Week 27 (long MD + UA9)

Multi-bunch injection on Q20 cycle and direct comparison with nominal optics cycle (H. Bartosik, B. Salvant, SPSU-BD team, et al.)

1) 1 batch 36 bunches nominal intensity
    a) setup of orbit, tunes, chromaticity, dampers and RF on both cycles. In the Q20, there were some issues with the setup of the dampers due to very high vertical orbit excursion at high energy, which required additional attenuators. In addition, with the present configuration in LSA, only one of the 2 vertical dampers could be setup correctly.
    b) Measurements of instability thresholds in the longitudinal plane during the ramp for both optics. The observed onset of instability occurred at higher energies in the Q20 cycle. Studies of different longitudinal parameters in the PS on the transmission efficiency in the nominal cycle.

2) 4 batches of 36 bunches nominal intensity
    a) damper settings were checked. Removing the vertical dampers did not yield to losses in Q20. Sometimes the beam was not lost even with all dampers off in Q26. To be continued.
    b) emittance measurements for both optics in PS and SPS were difficult as some inconsistencies came up. Variations of injected emittance from PS were between 1.2 and 1.6 mm.mrad (norm.rms). Extracted emittances from SPS were found ranging from 1 to 2 mm.mrad (norm.rms). We used the Standard mode with 900 25 ns slots. To be checked with the BI expert.
    c) At extraction, bunch length was ~1.51 ns in the Q20 instead of ~1.41 ns in the Q26. The longitudinal emittance was found at 0.41 eV.s (Q20), vs. 0.46 eV.s (Q26)

3) 4 batches of 36 bunches ultimate intensity (from 4:10 to 5:14)
    a) At extraction, bunch length was ~1.57 ns in the Q20 instead of ~1.41 ns in the Q26. The longitudinal emittance was found at 0.44 eV.s (Q20), vs. 0.46 eV.s (Q26)
    b) Similar efficiencies were obtained between the Q20 and Q26 optics for the few measured shots (~10% losses).

Many problems came up, in particular, BLMs and vacuum in ZS. We did not have time to understand the systematic dump during the ramp in the Q20 optics, despite the fact that the first shots before the ZS vacuum interlock went successfully through the ramp without any problem. From the measurements taken in the Faraday cage, the beam looks more stable in the Q20 (no instability observed) and no longitudinal emittance blow-up needed. Both are unstable at the end of the ramp (double RF system stabilization needed).

UA9 (W. Scandale et al.)

UA9 had 24h of coasting beam at 120 GeV/c. Details of the progress can be found in the logbook

https://ab-dep-op-elogbook.web.cern.ch/ab-dep-op-elogbook/elogbook/eLogbook.php?lgbk=810&date=20110707&shift=1

Weeks 28 (only parallel)

Tune scans with Q20 optics (H. Bartosik, Y. Papaphilippou)

Horizontal and vertical tunes were scanned on a 4 sec flat bottom in order to improve the resonance picture of the SPS. In particular, the scanning of the tunes in the tune plane was carried out from left to right and vice versa, top to bottom and vice versa. The purpose of this exercise was to better catch resonance lines that could appear weaker, when crossed always after another strong resonance and therefore with low intensity. Automatic chromaticity measurements were put in place with continuous radial steering.

Tests of the digital LLRF control system for the PSB Ring 4 (M. E. Angoletta, A. Butterworth, A. Findlay)

After many months of testing and developing the system fully parasitically (i.e. without actually controlling the beam) on the PSB users, finally the test digital LLRF system went online. It can now control PPM the beam on ring 4 and many tests are underway. It should be underlined that the hardware used in this test system is not yet the final version (which is currently in the making) and will be deployed next year. However, the tests carried out are essential to devise and validate new control strategies and algorithms.

As for the work as well as the MD results, the following points should be mentioned.

1. SYSTEM INTEGRATION.
   A WorkingSet has been created and we hope to be soon able to use the new function editor to edit our functions. Many signals are now available on Oasis, making the system development as well as its documentation on the elogbook quicker and better. See for instance http://elogbook/eLogbook/attach_viewer.jsp?attach_id=1178785
   More signals will be added to Oasis as well as synoptic screens (as it is in LEIR) to control the many parameters we have. Some InCA-related problems were encountered, but CO people are very reactive and hopefully solutions will soon be found.
2. GENERATION OF EXCITATION SIGNALS FOR THE C16 AND THE TRANSVERSE EMITTANCE BLOWUP.

Much work has been dedicated to the generation of these two signals. The final version will require a new FPGA code (which should be in the making now) but the results obtained so far are anyhow very promising. More MD time will be required to test and validate the new principle of noise blowup (phase modulation for the new system as opposed to frequency modulation in the current PSB LLRF). These results might be interesting for the RCS study, too.

3. CHANGE OF MDDS HARMONIC DURING THE CYCLE AND SYNCHRONISED COMPENSATION OF THE RESULTING PHASE OFFSET.
   This is a somewhat technical point, that refers to the very high frequency swing of the machine and of the fact that we have to change harmonic in the ADCs and DACs clocks so as not to be either too low (Nyquist) or too high (higher operational limit of the chips). The method we use is a variation of the tagged clock already deployed in the PS, but with a much more advanced hardware and increased flexibility. The development of this point is essential to be able to generate the C16 excitation signal.

It should also be mentioned that when the system was switched ON, it worked correctly and did its job with the control values devised in 2008. This made Alan pretty happy, as not only we have now a full PPM control of all parameters, but also the system response seems to be pretty stable over many years!

Unfortunately, the PSB activity will be reduced in August owing to the LEIR startup period, but it will not stop and will restart in full swing in September.

To summarise: so far so very good!