

Minutes of the 86th WP2 Meeting held on 28/02/2017

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General information (G. Arduini)

The minutes of the last meeting (14th, February) have been circulated. Gianluigi summarises the outcomes and the actions arisen from the last meeting.

Impact of b3/b5 of MBRD (F. Van Der Veken)

The correction of D2 by means of the corrector package is not trivial due to the fact that its two apertures need to be corrected simultaneously. The strategy is to apply the average of the two required strengths.

The systematic part of the errors can be corrected only for the odd components, as the even ones are antisymmetric between the two apertures. The random part can be (partially) corrected for all the components. The effectiveness of the correction is cross checked by applying errors in D1: the closest single aperture magnet.

The correction of the b3 component works well for both D1 and D2, resulting in a flat DA response versus the amount of error. Although the correction is simultaneously applied to both beams, Beam 1 always achieves better DA, Massimo comments that this is probably due to a different phase advance of Beam 2 which could be further optimised, **Action: Massimo to follow-up on that point.** The simulation contains one unit of random errors, but no octupoles to get a clearer picture.

The additional required strengths of the corrector package to correct for the D2 errors are typically few percents of the total, even in the extreme cases we are far from the limit.

b5 can be corrected in D1, but in D2 the correction results in smaller DA in some cases and definitely does not make the response flat. The analysis of resonance driving terms shows a drop of several orders of magnitude for the targeted terms, and a factor 10 reduction for the non-targeted ones, for both b3 and b5 case. Correlation between driving terms and DA is expected but not observed, possibly because of the noise from the random part.

The correction of all the components does not show significant improvements compared to the correction of only b3 and b5.

Riccardo comments that there can be a feed down effect from b5 (and b3?) due to the orbit that might be dominating the impact on DA and eliminate the correlation resonant driving term DA. The strongest resonances can possibly be identified by Frequency Map Analysis. Gianluigi adds that one can also switch off the crossing angle. The values of DA should be computed for 2.5 um emittance. **Action: Frederik**

For the time being it is critical for the magnet group to control the b5 component as we do not have an effective correction scheme for it.

Statement on transfer function precision between Q2A and Q2B (E. Todesco)

A trim between Q2A and Q2B of 120A is in place. The possibility to remove it depends on the precision of the measurement of the transfer functions of the Q2 magnets and on the difference between them. Currently short models of the new magnets have been assembled with components from different laboratories and we are still not able to accurately estimate the spread of transfer function, for this reason the estimations are based from previous experience. MQXA (Japanese) has 5 units of spread, MQXF (American) has 10.

Sorting helps in reducing the spread, but according to Montecarlo simulations the target of 5 units can be reached only with a probability of 66%.

Gianluigi comments that during the last HL-TC it was mentioned that sorting has some overhead on the logistic therefore we should understand if we need it. Riccardo asks if the production and measurements will end before installation, Ezio confirms that this is foreseen in the baseline, so the conclusion seems to be that there will be no overhead.

Another possibility to mitigate the spread consists in varying the length of the laminations, reducing the length of the strongest magnets. However this way of tuning requires careful analysis as the magnet needs to be disassembled and it implies a higher field.

Riccardo comments that it is possible to design the optics taking into account the imbalance and a longitudinal shift of the magnetic centre, although the latter should be possibly controlled down to few mm. Gianluigi asks about the imbalance between model and corrected optics in the current machine,

Action: Jaime.

Gianluigi asks about the advantage of eliminating the trim power converter. This will be addressed in the next circuit review.

Update on the field quality of the triplet (E. Todesco)

Large a4 and b5 components have been measured in the two short models. According to the measurements the spread of these components can be as big as +/- 5 units.

Simulations can reproduce the b2, b3 and b4 components by tuning the shimming and the coil alignment, but a setup that can also fit a4 and b5 has not been found. They may originate from the manufacturing process of the coils and the effect might be smaller for longer magnets similarly to what was observed for the LHC dipoles. The test of the 4 m long magnet is expected in the summer, possibly by September.

Measures of transfer function and of all the multipolar components will be provided for all the magnets.

Reported by Dario, Gianluigi and Riccardo.