

Accelerator Complex Status

End week 17 (Monday 1 & Tuesday 2 May 2017)

TI (Ronan Ledru)

Monday at 6:21 An electrical perturbation tripped the booster. EDF-RTE confirmed the perturbation on a 225kV line from Génissiat.

Monday at 10:35 All demineralised water circuits in BA3 stopped, due to an interlock on water leak. It was traced back to a valve that had been left open.

Monday at 11:57 Local power cut on 18kV in SX5 (EMD206 et EMD207/5E). CMS informs that the DSS had interlocked the 18kV, the reason was a smoke detection. The smoke came from a workshop.

Wednesday at 21:51 Stop of the mixed water for the computer center (b.513). The redundancy didn't work but the group has been quickly restarted by the TI operator in Shift.

Friday at 16:35 Stop of Fine water circuits in BA5 due to a human error during a maintenance.

Sunday at 06:07 An Electrical perturbation tripped the booster due to a short circuit on a 400kV busbar near Genissiat.

The detailed report can be found at:

<https://wikis.cern.ch/display/TIOP/2017/04/25/TI+Summary+Week%2C+17>

LINAC2 (Rolf Wegner):

Linac2 is running very well. On Wednesday, the low-level RF system for the RFQ amplifier was re-adjusted for longer beams. This increased the beam intensity slightly (~2 mA).

BI is working on filters for the transformers in the transfer line (T30, T40 etc.) to harmonise the monitored beam current. They are foreseen to be installed during the next technical stop (end of May).

LINAC3 (Rolf Wegner):

Linac3 is running well and producing quite stable Xenon beam (~30 uA).

PSB (Bettina Mikulec):

During this week a lot of effort went into continuing beam preparation and trying to understand the longitudinal issues (high intensity in ring 2 blows up beam in ring 1 and longitudinal instability in ring 4 with high intensity).

The beams for the upcoming physics users are available within specifications (ToF, EAST, AD), as well as the requested LHC25 beam. ISOLDE has been taking first physics beam throughout the week.

Summary of findings concerning the rf problems:

Observation 1: R4 C04 has spikes from ~c750 until extraction, often destroying the beam and causing losses; this happens also using the R0 beam control

- **Workaround:** switch off the C04 "RF Act", which limits the intensity to ~700E10, shortening the bunch, but the beam is stable
- An access of ~2h is requested to disconnect, test and recalibrate the cavity

Observation 2: the beam in R2 induces longitudinal blow-up of the beam in R1, most notable with high intensity beams, measurable as starting between c600-c700. An induced voltage in the R1 C02 (500 -600 V) is seen when its RF Act is OFF AND we have beam only in *R2*; the inverse is not true. There is a phase modulation visible on R1 C02 that is related to the intensity and radial position of the *R2* beam, this is thought to be what blows the R1 beam up; a change to last year's phase pickup didn't help.

- **Workaround:** radial steering in R1 to +9 mm during the cycle, which minimizes the blow-up, but more importantly minimizes the losses on the first BLM at extraction. It is also possible to greatly reduce the R1 blow-up by doing a -10 mm radial steering on R2, but we found the losses on the extraction BLM to be higher, despite the R1 beam blow-up being lower.

ISOLDE (Alberto Rodriguez):

ISOLDE low energy:

- First Physics experiment of the year completed last Friday morning (35Ar from HRS target to the VITO experimental station).
- Second Physics experiment started on Friday evening and will continue until next Wednesday (133In from GPS to the IDS experimental station).
- No mayor problems to report

REX:

- Bake-out of the REX-EBIS completed last Monday (the charge breeder had to be vented to replace the cathode of the electron gun a few weeks ago)
- Hardware recommissioning of the RF systems of the linac continued last week. The last few tasks will be finished on Tuesday.
- OP used a few available time-slots to start the beam recommissioning. So far, the RFQ and the buncher have been tested. Beam accelerated in the RFQ was drifted to the diagnostics box before the first cryomodule and the different devices and their control software was tested. The EBIS slow extraction mode was also tested

HIE-ISOLDE:

- Installation work on the HEBT lines continued last week and it is close to completion.
- Hardware commissioning of the cryomodules progressing well. The SRF cavities were conditioned and their performance characterized. First RF tests in close loop have just been done

PS (Frank Tecker):

The PS had a busy week, with the preparation of many beams to be available by Monday May 1st. LHC 25ns 12 bunches, NTOF, AD (with new RF sources), and EAST for North Area and IRRAD+CHARM were prepared. Furthermore, MTE fixed target beam, LHCINDIV and LHCPROBE were sent to the SPS. The beam availability was around 84%.

Beam permits were signed on for EAST-North on Wednesday, EAST Irrad+Charm on Friday, and NTOF on Saturday.

The main downtimes were for the pole face winding control, a fix of NTOF water infiltrations, the bending magnet F61.BHZ03 for EAST, the 10 MHz cavity C10-11, FTN.QDE480 (only affecting NTOF).

SPS (Francesco Velotti):

A very busy week at the SPS due to the start of the commissioning with beam.

Monday:

- About 80% transmission from the PS to SPS observed. Tried to optimize the injection, although losses seem to happen already in the transfer line. Bad trajectory already from TT2, beam not centered at the first screen in TT10. Golden orbit still to be defined.
- Orbit correction at flat top for the two optics performed. Quadrupoles found for corrections: 2 QFs (324 and 510) and 2 QDs (205 and 301).
- Long list of inaccurate BPMs found while performing the beam based alignment measurements. Experts already informed.

Tuesday:

- Access to align the 4 quadrupoles for the orbit correction. RMS orbit improved in both planes for both optics as expected from simulations.
- Cabled loop in BA4 fixed. Shift crew went in situ to verify.
- Problems with the mains - measured current off of 4 A wrt reference (also difference in number of samples) after rebooting. The problem was fixed re-driving the values back

Wednesday:

- After optimization of the cycle used for the aperture scan, first scan launched. Old bottlenecks in BA1 and BA5 still there. Restriction of few mm found close to the QD.511. After having the FT irradiating these region, RP survey requested. Two hot spots found: one just at the exit of the QD and one between the following MBA - MBB. For now left as it is as does not pose limit for the current machine operation, although to be sorted out before increasing the FT intensity. Endoscopy to be performed at the first TS.
- TIDVG vertical aperture scanned: found 44 mm vs the actual 42 mm.
- Beam position scan on the TIDVG as function of the energy. Everything as expected.

Thursday:

- Mainly dedicated to extraction to LHC TLs.
- Problems on MKE 4 and 6 found. MKE4 fixed during the night before from the ABT piquet. MKE6 showed a more severe problem which was fixed during the morning by Nicolas Magnin and Voumard.
- Problems on the water circuit of the MSE6 stopped the extraction from LSS6 for the morning. This is the second time in less than a month that this happens, to be followed up closely.
- Beam on TED TT40 and TT60. All checked for the extraction performed by the BTP team. New references for the bumpers defined. Aperture scans done.
- MSE4 girder alignment done. Downstream position varied from reference of 400 um.

- Problem in TI2 on RBI.22134 blocked the extraction to the TI2 TED.
- Beam down to the TI8 TED during the night after finishing debugging the TI8 elements.

Friday:

- Extraction to TI2 impossible due to the problem on the RBI.22134. Fixed in the early afternoon.
- No beam for almost the whole afternoon due to access in the PS.
- Regulation problem on the main dipole currents observed. EPC experts informed and fixed the problem.
- At the same time, another strange behavior of the current of the QD was observed. A modulation at about 6 Hz with an amplitude of about 0.05 A was found. This could also be observed on both Qh and Qv at flat bottom of the FT beam.
- When the beam from the PS was back, extraction to the downstream TEDs done for both lines with LHC requesting beam.
- Gerd came in to set up the damper for the FT cycle. He first switched it on with last year settings - improvement in transmission already visible. Due to the modulation on the QD circuit, it was not possible to set the damper up properly. To be followed up.
- Wire-scanner readings checked over night. The one in 416 worked properly and linear response of the average as function of the bump amplitude placed. The one in 519 showed some strange readings - BI experts informed.

Long weekend:

- Wire-scanner measurements at the 416 done in details.
- Tuning of the reference phase for the FT done with Thomas
- LHC INDIV taken. With the RF settings from last year, it was possible to accelerate up to FT with no major problems. Some reference measurements taken.
- LHC provided with beam on demand. The only stop was due to a problem with the MKP on Monday. N. Magnin changed a faulty HV cable which had a short circuit on gen3 of MKP and the beam was then back.

LHC (Jorg Wenninger):

End of the powering tests on Thursday. Extensive checkout tests from the middle of the week. Beam permit loop armed late night on Thursday (to Friday) after solving issue with ASB BIS input (rack not powered). Friday morning the LBDS was armed for the first time. Beam was sent down to the TI2 and TI8 TED later afternoon and the lines were steered slightly.

On the level of settings and cycle a problem was found on the *RQ8.L4B1* circuit: due to a large current imbalance between the two IPQ apertures, the PC was not able to maintain the low current for B1 (error of 4 A / 190 A). A new optics had to be quickly designed for IR4 at injection. It will be put on the machine later during the weekend.

A problem of communication between the LBDS TSU and the injection BIC was discovered late afternoon on Friday, but a solution was implemented in the same night. Revalidation on the test bench is ongoing.

First injections into the LHC took place Saturday at 18:00, at 20:12 both beams were circulating. Splashes were delivered parasitically to ATLAS and CMS during threading. Extensive checks of instrumentation and feedbacks started as soon as the beams circulated. Sunday afternoon the first ramp attempt was performed successfully and the beams arrived at 1m without losses and a beta-beating of only 10%.