Minutes of the 52nd WP2 Task Leader Meeting held on 03/07/2015

Participants: G. Arduini, M. Fitterer, E. Metral

Minutes, Follow-up of Actions, General Information (Gianluigi)

Previous meeting minutes were approved. Concerning the requirements for the crab cavity beam based alignment, Gianluigi commented that the corrector strength should be re-evaluated for the new layout. In the new evaluation also the D2 transfer function error uncertainties.

At the steering committee the structure of the technical design report V1.0 has been presented. This will be a revision of the PDR. During the week-end Gianluigi will send the Task Leaders the latest version of the PDR with some comments concerning the parts to be updated. The first draft is to be submitted by middle of August, Gianluigi asked the Task Leaders to send him the revised PDR contributions by **7th August**.

Gianluigi mentioned that the latest version of the preliminary design report will be published, but not printed.

Roll angle specification for IR1/IR5 quadrupoles (M. Fitterer, R. De Maria)

Miriam presented the first preliminary results on the roll angle tolerances for the inner triplet and Q4/Q5.

Assuming that the b_2 error can be compensated by rematching the optics, the roll of a quadrupole can be simulated as a_2 error with:

$$a_{2r}=\sin(2\,\delta\phi)\approx 2\,\delta\phi, \quad \text{with } \delta\phi = \text{roll angle}$$

Miriam highlighted that all roll angle values given in the following are 1σ values of a Gaussian distribution truncated at 3σ.

Miriam explained shortly the correction of the a_2 error as done currently for the HL-LHC. First a local correction of the IT a_2 error with the corrector package at the IT in IR1/5 (MCQSX3) is performed. Afterwards the coupling is corrected globally with the closest tune approach. Miriam commented that for squeezed optics, the skew quadrupoles in the strong arc are not used as for them the requirement of $\mu_x+\mu_y=\pi$ between pairs is not fulfilled anymore. Furthermore, the corrector strength limit is defined by the MCQSX3 strength for the IT, and for the Q4/Q5 the contribution to the global coupling should stay in the shadow of the needed arc skew quadrupole strength.

Miriam presented the results assuming a roll angle only for the IT. In general the roll angle can be almost completely corrected locally with the MCQSX3 correctors. For 1 mrad around 45% of the corrector strength would be needed. Nevertheless, for roll angles larger than 0.5 mrad the correction does not converge sufficiently for a non-negligible number of seeds and therefore a preliminary correction limit should be set to 0.5 mrad. Miriam commented that the reason for the non-convergence is not understood and the tests done to rule out:

- non optimal coupling knobs for squeezed optics (phase errors and no skew quadrupoles in strong arcs)
- beta-beating

- non optimal position of the MCQSX3 in terms of unequal beta-functions at the correctors

were not conclusive.
In the case of a roll angle for only Q4 and Q5, the coupling is corrected entirely with the skew quadrupoles in the arc and about 1 mrad roll angle for Q4 and Q5 could be corrected with the requirement to stay in the shadow of the contribution from the rest of the ring. Miriam commented that 0.5 mrad roll angle would though be preferable to minimize the effect of Q4 and Q5. Gianluigi mentioned that, as the phase advance between Q4 and Q5 and the corrector package is small, one could also think of correcting the a_2 error of Q4 and Q5 with the local correctors at the IT (MCQSX3). This should be further investigated.

Based on the preliminary simulations Miriam summarizes that the corrector strength limit is 1 mrad roll angle for IT, Q4 and Q5. To ensure a sufficient correction for the majority of the seeds (Q_x-Q_y < 10^{-4}), the tolerance should be lowered for the IT to 0.5 mrad. Furthermore, the correction algorithm should be revised and the overlap of the beam envelopes at the IP checked as proposed by Stephane. It was concluded that the reason for the failure of the algorithm to correct some of the seeds should be further investigated in collaboration with the OMC team. Rogelio and team will work on that.

Report from Task Leaders:

Task 2.4 (Elias): An updated list of HOM for the crab cavities has been provided by Rama and is available in the following EDMS documents: 1518298 and 1523249 (link available in the WP2 HL-LHC main parameters and assumption page: https://espace.cern.ch/HiLumi/WP2/Wiki/HL-LHC%20Parameters.aspx). The latest tables are being considered by Nicolo for the estimate of the growth time and will be discussed on two dedicated Task 2.4 meeting. Elias will report on the results in one of the next WP2 task leaders' meeting.
Some work has been done by L. Thorndahl to reduce the impedance of the 10 GHz kicker for the LHC ion stochastic betatron cooling. The structures would now acceptable from the point of view of the impedance. Gianluigi reminded that this is not part of the present HL-LHC design. Information on the design of the triplet BPMs has been received and impedance simulations will be performed.

Reported by Gianluigi and Miriam