LHC Beam Operation Committee

Notes from the meeting held on 21st August 2012

Participants

1. ADT Tune Measurement (Wolfgang Hofle)

W. Hofle presented the recent developments in measuring the tune with the transverse damper (ADT) system. For this, **selected witness bunches (typically first six bunches) are excited by the ADT.** The transverse position is acquired with the ADT pickups by using a **new study buffer** with a length corresponding to 2730 turns for six bunches.

An initial test with six nominal bunches at 450GeV (01.08.2012) showed that **with continuously repeated excitations, the beam lifetime is reduced to about 30h,** accompanied by a **transverse blow up of about 1.66nm per excitation. The tune measurement with the ADT showed a clear tune signal and clearly resolves a tune trim of ΔQ=0.001.** With a RF frequency trim of 40Hz the chromaticity could be determined to be +1.5 units (ΔQ=-0.00049).

W. Hofle elaborated on the presence of a significant **second spike in the spectrum, which is shifted by -20Hz w.r.t. the tune signal.** The spike was observed on both beams and all planes and changes frequency with the tune.

W. Hofle presented the results from a dedicated test cycle with 2·6 nominal bunches per beam (12.08.2012). During injection, noise in the tune measurement could be mitigated by a reduced ADT gain for the witness bunches. **During ramp, flattop and squeeze, generally a clear tune signal is observable;** for some cases spurious outliers are detected, which could be avoided by a stronger excitation. In collisions, a splitting of the tune peak is suspected to correspond to Σ and π mode. W. Hofle showed that in the **bunch-by-bunch tune measurement,** the presence of the -20Hz line is clearly visible. During the test cycle a transverse blow up (mainly caused by the excitation) of up to 3μm per hour was observed.

W. Hofle explained the next steps towards an operational tool, which includes the corresponding implementations in the sequencer and a **better understanding and treatment of the -20Hz line.**

Discussion:

J. Wenninger pointed out that when the gated BBQ is operational the acquisition could be reimplemented there in order to use the approach for the tune feedback. Furthermore, he suggested publishing the full FFT and not only the tune values. W. Hofle added that the frequency resolution of the FFT could be improved by acquiring data for one bunch only.

J. Wenninger underlined that an **on demand tune measurement would be very useful** in the present situation. D. Valuch confirmed that an on demand tune measurement will be available very soon.

M. Lamont pointed out that very prominent 100Hz/50Hz lines (with a fixed frequency) were observed so far. The presented -20Hz lines were not observed yet. R. Tomas suggested that the effect might be intensity dependent and proposed to do a corresponding test with pilot bunches. S. Zhabitskiy suggested that the problem could be related to the signal processing in the ADT feedback in connection with adjustment error of the ADT phase settings.

2. Automatic Coupling Correction (Tobias Persson)

T. Persson presented a new tool for the coupling correction (until now only at injection). The correction is **based on the BPM turn-by-turn data from the pilot bunch injection oscillations (about 600 turns).** Via an FFT, the coupling is calculated. Based on singular-value-decomposition (SVD) the optimal settings for the coupling knobs are determined.

T. Persson presented several tests of the application which clearly showed that **applying the corrections reduced the coupling**. He explained that currently, the application can load the required data and calculate and display the corresponding corrections (in about 30-40s). The proposed corrections have to be trimmed manually.

After injection, a beam excitation would be required for coupling calculation and correction.

T. Persson suggested to use the raw data from the BBQ to determine the coupling correction (phase advance for B1 not profitable, though).

A. Discussion:

E. Metral asked if negative effects due to strong coupling were observed. J. Wenninger replied that the tune feedback switches off when the coupling is too strong. M. Lamont added that there was at least one beam dump during stable beams caused by too strong coupling.

J. Wenninger asked if the excitation from the ADT could be used to determine the coupling. W. Hofle replied that probably the synchronization of excitation and diagnostics would need to be improved.

J. Wenninger asked if at flat top the excitation with the tune kicker would be sufficient. G. Vanbavinckhove replied that this is not the case.

Upcoming meetings:

Tuesday, 4th September 2012 15:30 in 871-1-011: LSWG

Reported by Tobias Baer