MSWG Meeting #7, 16-June-2017

Present: F. Asvesta, M. Barnes, H. Bartosik, C. Bracco, D. Cotte, V. Forte, A. Guerrero, G. Guidoboni, A. Huschauer, K. Cornelis, V. Kain, T. Lefevre, E. Metral, D. Nicosia, G. Papotti, F. Tecker, P. Zisopoulos,

Agenda:

Link to the Indico Event

- Approval of minutes – Karel Cornelis
- Status of operational beams – Machine supervisors
- Main presentations:
  - Final results from the HST – Chiara Bracco
- MD updates:
  - New PS working point knobs – Alexander Huschauer
- AOB

The MSWG minutes of the last meeting were approved. **G. Papotti** commented that the setting up of 200 MHz and 800 MHz is still not fully completed for 288 bunches. The phase of the 800 MHz is aligned with the 200 MHz, however still the feed forward cannot be used. **V. Kain** added that the HiRadMat beam still suffers from longitudinal instability.

Status of Operational Beams:

PSB – Vincenzo Forte

M. Haase discovered an insulation problem on the HV cables for the R2 C02. The cables were replaced and the R2 C02 is back to work.

The operational beams are all within specs. The setting up of the 50 ns is ongoing. The emittance measured so far is close to the PSB brightness line. The next beam to be prepared is the doublet beam.

PS – Denis Cotte

All operational beams are ok in the PS. However, the transverse emittance on the LHC25ns standard beam is around 3um with 940e10, i.e. the emittance is slightly too large. Investigations are ongoing. All LHC users are now using both 40 MHz cavities for the bunch rotation.

Trajectory fluctuations are observed at injection into AD probably due to a faulty element in the FTA line.

SPS – Verena Kain

The BCMS beam is presently delivered to the LHC with 1.1e11 within 1.5um. The LHC25ns beam used for the HiRadMat run last week had too large emittances (as mentioned by **D. Cotte**). In addition, the beam size measured on the BTV screens is not trusted for the moment, as it seems independent of the actual beam parameters. This needs to be further investigated (including the instrument itself, optics, …). **K. Cornelis** proposed additional checks with low intensity beams.

The successful bunch rotation of the single bunches extracted to AWAKE was reported. The bunch length at extraction was about 1 ns (4 sigma).

The intensity of the SFTPRO beam was increased to 3e13 ppp at SPS flat top. The transmission is still being optimized. For the moment up to 91% was achieved.

During the dedicated MD on Wednesday about 1e13 ppp of the fixed target beam were extracted within 1 s on the SHiP cycle.

LEIR – Dom Nicosia

The RF setup on both cavities is done for the EARLY user (1 cavity is used as hot spare). The Early beam is delivered to the PS. The Nominal beam is accelerated with 1 injection, but the fine tuning is still to be done. Commissioning studies with the new BPMs in the ITE loop are ongoing.

Main presentations

Final results from the Half Sector Test – Chiara Bracco

The Half Sector Test (HST) was a temporary installation of half of the PSB injection chicane of one PSB ring in the Linac4 transfer line to test the future injection scheme with H^- charge exchange. In addition a stripping foil test stand is permanently installed in the Linac4 transfer line to study foil lifetimes and gain experience with the stripper foil changing mechanism.

The experience gained so far showed that the handling of the stripper foils is very delicate. The foils are installed on a belt that can be rotated for changing to another foil. No foils broke with beam. One foil broke during movement of the belt. However, foil breakage occurred in some cases when the beam was impacting on the BTV screen in front of the foil – the reason is not fully understood but it may be linked to electrostatic charge build up. On the stripping foil test stand the stripping efficiency can presently only be measured by comparing the signals of two cross-calibrated Beam Current Transformers (BCT) located at each side of the unit. Unphysical transmission values of 120% were measured without foil. Since similar transmission was measured with foils, the stripping efficiency is close to 100% as expected.

Measurements of the stripping efficiency at the actual HST gave excellent results. The tested amorphous Carbon foils and the diamond like Carbon foils showed stripping efficiencies of practically 100%, since no signal was measured on the H0/H- detectors. The Boron mixed Carbon foil resulted in some measurable signal at the H0/H- detectors corresponding to a stripping efficiency of 99.6%.

The HST was an important test that allowed identifying a few weak points that need to be improved in the actual installation in the PSB, e.g. the BSW bumper magnet flat top precision. Furthermore, issues with beam instrumentation could be resolved, e.g. new filters in BCT amplifiers allowed suppressing high frequency beam signals so that now the transmission values make sense.

Discussion

- Following the statement that the pieces of the broken foils were found to simply fall to the bottom of the vacuum chamber, **K. Cornelis** proposed to study if the pieces of the broken foils would start moving due to induction when the beam would continue passing by the injection point in the actual PSB installation.
- **V. Kain** asked if similar foil mechanisms are used in other labs. **C. Bracco** explained that at SNS in Oakridge the foils are mounted only on top.
- **V. Forte** pointed out that the foil pieces are radio active. The main issue comes from possible contamination. **V. Kain** added that at ISIS a special vacuum cleaner is used to collect the damaged foil pieces.
- **H. Bartosik** asked how long the foils are expected to last. **C. Bracco** explained that they are not expected to break due to beam impact, but the issue is rather that the stripping efficiency will degrade with time and therefore the foil might need to be exchanged more often. The lifetime can also be studied on the test stand. The mounting mechanism will be improved to ease the handling.

<u>New PS working point knobs – Alex</u>

The PS working point and chromaticity is mostly controlled with pole face windings on the combined function magnets. The operational use of these pole face windings is based on the measured response matrix. New measurements will be done on the ramp (in the past measurements were done on 7 plateaus with polynomial interpolation in between). Up to now a working point control application was used. These knobs are now implemented in LSA. Horizontal and vertical tune knobs were successfully deployed and tested with beam. Both tune and chromaticity follow the knobs as expected. At some point the PS operation crew will switch to these new knobs also on all operational cycles and discard the old application.

Knobs for the figure of 8 loop (F8L) and the low energy quadrupoles (LEQ) are in preparation – almost ready. Similar knobs will be prepared for the new chromaticity sextupoles.

Discussion

- **A. Huschauer** mentioned that the basic function setup as generated by the old application still needs to be implemented and included in the cycle generation of LSA.