

PSB MDs report – week 42

Topic: Chroma vs. losses relation in a space charge dominated regime

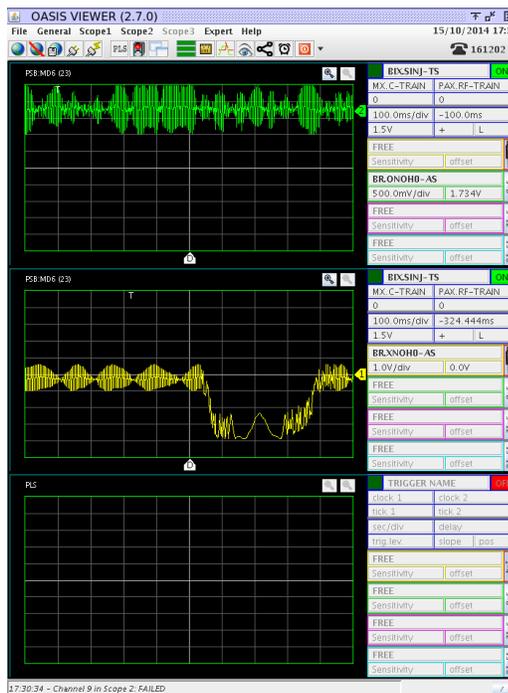
Date: Wed 15th October 2014

People: Vincenzo Forte, Bryan Jones

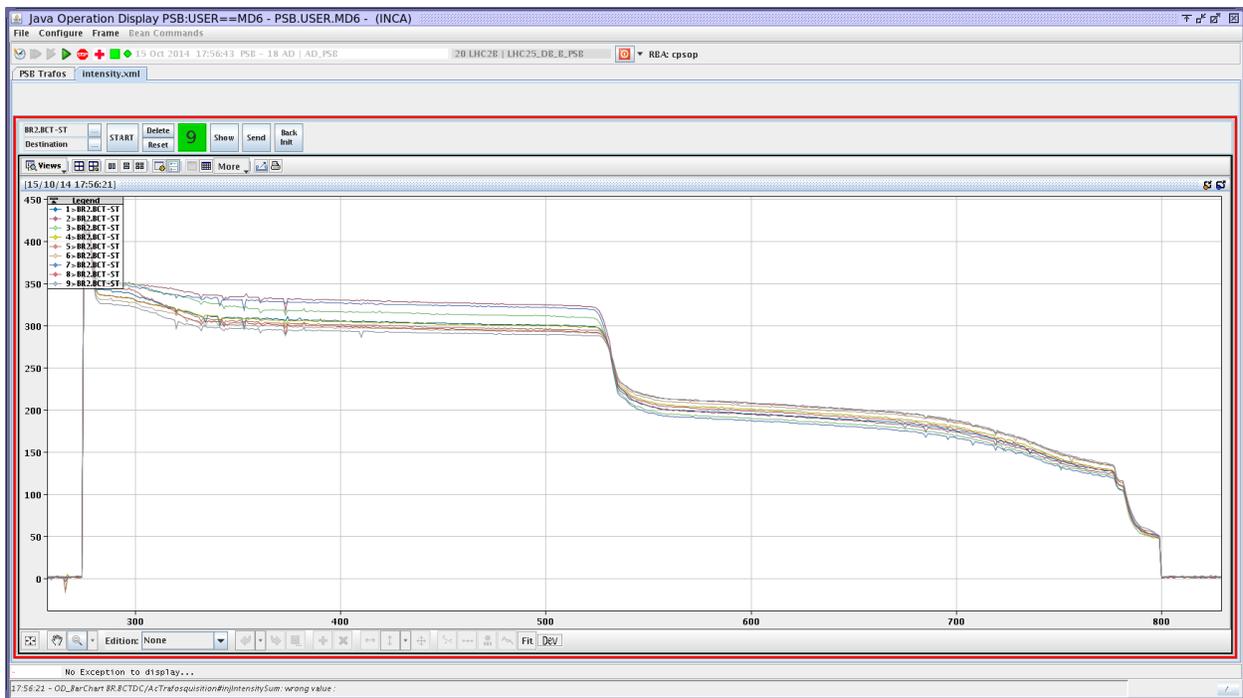
We tried to replicate the vertical dynamic integer scan performed on 12th Feb. 2013. Practically the vertical tune, with the vertical closed orbit corrected, has been brought close to the $Q_y=4$ resonance and then back to the original working point in a 70 ms span from C500 to C570. Close to the minimum w.p. ($Q_y=4.09$ at C535) losses occur without COD blow-up, so they can be related only to the tune spread. Also beam deformation (emittance blow-up) occurs. The aim of the MD was to see the effect of the chromaticity correction on the losses. The harmonic sextupoles XNOH0 have been powered in the Ctime window of interest and the difference in losses with and without them has been evaluated.

A big issue was present in the machine, because it seemed that the GFAs and the power supplies of the XNOH0s were not affecting the signal (looking through OASIS). It seemed, although, that the ONOH0s were piloting them (M. McAteer confirmed me that this situation is the same as before LS1, but it was supposed to be fixed...), while the XNOH0s were affecting somehow the ONOH0s: practically, it was like the signals are crossing. Also the OASIS signals were very noisy and also with opposite calibration (?) with respect to the GFAs. All this has been reported to the OP in charge (Fabrice) that has contacted the INCA support (also timing issues).

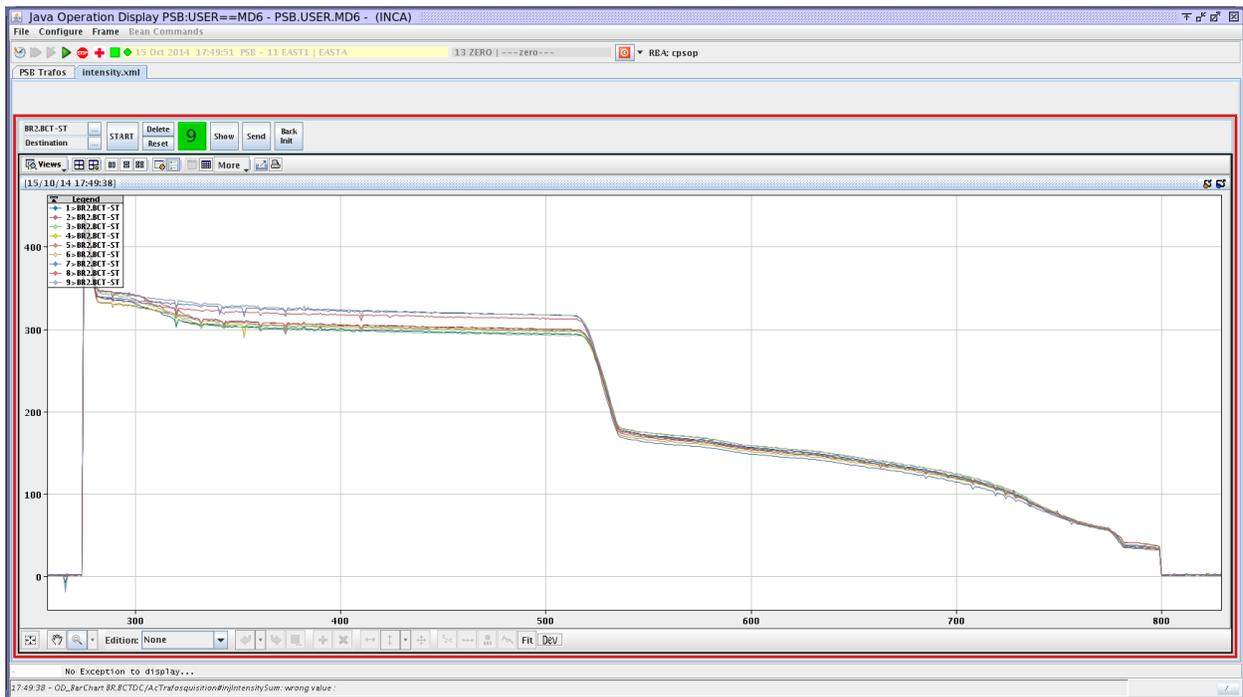
It was, anyway, possible to run a first attempt trusting OASIS for the XNOH0 signal and looking at the losses.



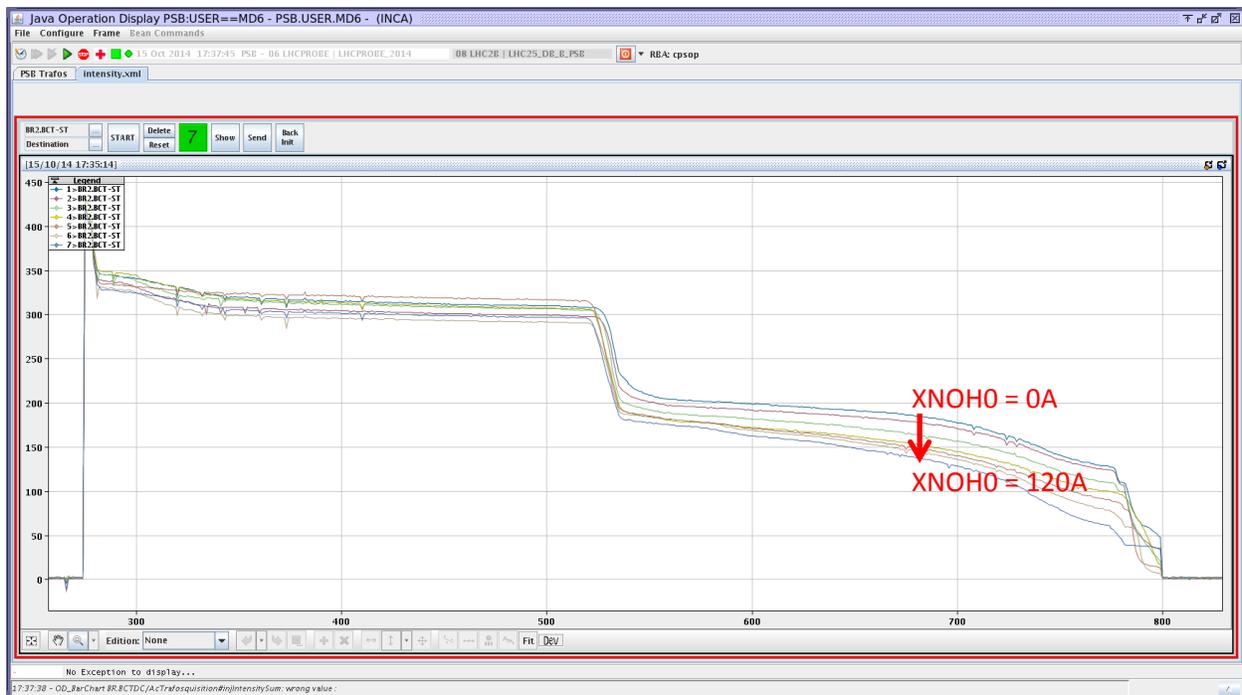
An example of the OASIS noisy signal



Losses without XNOH0 correction (from 300e10 to 200e10 around C535)



Losses with XNOH0 GFA at 120 A - (from 300e10 to 175e10 around C535)



Losses with XNOH0 variation (from 0 to 120A in 20 A intervals).

The chromaticity GFA has been varied from 0 to 120A. It seems that the chromaticity, as simulations showed, plays a role in the incoherent losses (25% more in this specific case).

The XNOH0 power supply must be manually switched to change the current sign. The positive GFA effect, as Meghan measured before LS1, is toward the annihilation of the horizontal chromaticity, so enhancing the vertical one. This induces a spread increase, so more losses.

This should be verified again through chromaticity measurements in control room, that were not performed on Wednesday.

The suspect is that, inverting the polarity, the vertical chromaticity will reduce and so the losses. This would confirm the effect seen in PTC-Orbit simulations with space charge.

This chromaticity control could lead also to a good effect for high intensity beam (to be checked).

This MD was just to check if, effectively, there was a chromaticity-related effect. A more extensive MD in week 43 is planned to confirm this feeling.

References:

Vincenzo's 45th S.C. meeting presentation:

http://frs.web.cern.ch/frs/Source/space_charge/Meetings/meeting45_09.10.2014/09-10-2014_dynamic_vertical_integer.pptx

PSBMD logbook: <http://elogbook.cern.ch/eLogbook/eLogbook.jsp?lgbk=29&date=20141015&shift=1>