

[LIU beam dynamics coordination meeting \(13.01.2020\)](#)

Present: S. Albright, F. Asvesta, H. Bartosik, H. Damerau, G.P. Di Giovanni, M. Fraser, K. Hanke, A. Huschauer, V. Kain, B. Mikulec, E. Renner, G. Rumolo, E. Shaposhnikova, P. Skowronski, F. Tecker;

This meeting was held in preparation of the LIU workshop in Montreux, which will take place in a couple of days. The aim was to discuss and agree on the strategy for the beam performance ramp up after the re-commissioning of the injectors after LS2. A particular point of discussion concerns the brightness ramp up during Run 3.

[Plan for brightness ramp up during Run 3 \(Alex\)](#)

- The remaining upgrades of the PS RF systems will further improve the reproducibility and reduce the bunch-by-bunch variability, but there will be no major modifications to the high-frequency cavities. As the PS demonstrated already LIU intensities before LS2, it is expected that the PS should be able to deliver LHC beams with LIU intensities already few months after the restart. Therefore the PS complex will mostly focus on the brightness ramp up.
- Based on Evian discussions it is assumed that the LHC will use BCMS beams for operation during Run 3. This it should be made clear in Alex's the presentation at the LIU workshop.
- As observed during Run 2, the emittance preservation at PSB-to-PS transfer is critical with large momentum spread. Therefore it is planned to perform a ramp up of the brightness along Run 3 in order to characterize and optimize the PSB-to-PS transfer at each brightness step.
- It is proposed to perform the first step of brightness ramp up with the standard beam such that the longitudinal parameters of the BCMS beam at PSB are used. This will result in lower brightness due to space charge in the PS, but the PSB can use the same beam production scheme for BCMS and standard beam (only with different intensity). The brightness will be increased step-wise by increasing the longitudinal emittance from the PSB towards the nominal 3 eVs. This will also allow for some time to reach the LIU design brightness in the PSB.
- The brightness ramp up of the BCMS beam will be based on a recovery of the pre-LS2 parameters during 2021, followed by an intensity ramp up with constant transverse emittance until the final brightness line is reached. This is also compatible with the PSB, as the BCMS brightness is anyhow limited by the PS and therefore the required beam brightness from the PSB is less demanding.
- For low beam intensities there is a lower limit of the achievable transverse emittance because of the minimum emittance from Linac4 and because of the scattering on the injection foil. It was remarked that this dependence should be roughly linear with intensity (and not constant, i.e. independent of intensity, as originally indicated in the plots shown). Alex will change the plots.
- It was also proposed to include more details on the challenge about the emittance preservation at PSB-to-PS transfer, a slide on the choice of the intermediate energy plateau for RF manipulations in the PS, and a slide on

the studies of smaller longitudinal emittance for possibly reducing losses in the SPS.

Minutes by Hannes Bartosik