

Minutes of the 74th WP2 Meeting held on 16/08/2016

Participants: G. Arduini, H. Burkhardt, R. De Maria, M. Giovannozzi, K. Li, E. Métral, Y. Papaphilippou, K. Sjobaek, G. Sterbini, R. Tomas, F. Van Der Veken, C. Voellinger.

Minutes, Follow-up of Actions, General Information (G. Arduini)

Minutes of the last two meetings have been approved.

Gianluigi went through the main actions from the previous meeting.

Elias confirmed that the meeting scheduled on the 27/9 could be moved to 23/9. He also passed a comment from Elena who was not informed about the HL-LHC annual meeting program. Gianluigi clarified that the invitation list will be announced as soon as department heads will process it. Rogelio will present the program next week at the WP2 meeting.

Yannis mentioned that mini workshops could be organized Thursday and Friday at CEA. Gianluigi suggested to try to organize meetings at CERN instead as it might be more effective for the discussions with all the people involved (including those not participating to the annual meeting).

RF Finger Simulations (K. Sjobaek)

Kyrre introduced the problem: trapped modes can appear when the bellows are not completely extended and a resonance could occur in between volumes. There are two designs based on 2- or 3-convolution bellows. Measurements carried out on these two designs are not completely conclusive and needs to be confirmed by simulations.

The software used is ACE3P as electromagnetic solver and Trellis for mesh generation. The mesh has been redone starting from a CATIA model to allow parametrization and fine-tuning needed by the solver.

The outer volume show very little coupling with the beam. When stretching the structure the modes shift, but not significantly. The longitudinal wake behaves as expected, while the transverse one is being investigated for accuracy.

Next steps are to study the impact of a transverse distortion of the bellow (the modelling of the deformation is not trivial), evaluate the transverse wake, study 2-convolution bellows and to simulate wire measurements.

Gianluigi asked whether the weak coupling observed in simulations and the value of the frequency of the main mode (at ~2 GHz) is consistent with the I measurements. Christine confirmed that the 3-convolution measurements are consistent with simulations. Gianluigi asked about the impact for the real geometry (the simulations have been performed for 111 mm diameter). Kyrre replied that the mode frequency will shift slightly. Gianluigi asked whether the remaining open points could be finalized by the beginning of September to present a status to the TCC. **Action: Kyrre prepare update for the 13/9 on transverse wake.**

Heat load estimates for the experimental vacuum chambers and potential limitations (B. Salvant)

Benoit reviewed the modifications expected in HL-LHC for the four experiments. The largest modification is in LHCb for the VELO and wake field suppressor. The present HL-LHC baseline does not include high beta physics at small angles (and therefore Roman pots are not expected to be installed).

ALICE modifications have been discussed at the TREX of June-July 2014. The change was approved provided that the Beryllium pipes can sustain 5 to 6 W/m and the stainless steel up to 20W/m (HL-LHC currents). **Action: Benoit to verify whether the corresponding thermomechanical simulations have been performed by the ALICE experts.** The power deposition on the large aperture chamber could be as high as 1.4 kW if one of the lines of the beam spectrum exactly overlaps with one of the HOM. Temperature monitoring has been installed very close to the stainless steel in the material. The measurements show indeed that heating is present and it is sensitive to the spectrum, however the temperature increase is reasonably low indicating that the above situation is not occurring and it is expected that the temperature increase for the HL-LHC parameters will be less than 10 degrees. Gianluigi asked whether the longitudinal beam spectrum has been measured in the LHC. Benoit replied that there are issues with the reliability of the measurement. **Action Benoit: to check whether beam spectrum continuous monitoring could be re-established.**

For ATLAS there is no particular issue as long as there is no forward physics request to include roman pots in the lattice.

CMS requested recently a change of diameter and material of the experimental vacuum chamber. The choice of Aluminium will move the modes to higher frequency and with higher shunt impedance. The expected power loss will be reduced with the new pipe. The impact of the NEG coating is not easy to assess, however this should lead to a reduction of the power loss.

LHCb VELO new geometry is more complex and it is under development. The contribution to the longitudinal impedance after the upgrade amounts to 5% of the total machine impedance.

Benoit noted that a recommendation to reduce the corrugation was given, but it was not possible to implement. The simulation uncertainty is large. Gianluigi asked if heating in the present VELO is compatible with simulations. Benoit replied that since the VELO is actively cooled, it is then more difficult to compare with simulations. **Action Benoit: check if an experiment with a controlled reduction of the cooling could be envisaged to compare simulations with measurements.** The estimate of the longitudinal impedance has been provided to Elena Shaposhnikova and the implication for the longitudinal stability will be discussed in the meeting planned for 23/9. The power loss is non-negligible and there is a risk that heating might require opening the VELO to larger aperture. Benoit is following that up with Massimiliano Ferro-Luzzi. Yannis and Massimo, stated that larger aperture could impair significantly the VELO performance.

Gianluigi asked if there is any update on the triplet BPM and whether we can establish the minimum bunch length that is compatible with the operation of the present kickers with HL-LHC beams based on the experience gained during Run 2. Benoit will come back to that. Elias reminded also that MDs are planned to validate the beneficial effect of new collimator materials, it has been demonstrated that this is possible thanks to the good precision achieved in the tune measurement as demonstrated in the last MD.

Reported by Gianluigi, Riccardo and Rogelio.