

Notes from the meeting on the LIU-PSB injection (05/11/2014)

Present: J. Abelleira, H. Bartosik, E. Benedetto, C. Bracco, G.P. di Giovanni, V. Forte, B. Jones, M. Kowalska, M. Meddahi, B. Mikulec, G. Rumolo

After checking with the experts, Alessandra confirms that the debuncher phase can be changed ppm, thus potentially changing the energy spread from min to max pulse-to-pulse.

Progress on simplified model of injection line into PSB – Chiara

As decided at the last last meeting, the next steps were to start MAD-X modeling @BHZ40, downstream from which space charge should be less important; check “s” coordinates and the bump closure at the distributor (DIS); do the optics for the transfer lines to all 4 rings including vertical distribution; check the various optics options for all rings ($D_x=0$ with large and small beta and $D_x=-1.4$ m with nominal, large, small beta). Also the longitudinal positions of the elements were updated according to data from the latest survey. After reshuffling nominal, small and large beta optics, which were in different columns of the Excel file than previously assumed, the PATH and MAD-X look much closer with the expected slightly larger defocusing in the PATH optics. The simplified MAD-X model of the lines can then be a good basis for basic aperture checks. The vertical envelope, with a transverse emittance of $0.5 \mu\text{m}$ (to include a little margin) including contributions from $\pm 2\text{mm}$ orbit and momentum offset required for longitudinal painting seems to comfortably fit in the vertical restriction at the distributor, while it is close to the aperture at the SMV. The last 3 m of beam pipe exhibit a comfortable 15 to 20 mm distance between beam envelope and vacuum chamber in both horizontal and vertical plane. Next steps are to study the configurations with nominal beta and matched dispersion, and small and large beta with zero and matched dispersion.

Simulation of injection of LHC beams from Linac4 – Elena

The brightness line of the PSB has now been reproduced for two cases of different longitudinal emittances (1.4eVs and 0.8 times this value). The case 1.4 eVs is the same as already shown last time and exhibits a much lower slope than the assumed twice smaller slope with respect to the present PSB brightness (with multiturn injection from Linac4). The brightness line for lower longitudinal emittance has a larger slope (as was expected) and becomes much closer to the so far assumed line. Besides, the machine model has been extended to include the set of quadrupolar errors extracted from the beam based measurements of 2012. There seems to be not a big difference in the expected brightness line.

Action: Elena.

Injection of ISOLDE beams in PSB - Jose

The losses found in the simulations shown last time (injection scenarios with different vertical offsets) have been further investigated, by checking at which injection turn they mainly occur and how they are distributed along the machine. Increasing the offset value, the peak earlier on in the injection process becomes higher. The loss localization can be looked at through two different output files (AperturesHits.dat and Orbit.out). The former one shows that most particles are lost at the beamscope, with minor peaks at other locations. The latter shows the same low peaks but not the high peak at the beamscope window. **Action: Jose, to check aperture model (plot aperture as a function of s around the machine) and understand the difference between the different output files.**

Some follow-ups (list of actions)

Longitudinal evolution of LHC beams in the PSB with Linac4 – Vincenzo

Work in progress, trying to understand the best longitudinal code to reliably include space charge in the calculations.

Multiturn injection into the PSB from Linac2 – Gian Piero

The study is proceeding. PTC-ORBIT (without PTC libraries) is being set up to reproduce Vivien's results.

Next meeting: Wednesday 19 November, 16h30 to 17h30, 865-1B03