

LHC-Beam Commissioning Working Group

Notes from the meeting held on
6 April 2010

1- LHC beam commissioning- General progress report: see Mike Lamont's [slides](#)

Discussion – Comments:

Tune correction: Ralph Steinhagen: QTF/QTD, trims of $5e-3$ were tripping with quads above 50 A, 3 different mitigation possibilities – reduce strength by factor 5, but lose feedback efficiency at start of ramp; increased trim frequency from FB; QPS looking at increasing the 50 A limit to 75 A for temporary fix. Used tune feed-forward with some success, but need better solution soon.

Mirko Pojer: 50 A was considered as safe limit for unprotected circuits – new simulations from MP3 needed to see if higher current is safe.

RF voltage re-matched closer to SPS beam for LHCPROBE – momentum spread looks better (now 5 MV at start of ramp, was 12 MV). Needs to be redone for LHCINDIV.

Separation scans at IPs presently trimmed in by hand – try to implement going to optimum when collapsing bumps, incorporation somehow? Simon White: Seems to be moving by max 100 μm from fill-to-fill. Scans needed systematically at start of fill. Mirko Pojer – scans during the 'long fill' showed that there were no changes. Orbit not generally corrected during fill – to be done if RMS difference is $>100 \mu\text{m}$. Mirko Pojer also noted high hysteresis for warm magnet used in P8 – something here not understood. For TCTs, allow 3 sigma for scan, but should at some stage re-centre the TCTs around the beam. Gianluigi Arduini: should also take care to correct back to the same reference – not always done.

Beam-beam – request from Werner Herr to excite beam MKQ to see different spectra for different bunches. Ralph Steinhagen – can use PLL, but better to chirp on one beam and measure on the other. Ralph Assmann – should also bring beams into collision one IR at a time. Werner Herr will be performing these studies.

Non-linear chromaticity – strange kink seen in curve for B2 – data being reanalyzed

Off-momentum beta beat measured and consistent with expectations in measured range

Bunch length on flat top - Giulia Papotti – B1 increases faster, maybe due to larger noise? Also B2 see larger blow-up in vertical plane so could be IBS? Bunch lengths in measurement database – CO to put this in logging DB.

2- Optics during IR1 and IR5 squeeze to 5 m beta*- Rogelio Tomas ([slides](#))

Discussion – Comments: Dispersion and beta-beat look good – coupling clearly increases to ~ 0.01 . Error matches with -23 units in IR5.Q2 L&R, possibly due to QSX3 L&R of P1 (presently off). Interpolated measurement of b^* , get very close values to set value. IP5 vertical maybe a bit off, but all within the 20% limit. See some differences in beta-beat pattern around ring and increase of beating at 5m.

3- Chromaticity studies during the ramp - Ralph Steinhagen ([slides](#))

Discussion – Comments: snap-back at start of ramp visible, time constant of 50-70 s, much noisier in H. Can feed this forward. Ezio Todesco: Present Fidel amplitude of b_3 correction during snapback is 0.1 units. This is based on extrapolation of the model (no

dipoles have been measured at 2 A/s, and SM18 is in shut down up to May). Ralph measurements suggest that at the snapback there is a chromaticity change of about /pm 10 units, thus leading to the conclusion that the needed correction is 0.4 units. A modification of the snapback amplitude, forcing the FiDeL model to correct 0.4 units will be implemented soon. Since the decay is included at injection, this will also have an impact on injection trims.

Ezio Todesco concerning b5 correction: Recent analysis of magnetic measurements of the dipoles with the fast rotating coils has shown that the b5 snapback speed is ten times lower than the b3 one. In absence of data, the b5 value was set to the b3 value in 2009, and this is what has been used up to now in LSA. A correction should be considered. The issue will be presented in one of the next meetings.

Ralph Assmann: B1 emittance increase strongly in ramp, then slow growth in ramp – B2 vertical is largest emittance to start with, and seems to grow more. Brennan Goddard: easy to detune B1 vertical injection to see if related to initial size. Also should compare relative growth. Ralph Steinhagen: could be hump? Gianluigi Arduini: should measure just before and after going into collision.

4- What's next?

List of objectives:

- Squeezed stable beams with 2m b* with safe beam
- Prepare higher intensity at injection
- Prepare for intensity increase in stable beams

List of TO DO work:

Transfer and injection

- Stuff preparing for higher intensity

Injection system studies

- B2, high intensities, collimators, damper

Ramp

- B3/Q' feedback, orbit feedback, collimators, long feedback, beta-beating

Before higher intensities, MP issues

Squeeze

- Revisit mechanics and iterate
- Collimation
- Prerequisites for stable beams

LBDS related

- Tidying up, some MP tests, asynch dump test after squeeze
- Abort gap cleaning and monitoring

Outlook over next several days – presently under discussion

A.O.B.

Daily 8:30 HWC meeting in the CCC conference room (09:00 at weekends).

Daily 17:00 Beam commissioning meeting /OP, CCC glass box.

Next meeting: 13 April 2010, 15:30, 874-1-01. Agenda will be sent in due time.

Brennan Goddard