LHC Beam Operation Committee
Notes from the meeting held on 07th August 2012
Participants

1. Inconsistencies in the MQY Transfer Function – E. Todesco (slides)

E. Todesco explained that the transfer functions of the superconducting magnets normally present a spread of the order of 5-15 units. S. Fartoukh found an inconsistency for the MQY in FiDeL: a spread of 50 units which is not realistic and in contrast with previous estimates. The large spread was due to the presence of several magnets with 1-1.5% larger transfer function values. Part of the MQY was measured at 4.2 K and part at room temperature (some magnets have high permeability collars at room temperature) but the inconsistencies concerned both types.

A table with revised data for the MQY has been produced by P. Hagen; a correlation was found between the errors of the MQY transfer functions and the corrections applied during the beta-beating measurements campaign (see next talk).

The measured errors are non negligible, in particular during the squeeze, and are different for two beams. The beta-beating corrections compensate partially the problem but the question if correcting the transfer functions now or during LS1 is addressed.

Discussion:

R. De Maria asked if the error in the transfer function measured for one aperture might depend on the powering of the other aperture.
E. Todesco answered that no clear evidence of it exists and that, by construction, the two apertures are uncorrelated.
G. Arduini asked how the two apertures were powered during the measurements.
E. Todesco answered that the measurements were done powering the two apertures with equal (in absolute value) and opposite (in sign) current **.

G. Arduini commented that the correction of the transfer function would require redoing the full campaign of beta-beating measurements and it would then be better do it after the long shutdown 1.
R. Schmidt confirmed and added that also the collimation system should be re-setup. In total one week would be needed to re-establish the operational conditions.

** Added after the meeting: The MQM/MQY are powered in series (external/internal) aperture. This means that the gradient has the same sign in both apertures when looking from the lead end (convention for magnetic measurements). As a consequence, the MQM/MQY cold mass is always an F/D combination (external/internal) guaranteeing anti-symmetric optics in the insertions.

2. Correlation Between Quadrupole Errors and Measured Beta-beating – R. Tomas (slides)

R. Tomas showed, as a reminder, the results of the measurements for the virgin beta-beating versus $\beta*$ and highlighted that, for some planes (beam 1 vertical and beam 2 horizontal), the beta-beating was close to 100%. He compared the errors found by P. Hagen with the applied local corrections, in all the different IRS, and showed that a generally good correlation could be found.
R. Tomas explained that IR8 was the leading source of the beta-beating and it was not easy to find good correctors in this region (last year the triplets were used while, this year, independent quadrupoles were preferred). The choice of the correctors and the combination of different errors could explain the non-perfect correlation with the transfer function errors for this IR. Nevertheless, the comparison of the virgin machine with the measured errors and simulations at flattop, showed a good correlation.
The measured errors have a non-negligible effect on the beta-beating and the tune shift.
R. Tomas concluded proposing to correct at least IR8 and see the effect on beta-beating at flattop. This could be done during an MD and would allow being ready for LS1.

Discussion:

G. Arduini agreed with the proposed MD to find eventual remaining errors before LS1. The test could be combined with additional ATS MD or in case of the commissioning of new optics. He pointed also out that the critical part would be to go back to the current transfer function at the end of the MD.
E. Todesco commented that this could be done through a trim.

F. Zimmermann asked if this changes would have also an impact on the crossing and separation scheme.
R. Tomas answered that the change should be of the order of 1%.
The LBOC supported the request of MD time for a measurement of the beta beating after correction of the transfer function in the MQY.

Operation should continue with the present transfer functions until the end of the run.

3. Preliminary analysis with the BLM Pattern Recognition tool – E. Del Busto (slides)

E. Del Busto explained that the main motivation for the BLM pattern recognition tool is to get some understanding on beam dynamics starting from beam losses based on the comparison with well known loss patterns (i.e. loss maps). Essentially all the losses can be represented by a vector which is a linear composition of reference vectors (horizontal and vertical losses for Beam 1 and Beam 2). Three independent methods are used to define the proportion of any type of known loss with respect to the measured one.
The reference vectors are defined based on the readings of selected BLM in IR7 during beam loss maps with the ADT. The references depend also on the beam conditions, optics and collimator settings.
The result of the analysis of different loss scenarios (loss maps, physics fills, etc.) show a reasonable consistency but the model is very sensitive to the chosen reference case and the reproducibility of all the beam/machine conditions.
E. Del Busto concluded affirming that the analysis of seven physics fill showed evidence of some activity for Beam 2 in the horizontal plane when going into collision.

Discussion:

G. Arduini asked if the latest reference vectors (ADT loss maps) were used to check the loss maps done in the past crossing the resonance and if they agree.
E. Del Busto answered that this is the case if the reference is close to the analysed setting.

R. Schmidt commented that small changes in the orbit have a big effect on the losses at the collimators. This could affect a lot the analysis of the pattern recognition tool since it is difficult to control all the parameters with the required precision.

D. Wollmann suggested taking only the elements at the beginning of IR7 as a reference since many BLM suffer from crosstalk from other locations (i.e. IR3).

4. AOB

G. Arduini gave an update on the polarity switch of the octupoles. He explained that, after the change, the chromaticity was measured and corrected and a reduced number of bunches will be brought into collision. The next step will be to redo the same with the full intensity.
E. Todesco asked if the circuit-by-circuit polarity sign will be checked?
G. Arduini answered that this will be done since, according to Rogelio's measurements, some inverted polarity is not excluded and this is an important information in view of operation at 7TeV. The measurement could be performed next week.

5. Next meeting

Tuesday, 21/08/2012: **LBOC meeting (14:00 in 874-1-011) and LSWG meeting (15:30 in 874-1-011).**