Accelerator Complex Status

End week 16 (Monday 25 April 2022)

Technical Infrastructure (Jesper Nielsen):

Statistics:

- Slightly more than 3'000 alarms.
- 420 phone calls (302 incoming, 118 outgoing).
- 57 ODM created.

Events worth mentioning:

- Mon. 18.04:
    - Thyristor Controlled Reactor (TCR) in LHC 6 switched on successfully.
    - Thyristor Controlled Reactor (TCR) in LHC 2 switched on, but caused a trip of the ALICE dipole, even though the ramp down had been done correctly before switching on.
- Thu. 21.04, Trip of POPS-B due to a low level of the cooling tower. Bassin was quickly refilled and restarted the cooling tower.

Details: https://wikis.cern.ch/display/TIOP/2022/04/25/TI+week+summary,+Week+16

LINAC 4 (Sandra Lombardi)

- Saturday at 5 am the chopper tripped. After 20 minutes the operator reset was not effective. Piquet was called, changed a faulty power supply and the beam was available at 6:46
- Saturday morning : trip of CCDTL: 3-4, reset by operator
- Sunday evening : source HT reset by autopilot

PS Booster (Chiara Bracco):

A very good week for the PSB with about 97.5% availability and a Linac4 chopper fault as the main downtime driver.
Specialists continued their investigations on the LL RF issues performing tests in Ring0; they will switch to Ring4 early this week (to be coordinated with the downstream machines and users).
A 3+3 bunches beam was prepared which allowed to push the intensity for an LHC25 MD user up to 340 ppr at the PSB extraction. This was a fallback solution since it was not possible to stabilise Ring 4 and reach the target intensity of 320 ppr as requested by the PS.
HiRadMat beam was also prepared and the SIS interlock logic to control the minimum emittance tested but not made operational yet (this will be done as soon as requested by the SPS, i.e. before extraction to the HiRadMat line).
Preliminary checks were done to evaluate the benefit of shaving the beam in the PSB to reduce the vertical tails observed in the SPS. A reduction in the tails is glimpsed only when "aggressively" shaving and also the emittance is slightly reduced. Further studies are needed to proper quantify the tail population in the PSB, PS and SPS and understand how to reduce them in case they represent a real issue.

ISOLDE (Miguel Lozano):

It has been a quite busy but a rather successful week at Isolde.
CRIS finished its beam time last Monday and since then we have been running a new target prototype (LIST target) on GPS delivering beam to IDS.
One of our beam optics power supplies died on Saturday , around 8 hours down , and then on Sunday we had some communication issues with the computer controlling the target parameters (2 hours downtime).

Other than that and the usual problems associated with an experimental target everything went pretty smooth.

PS (Bettina Mikulec):

A good week for the PS with around 94% of availability for the moment.
Main issue this week:

- **PI.SMH42** vacuum incident on Monday 18/04 and Tuesday 19/04: same signature as another event on the 8/04
    - OK given by ABT for restart in steps of 5 kV
    - **Under close surveillance – in worst case the upgraded spare is available, but would mean >1 week of downtime**

Beams:

- LHC-type cycles:
    - LHC25 provided to SPS for NA startup
    - **LHC25 variant with LIU intensity of 2.6e11 ppb and 3+3 PSB bunches** (instead of 4+2) prepared; fine-tuning ongoing
    - BCMS provided at 1.7e11 ppb
    - **AWAKE cycle prepared** on Friday and checked @3E11 ppb
- TOF:
    - Nominal TOF cycle provided to experiment
    - **Parasitic TOF cycle set up on EAST cycles**
        - Power density on target checked and OK
        - Bunch length fine
        - No pre-pulse visible
- Excellent progress for EAST cycles:
    - Optics measurements (quad. scan) started in F61; already very promising results
    - **Sweeping compensation** implemented on Wednesday for T8
        - Ramp down W8L to zero before extraction (perturbed tune stability) —> reduced dependency on supercycle composition
        - New version available: late extraction, no-sweep, 300-400 ms spill length
        - Beautifully round profile measured with foils in T8
        - Will be put into operation on Wednesday

Additional point:

- Energy matching refined between PSB and PS:
    - Propagated to all operational cycles apart from MTE (still to be done)
    - For cycles with 2 injections: observe B-field drift around 0.5 G between 1st and 2nd injection; being followed up.

PS - East Area ():

No report.

AD - ELENA (Laurette Ponce):

AD:

- Back to similar performance as end of last year: deceleration efficiency above 90%, 3.3e7 pbars injected and around 3e7 extracted.
- New optics has been deployed in FTA and automatic optimization of the doglegs/ septum-kicker settings has been launched over nights.
- Study of the pbars orbit drift on low energy plateau to optimize cooling at 100 MeV/c plateau, further work needed to fully optimize.

- Study with IPM: good profile in H, some problem to get V profiles, MCP HV seems to cause orbit jump at extraction
- Test of the 3rd deceleration with h=3 in view of shortening the ramp
- Since 15.04 the power converter of the DR.BHZ trips on IGBT communication error more than 3 times per day, even every hour over some period during the weekend. First line intervened already 3 times on the problem without success to fix the problem. EPC experts are investigating.

ELENA:

- Correction of injection oscillation
- Deceleration efficiency above 80%, 7-8e6 pbars per bunch extracted
- Same transverse emittance as last year, a factor worse in longitudinal.
- First pbars in ALPHA experiment after steering check of the lines.

Ready for physics.

SPS (Francesco Velotti):

A very busy week in the SPS with the last 5 days of stand-alone beam commissioning preparation for physics - Friday morning in fact there was the come back of the LHC. The week started with a long stop for the NA as the wobbling 3 magnet got blocked by an interlock due to faulty cables due to radiation (more info here). This issue blocked the NA commissioning for the whole week. Thanks to the MSC team, the magnet was back in operation Friday afternoon (much earlier then first foreseen). As consequence, physics for NA62 delayed but not for the other experiments - they will start to take beam from Monday.
From Friday morning, LHC taking PILOTs constantly as start of commissioning - very fast and promising so far.

The week was then exploited to carry out the last steps of commissioning and high intensity beams:

- HiRadmat cycle was taken with 4 injections of 72 bunches accelerated to flat top with 1.2e11 p/b. Here we still used the standard beam used so far but dedicated cycle was prepared in the PSB with larger emittance.
- BCMS cycle was taken with 5 injections of 1.2e11 p/b and accelerated to flat top. Emittances in the range of 1.5 mm.mrad but with large tails. The tails were traced back to the PSB and mitigation with shaving was proved.
- High intensity beams were taken both at flat bottom and to flat top. By the end of the week 72 bunches with 1.87e11 p/b were accelerated to 450 GeV. On this cycle, also RF amplitude modulation was deployed to help the requested power to the cavities. Very very good transmission from PS to SPS up to 94%!
- AWAKE beam was taken. Bunch length optimised for 1e11 p/b and the final version of 3e11 p/b was also accelerated to flat top with very good transmission.
- SFTPRO cycle was prepared for 2 injections with max intensity of 1e13 ppp. Transmission still need work as well as losses at the splitters. This was the reason why we kept only 1 injection for the weekend and waiting for the week to optimise it properly. Work on the longitudinal blow up continued making quite good progress.

On other topics and faults:

- MKP 200 ns was set up and almost ready for physics. To be checked if better performance can be obtained increasing temperature of gas in the switches
- Empty bucket channelling first test were completed and reduction of 100 Hz on the spill was clearly visible. Analysis will follow
- Brightness curve measurements done at flat bottom

- A few issues with MKDV/H: a PS was replaced during the weekend and intermittent faults mitigated. Follow up in ABT for the some of the issues seen
- Recurrent RF trips along the week
- Scraper still not being setup due to high losses. To be understood if to be expected.

SPS North Area ():
No report.

AWAKE (Giovanni Zevi Della Porta):
Restart after vacuum intervention, laser manufacturer intervention, electron alignment, new diagnostics

- **Restart** laser (UV and IR) and electrons after vacuum intervention: no hardware issues
- **Electrons**: Continuing beam steering tests to understand YASP limitations and overcome them (i.e. dipole component in quadrupoles)
- **Laser**: manufacturer visit Thursday/Friday to refurbish system (internal alignment, characterization, flash-lamp replacement)

Plan for week 17: laser re-alignment after intervention (M), rubidium vapor source intervention to replace broken temperature probes (W),
finalize laser and electron alignment (T, Th, F). Protons in week 18!

LINAC 3 ():
YETS.

LEIR ():
YETS.

CLEAR ():
No report.

LHC (Jörg Wenninger & LHC Coordination webpage):
Machine finally closed and in beam mode with nominal BIS configuration and LBDS connected to LASS Wednesday evening. The same evening the entire machine was driven through cycle to 30 cm without issues (only RF and ADT HW and feedbacks missing in all/part of the cycle).
Thursday final MP tests in nominal configuration, beam synchronization with the MKI pulses by extracting to the downstream TEDs.
First beam injections Friday around 10am, by midday both beams were circulating. The following days were extremely productive:

- Setup of most instruments as well as orbit, radial and tune feedbacks,
- Setup of ADT excitation modes,
- Optics measurement at injection confirming a stable beta-beating of 5-10% (2021 corrections),
- First collimator setup and aperture measurements (12-13 sigma for all planes and beams),
- Commissioning of the ballistic optic at injection, first ramp test lost around 2.8 TeV due to RQTF QPS trip driven by QFB trims, IT L2 training quench at FT.
- Tune and chromaticity decay measurements at injection.

In this phase operation is made with half of the RF system. The S34 cavities are conditioned, but the LLRF setup is not yet done.