

Accelerator Complex Status

End week 19 (Monday 15 May 2017)

TI (Jesper Nielsen)

A rather quiet week for the technical infrastructure:

On Thursday 15:28 the SPS Septum cooling water circuit tripped several times. Reset by SPS and restarted by TI.

Friday 8:33, Too frequent filling of water circuit detected. After investigations the loss was estimated at 1000 l/h. After discussing with CV and LHC, an access was planned, the leak was found to be close to a power converter, and it was repaired.

The complete summary can be found

at: <https://wikis.cern.ch/display/TIOP/2017/05/15/TI+Summary+Week%2C+19>

LINAC2 (Giulia Bellodi):

Linac2 had a good week. On Monday afternoon an RF intervention was scheduled to replace RF tubes in the LT.CDB10 and CDB12 cavities, which had been found to be at the limit of failure in a routine inspection. The actual swap took about 1.5 hours, but some difficulties were later experienced in the retuning of the cavities until the original settings were found and restored. Operational conditions were recovered after about 4h from the start of the intervention (at 20h).

Less than an hour after that, a problem with the start/stop timings of LT.BCT20 triggered the watchdog to cut the beam. The problem was correctly spotted by the PSB operator and fixed

by the BI specialist (40 minutes downtime).

The rest of the week saw smooth operation.

LINAC3 (Giulia Bellodi):

Linac3 officially handed over beam to LEIR for start of their commissioning last Monday.

The de-bunching cavity could be finally set up after ion beam measurements in the LBS line were made possible again (after fixing some diagnostics and controls problems).

Some retuning of the beam at the exit of the IH linac (lowering beam energy and re-centering the beam in the ITF transfer line) were carried out to optimize the conditions

for injection and beam circulation in LEIR. The current delivered to LEIR was thus improved by 3-4 uA (32uA average on BCT41).

LEIR (Django Manglunki):

LEIR beam commissioning went on last week.

The beam was eventually injected successfully on Wednesday afternoon, when the magnetic rigidity of the whole machine was scaled down by 1.5%, as was the case for Argon. It turns out that it is also the case for Pb,

so the linac3 energy is lower than expected (~ 4.12 A MeV instead of 4.2)

RF commissioning took place on Thursday and Friday, and on Friday afternoon the first extractions took place, after the long standing problem on EE.BHN1020 was fixed (the interlock cable was not plugged in).

The machine is now ready for RP measurements which should allow to open the passerelle. They are tentatively foreseen for Wednesday 17/5.

Remaining issues:

- recurrent trips of ITE.BHN30
- a tube has to be changed on cavity ER.CRF41
- the damper needs an intervention in the machine

As CRF43 works fine and the damper is not needed for low intensity Xe beams, the last two interventions can wait for the technical stop on May 31st

PSB (Vincenzo Forte):

A relatively calm week for the PSB with no long-blocking faults and progresses on the beams preparation.

The elogbook statistics for the FOM shows a **98% machine availability in the period.**

The STAGISO beam has been set up and is ready to be taken by ISOLDE if they request.

The work on RF was followed up by Matthias and Simon since beginning of the week. After various interventions, Simon had the impression that the cross-talk was cured as he could not see it anymore (see Tuesday). Some changes were necessary and propagated in the C02-C04 relative phase function due to new cables (=delays) installed.

Setting up for MTE high intensity were performed by the operators and me in the second part of the week. The intensity was raised and delivered to PS up to $1600e10$ p with emittances almost in specs (to be checked large horizontal emittance from Ring3). Ring 4 was optimized. It is now important to push toward $2000e10$ p keeping the emittances bounded and within specification.

Other requests were related to LHC transfer line studies by SPS (very short-notice request). The operator and I obtained emittance blow-up on the LHCProbe beam of more than a factor 2 in ~ 1 hr. The beam was transferred to the PS.

Some MD beams were created for studies:

- Tune shift vs. intensity at different chromaticities at 160 MeV (T. Rijoff and me as support) - started on Thursday.
- Tune measurement (Andrea).

ISOLDE (Emanuele Matli):

HRS:

CRIS took beam until Thursday morning without major issues.

GPS:

target #595 was reinstalled last week after a failed attempt with #575 that was leaking.

Setting up was straightforward as the target was already used on GPS.

Recurring issue with front end electrode that again moved by itself all the way into the target and was impossible to control until C.Mitifiot's intervention to reset it.

GPS separator magnet needed a local reset of the FGC but OK afterwards.

Proton scan on converter done on Thursday morning and stable beam to ISOLTRAP in the afternoon.

Ti production was much lower than expected, on Friday moved beam to target, proton scan and new yield checks but Ti production still too low.

ISOLTRAP taking Sr/Rb beam during the w/e.

HIE:

Continuing with the phasing of the normal conducting linac.

All 15 super conductive cavities are running at 1MV/m

Setting up of the Field regulated dipoles in the experimental lines by EPC.

PS (Ana Guerrero):

The PS machine run smoothly until Thursday with only minor issues that stopped the beam for a few minutes. In particular SMH42 systematically trips due to the daily scheduled sublimation.

On Friday an intervention had to be programmed on 10MHz C11 due to a water cooling problem. The intervention was shorter than announced but the beam came back 1h after due to SMH16 power supply becoming uncontrollable after a reboot of the FEC. The task was shown OK in diamond however finally a restart of the task solved the issue. The beam was stopped for three hours in total.

In addition the EAST beam could not be delivered for another 6h1/2 due to the following devices where PIPO and FirstLine had to intervene: Bump 57, PR.XSE and QSE each producing around 1h of downtime and F61S.QF001 with 3h.

Work has continued on all operational beams including BCMS. The set-up of the EAST Irrad line has been done. LHCIndiv has been delivered to LHC and the LHC25ns 12b and 72b to SPS. The emittance measured on the 12b bunch in PS was rather high 3.4um where as the same measurement at SPS injection provided systematically 2.5um. To be followed up.

The MTE beam intensity has been increased in PS up to 1600e10. TOF and AD beams have been delivered with nominal intensities.

AD (Lajos Bojtár):

The AD was running well, apart from a few resets of ejection kicker and the bunch rotation cavities, there were only some complaints from Alpha about horizontal fluctuations of the ejected beam position, but it disappeared by the time I started to investigate. This issue is reoccurring from time to time. During the EYETS there were some modifications made on the ejection SEPTUM power

supply to improve the position stability of the beam. There is a definitive improvement compared to previous years.

SPS (Hannes Bartosik):

Monday was the start of this years' North Area physics run. The beam availability was generally quite good with a few exceptions. On Monday some downtime was accumulated due to a Linac2 intervention and a FGC firmware upgrade for the main power converters that had to be deployed. Alignment scans of the ZS extraction septa were done on Tuesday to minimize losses in the extraction channel, which meant low intensity beam for the physics users. Unfortunately the scans were not conclusive yet and need to be repeated (to be scheduled). Issues with cooling of a few magnets in the North Area encountered with the high duty cycle in the beginning of the week could be resolved in the shadow of the dedicated MD on Wednesday. On Thursday the steering of the transfer lines to the targets was optimised and the PS was asked to increase the intensity. The intensity on the SFTPRO cycle is now about 1.1×10^{13} ppp at flat top with a sharing of about 15/15/45 units on the targets. On Friday a downtime of about 3.5h was accumulated due to an access in the PS and issues with the PS extraction septum at the restart.

The SPS sent Pilot and Indiv bunches to the LHC for the various commissioning activities. During periods where the LHC did not request beam, the 25ns beam was taken for scrubbing in the SPS in preparation for the HiRadMat run next week. By the end of the week, up to 4 batches of the nominal 25ns beam with 72 bunches per batch could be stored on the flat bottom. The main limitation in terms of pressure rise comes from the vented and partially modified extraction elements in LSS4, however clear conditioning is observed. The RF experts worked on the commissioning and setting up of the 800 MHz cavities. Although the longitudinal setup of the LLRF is not fully completed yet, the beam can be accelerated to flat top. Up to 2 batches were accelerated to top energy. As requested by EN-STI, 72 bunches were dumped at flat top for an extended period of more than 3 hours for the commissioning of the new TIDVG. The HiRadMat cycle is ready for the setting up of the extraction.

The dedicated MD on Wednesday was devoted to studies in coast in preparation of the Crab Cavity tests in 2018. The slow debunching observed in previous MDs could be significantly reduced by switching off the one turn delay feedback on the 200 MHz cavities. A highlight was the successful measurement of the beam size evolution from synchrotron light with the BSRT at the 270 GeV coast energy.

LHC (Massimo Giovannozzi):

Optics corrections at 40cm were finalized with non-linear triplet corrections (a_3 , b_3 , a_4 , b_4) and with global corrections to compensate the impact of the crossing angle on the beta-beating (1-2%).

Nominal bunches were accelerated for the first time to 6.5 TeV Thursday. Collisions were found in all IPs (IPs 1,2 and 8 with probes, IP5 only with nominal bunches). The CMS IP shift was set to -1.5mm.

The collimators were aligned at injection (all), at flat top (all), at the end of the squeeze and in collision (TCTs and TCLs).

The transfer lines were setup, the TL collimators and injection protection devices were aligned and the injection protection was validated.

Coupling measurement performed at injection: source of decay seems to have been identified. Coupling measurement through the whole cycle could not be performed due to a fault (AC dipole B1-H).

Some tests carried out with the collimators with wire (Beam 2).

On the MP side:

- the new TSU was validated at the LMC following a code review and a recommendation by rMPP.
- FMCM tests were accomplished at injection and partially done at flat top.
- Dump at intermediate energies were performed.
- Waveforms were measured for MKI, MKD

On the BI side:

- Pre-calibration of WS and BSRT has been carried out. Issue with the WS B2V scanner: it cannot be used until further notice.

Next steps:

- Access for about 12 hours with cryogenics re-generation in point 4 and various other access related to RF, BI, etc...
- Continue and finalise the machine protection tests, mainly FMCM and dump at 1 TeV
- Optics measurements and corrections at 33 cm
- Loss maps and asynchronous beam dumps
- Aperture check at injection and transfer lines
- Injection for trains with 12 bunches.