version.

Beams:

- AD beam provided at high intensity with almost 1800×10^{10} ppp.

- nTOF beams provided all along the week at different intensity (half, nominal) according to user requests.
- MTE barrier bucket provided with reduced intensity (around $1400e10$ ppp), we also moved the dummy septum TPS15 in parking position (+120mm). We saw a very good effect on losses in SS15 and SS16, then the decision was made to keep TPS15 OUT until the end of the run.
- LHCINDIV VdM 4 bunches provided for LHC as well as usual beams like BCMS and 8b4e.
- Ions beam have beam sent to SPS, PS-SPS synchronization has been improved. We also made nice beam size and position measurements on ion cycles with BGI82.

PS - East Area ():

No report.

AD - ELENA (Pierre Freyermuth):

No major issue in both AD and Elena.

Asacusa1 is now taking the beam, we steer the line with them.

The H- source is back in business.

We cannot increase more the proton intensity to the target as we reach the radiation threshold on the Aegis area.

A database update Friday evening prevent us to use the elena extraction line grid for steering. We lived like that for the weekend and the specialist is on it.

SPS (Arthur Spierer):

This week, the availability of the fixed target proton beam was 85% and around 93% for LHC and AWAKE, with the faults mainly coming from the injector complex. The week started with the LHC MD block 2 (Mon-Tue), with high intensity BCMS and 8b4e beams. On Wednesday the dedicated lead ion commissioning started and it was completed in parallel with protons during the two following days. The fixed target ion beam is now ready for the slow extraction setting up and the two LHC ion beams (2 injections slip-stacking and 3 injection early) were extracted to the LHC transfer lines. The parallel MDs took place on Thursday: PS-SPS transfer studies and Friday: PS to SPS automatic steering. The LHC took regular fills with Pilots, Indivs and VdM beams, as well as BCMS with $1.48e11$ ppb. Finally, the AWAKE fifth run started smoothly on Saturday.

LHC: During the second MD block the SPS provided BCMS 4×36 bunches beam up to $1.8e11$ protons per bunch and 8b4e beam 2×56 bunches up to $1.6e11$ protons per bunch. The MKDV1 vacuum threshold was temporarily increased to lower the number of trips. Investigations are ongoing to explain the unexpected TWC800 vacuum faults when pushing the 8b4e intensity to $1.8e11$ ppb.

Ions: On Wednesday an energy matching and radial steering at the PS were needed to solve jittery injections problems. The day started with a 2h LLRF upgrade for SFTION1. Following this, the 4xfrev RF modulation was implemented and four bunches equally-spaced in the machine were captured. The RF gymnastics were commissioned (debunching, recapture and jump to unstable phase before extraction) to obtain a uniform beam distribution over the ring. For the LHCION1 cycle (slip-stacking, 2 inj.), the rephasing and extraction to TEDs were set up. Some time was lost during commissioning on incorrect default/non-generated settings. The ion cycles generation will be consolidated in the coming weeks.

SFTPRO: The last week of protons to NA went without major issues. On Friday a 24 hour test with the TECA in shadowing started but was stopped quickly due to very high readings on a BLM. It will be carried out next year as it requires a discussion with RP.

The test of the TT20 CSI screen from last week could be completed on Thursday.
During the weekend, a reference aperture measurement was performed with MTE core

AWAKE: The beam was taken in the SPS for an hour on Friday with no particular issues and the run started smoothly with scans of the steering to the experiment on Saturday morning and stable beam for the rest of the weekend.

Main interventions:

- 30 min RF power intervention on 200 MHz cavity 3, Several trips on cavity 2 during ion commissioning (amplifiers rebalanced by experts)
- 200 MHz cavity 5: Several cooling water faults on Saturday, false alarm but a mechanic is needed to fix a switch beginning next week, Currently masked in SIS, Expert informed.
- MKDV1, MKE4, MKP4 piquet interventions on Monday/Tuesday
- Access maintenance BA1, BA4, BA5, BA6, BA7
- Wednesday: Fire alarm for false alert in BA4, BA5 and BA6.
- Saturday: piquet intervention for damper (ADT V2) trip around 21:30
- Sunday: Observed increased losses on BLM210558 located near crystal, adjusting crystal angle helped
- Sunday night (no beam ~2 h): fire brigade call about fire alarm in BA1, BA5 and BA6
- After the LLRF upgrade the rephasing settings for LHC/AWAKE and BQM had to be re-calibrated
- 50/100 Hz application sometime does not trigger corrections, experts on it

Upcoming:

- DSO test on Monday morning (No beam from 8 to 12h), parallel intervention on MSE BB4
- Followed by setup of slow extraction of NA ions for the beginning of the two weeks run
- RP survey on Tuesday mid-day (After 30h cooldown)
- LHC ions (Thursday and Friday)
- AWAKE from Wednesday.

SPS North Area ():

No report.

AWAKE (Giovanni Zevi Della Porta):

Prepare and start proton run

- Preparation:
 - Laser:
 - Manufacturer visit to solve signal/noise contrast issue and tune entire system
 - Align virtual line to main beamline and laser marker
 - Electrons: set up high-charge beam and propagate to spectrometer
 - Warm up vapor source and align Rb interferometry measurement
 - Check electron/laser and laser/marker timing on streak
- Proton run:
 - Diagnostics: find proton beam on all cameras, check timing, etc
 - Self-modulation with protons in plasma
 - Electron acceleration, and quad scan of accelerated electron beam
- Plan for week 46: access Monday-Wednesday, then protons.

LINAC 3 (Giulia Bellodi):

Linac3 delivered higher than 35uA beam currents to LEIR throughout the week without any interruptions.

Intensity fluctuations from the source required daily tuning by the source expert, even outside normal working hours.

The stripping foil was exchanged on Tuesday and daily energy measurements were taken.

LEIR (Michele Bozzolan):

Main activities

- Delivery of beam to SPS for beam commissioning and MDs during the all week
- First turn trajectory BPM tests
- Machine learning MDs for schottky image recognition

Current issues

- Instability of the source (often bad injections). LEIR nominal beam cannot follow the intensity drop. This need to be fixed for both NA and LHC lead test
- Trips of the corrector ER.DWv42 (recovered by autopilot)
- Issue with operational cavity 41.

CLEAR ():

No report.

LHC (Jörg Wenninger & LHC Coordination webpage):

MD2 lasted until Wednesday and was very successful. The 2023 configuration was tested with collisions down to 30 cm. Bunches of $1.6-1.8E11$ ppb were brought to FT, but with BCMS and 8b4e. With the BCMS beam @ $1.8E11$ ppb, a vacuum pressure spike occurred in point 4 on B1, closing vacuum valves and triggering the beam dump.

Wednesday morning start of the VDM program, Wednesday was used to check the setup, check and align TCTs and finally perform two MP validation cycles at FT and in collision. The full VDM program could be completed with two fills of around 24 hours each.

In the night of Friday to Saturday, pp production with BCMS was resumed, starting with a 600b fill (re-validation) with LHCb spectrometer off and with a 1800b calibration transfer fill. Regular BCMS operation for production with 2462b fills resumed Saturday afternoon. The excellent machine availability over the week was interrupted Sunday evening by a quench heater firing on the dipoles of S45 while at 6.8 TeV.