Accelerator Complex Status

End week 21 (Monday 31 May 2022)

Technical Infrastructure (Jesper Nielsen):

Statistics:

- About 3'500 alarms.
- 425 phone calls (282 incoming, 143 outgoing).
- 77 ODM created.

Events worth mentioning:

- Mon. 23.05:
    - Electrical perturbation on 400kV line, confirmed by RTE. -9.1% measured for 70ms. Trip of LHC, Booster, SPS
    - SEQ8 SEQ6 switched ON
- Fri. 27.05, issue on the routeur T874-RV-RJUES-2, same as the 12th of April. IT has stopped the redundancy, the problem is still being investigated.
- Sat. 28.05, Dump LHC because of high temperature on the SR2 BLM. A hardware problem on the chilled water valve has increased the water temperature.

Details: https://wikis.cern.ch/display/TIOP/2022/05/30/TI+Week+summary%2C+Week+21

LINAC 4 (Piotr Skowronski)

Quite a good week for LINAC4.

From Monday to Wednesday: Several interlocks from transmission watchdog on an MD beam LHC25 3eVs. This beam has less chopping than all the other beams, so the beam loading effect is stronger. Power of DTL1 klystron was temporarily increased to provide overhead for the RF feedbacks. Normally we we keep power in all the klystrons as low as possible to reduce risk of faults.

Friday: A network router started losing packages at 6AM. It caused very frequent SIS interlocks that we could not understand. We spent all the morning trying to find out the reason, we called several experts. We learnt only at lunch time that IT has an issue and it was fixed at 12h30. We had very similar problem couple months ago.

Saturday: L4L.RLF.121 power supply - 8 min downtime.

PS Booster (Foteini Asvesta):

It was a good week for the PSB with an availability of approximately 97% mainly affected by the LINAC4 issues on Friday morning.
On the PSB side, the longest fault occurred on Wednesday night on one of the quadrupoles of the BTY line to ISOLDE (BTY.QDE104). The first line was called and the problem was resolved within an hour.
The RF team has been working on a new firmware that was tested throughout the week and discussions are ongoing to deploy it operationally.

Measurements of the **energy spread** at injection showed higher values both from the expectations and 2021 measurements.
This can explain the larger longitudinal losses (at low energy) that have been observed for the LHC users this year.
Some initial tests were done with the LINAC4 colleagues, where changes of the debuncher voltage had a clear impact on these losses.

The settings for the **LHC25 3eVs** variant and in particular the chopping factor has been reduced to 0.72 from 0.82, following multiple WD issues in the LINAC4.
In addition, the DTL1 voltage was increased (on the LINAC4 side) to ensure a smooth operation during the SPS MD on Wednesday.
Finally, some adjustment was needed on the R4 longitudinal emittance to bring it to ~3eVs.

A new **BCMS** variant is currently being prepared with smaller transverse tails at extraction (working point evolution, resonance compensation settings and shavers).

ISOLDE (Emiliano Piselli):
It has been a very busy but good week at Isolde.
HRS:
On Standby. We have performed many test on the mass scan application and on the separator magnets. Target change foreseen on Tuesday.
GPS:
On Tuesday we have improve machine setup with stable beam to IDS, LA1 and GLM.
Beam time was really good, except for a small issue with target HT (SY-ABT best effort colleague helped remotely).
REX-Hie:
On Tuesday morning a vacuum leak has been found in a compressor station at Hie-Isolde. Intervention foreseen for today.
The HIE-Isolde cryoplant tripped on Thursday late afternoon. It seem to have been a more serious problem, as recovery took a significant time and some cavities warmed up to 15K. To be followed up.
7GAP1 failed during the weekend. We are discussing with RF on the way to proceed. But most probably we will need to inspect the structure during this week.
During the week we have worked on the phasing of the cavities with beam to XT01.

PS (Bettina Mikulec):
It was a quite good week for the PS with a few ups and downs…

Equipment-related:

- Injection kicker KFA45 issues with 2 modules fixed Monday afternoon (heating current adjusted, calibration and interlock card changed)
- Another vacuum spike on PI.SMH42 on Monday with similar signature to the previous ones from April
- RF:
    - Beam stop last Tuesday 12h for intervention on C10-96 (ventilation) and C10-56 (relay gap)
    - Profited to tune 40/80 MHz system (+ some FGC deployments for multi-ppm condition of F61.BHZ01.DUMP and to allow control of inj. Bumper pulse length)
    - Friday HW intervention once more for C10-96 (piquet)

    - Friday after 3pm: beam loss for high-intensity cycles and issue with splittings (affected mainly the MTE cycle, but also AD and TOF —> reduced intensity for TOF); finally found cfv-353-allrpos down à restart of FEC at 10pm
- Confirmed inversion of PR.BLM83 and PR.BLM85 with beam

Beam-related:

- TOF:
    - Small cycle optimisations to reduce losses
    - Adjusted bunch rotation for TOF and parasitic cycles
    - Revert some earlier settings changes to recover vertical beam size on target
- SFTPRO: investigating stability issues with extraction trajectories and splitting —> longer-term study
- To fulfil a request to use a very low intensity cycle for special irradiation experiments in IRRAD/CHARM, good progress on the preparation of such a cycle
- During Wednesday's MDs, transverse emittance measurements throughout the complex confirmed high brightness of the LHC25 3 eVs cycle.

PS - East Area ():

No report.

AD - ELENA (Pierre Freyermuthy):

It was a good week for the Pbar complex.

On AD side:
Work has been done on Make rules and RF cycle editor.
There is a pending issue with control timings of the magnetic horn. Specialist will resume investigations on Monday, meanwhile some cycle can be lost.
On Friday we were impacted as well by the RF issue in the PS.
On Sunday, an injection quadrupole power supply failed. Promptly fixed by the First-line piquet, called by the PS team.
On ELENA side,
A communication error with Electron-cooler power supply has been solved.
The bunch extraction of the LNE50 line (Gbar) has been slightly delayed to enable the bunch rotation, in such a way the LNE00 line (extracted first) is not impacted.

SPS (Arthur Spierer):

This week the SPS mainly provided beam for the North Area with increased intensity and LHC beams for injection tests and fillings. We had parallel MDs on Monday and Tuesday and dedicated MDs on Wednesday.

SFTPRO
On Monday we started by increasing the intensity from 2.57e13 to 2.75e13 p/beam at flat-top and then reached 3e13 protons in the evening. On Tuesday Morning, the losses were greatly reduced by improving the steering/sharing, with a roll-back to reference settings. The target for the week was for T2/T4/T6: 25/75/150 units. We reached and tried to maintain these values with regular optimizations. The spill quality/losses were often altered by changes in the super cycle during parallel MDs. The number of sparks in the ZS1 and 2 stayed relatively low. The ZS had to be reset three times whilst being monitored by the experts. To improve the spill, the RF was turned off completely 750 ms after flat top during the week.

MDs

The subjects of parralel MDs on Monday and Tuesday were the PS barrier bucket MTE transfer study and PS-SPS transfer studies with increasing intensity.
The dedicated MD time was used for TT20 optics measurements and LHC 25ns beam intensity increase with 3 eVs variant (transmission from 94% at 1.54e11 p/b at injection down to 90% at 2.45e11 p/b).
A few shots of INDIV beams were sent to the LHC during the dedicated time, requiring (lengthy) destination changes in the supercycle on the booster and SPS side.

LHC PILOT/INDIV
No major issues apart from an intervention on a LLRF pick-up frontend. Diagnosed on Wednesday morning by the piquet and replaced in the afternoon as it was only affecting the very low intensity beams (high gain required).

HiRadMat
A few shots of single bunch beams were provided to HiRadMat for equipment tests. (No chance to test the larger emmitance version of the beam and multi-bunch unfortunately).

Availability/Main issues
-The availability of the SPS during last week was 83.3%, mainly due to the injectors and power converters.
-Faulty power converters to be followed up: MDLV.2115 polarity issue; RQID20700 trips
-Special magnet RDHW.11732.M is not following the complete ramp.
-Sparks in the ZS issues mainly from Wednesday night to Thursday evening

Next week will include dedicated MDs on Wednesday and Friday for BCMS beam with 5 batches and empty bucket channeling. Parallel MDs will take place on Thursday (PS-SPS transfer and TFB blow-up studies).

SPS North Area ():
No report.

AWAKE (Edda Gschwendtner):
Finish alignment after BI intervention

- Finished optical alignment (Upstream streak, BTV442 Core) after BI intervention
- Streak camera timing troubleshooting: re-installed LEDs in front of 2 streak cameras to study occasional missing shots with FESA experts
- Began a full review of laser interlock system for equipment safety (protecting screens, cameras, etc). Laser experts from CERN and MPP made an initial study, but more expert help might be needed to understand the FESA and PLC controlling the interlocks, and the related Timing events.

Plan for week 22: re-establish patrol and electron beam. Mostly electron and laser work to prepare for the run. Short access on Wednesday morning for plasma experts visit.

LINAC 3 ():
YETS.

LEIR ():
YETS.

CLEAR (R. Corsini and P. Korysko):

Last week (a short one, only 3 days due to official CERN holidays) was dedicated to VHEE chemistry and dosimetry studies in collaboration with CHUV.
On Monday morning, besides adjustments to the installation and realignment and optimization of the laser, we also had two visits (CERN artists, and a delegation from the CERN Gateway team). In the afternoon the beam was adjusted to the requested parameters, and a dosimetry test irradiation was performed. The first chemistry irradiation could then take place on Tuesday. Two other irradiations took place on Wednesday. The C-robot was then removed and an electro-optical pick-up test assembly was installed in preparation for the following week experiment. A first analysis of the films used for the chemistry showed a good agreement with the target doses, the chemistry data will be analyzed by CHUV. An issue with the e-Logbook perturbed operation on Tuesday, but it was solved in about 20 minutes (apparently a CERN-wide issue).

LHC (LHC Coordination webpage):

The configuration for collisions at injection was prepared, the single stage collimation system was validated for the **first stable beams at injection** on Friday morning. In total 3 stable beams fills were delivered over the long weekemd.
Various ramp tests and measurements have been performed: a nominal bunch was ramped smoothly and for the first time to 6.8 TeV with longitudinal blowup on Friday. Coupling and Q' were measured along the ramp and fed-forward successfully into the settings.
Important progress at injection for passive protection as preparation for train injection: all TI2/8 transfer line collimators (TCDIL) were aligned and the settings were validated, the TCDQ was aligned, the full collimation system was aligned.
The 60 degrees phase advance optics was commissioned at injection for B1. During the threading a large vertical trajectory excursion (~15 mm) led to a **beam induced quenchino in B12L7**. The OMC team measured and corrected the global beta-beating on B1.
Optics measurements were continued at 30 cm, and a change of beta-betaing was observed with respect to the pre-VELO-stop period, the differences point towards the Q4 of B1. Investigations ongoing, it seems that it does not come from the difference between pre-cycle and rampdown from 6.8 TeV
A **training quench** occurred on the **RB circuit of S23** on Sunday night just before reaching FT.