

Minutes of the 87th WP2 Meeting held on 07/03/2017

Participants: S. Antipov, G. Arduini, N. Biancacci, R. De Maria, I Efthimiopoulos, M. Giovannozzi, P. Hermes, G. Iadarola, N. Karastathis, E. Maclean, L. Medina Medrano, E. Metral, A. Oeftiger, Y. Papaphilippou, D. Pellegrini, B. Salvant, R. Tomas, F. Van Der Veken.

General information (G. Arduini)

After the talk of Luis on the parameter update scheduled for today, Rogelio will present at the technical committee taking into account criteria for longitudinal stability.

The outcomes from the steering committee (where the task leaders of each WP presents twice per year issues related to man power, work progress and deadlines) are:

1. The proposed WP2 deliverables have been endorsed but the definition of 2018 beam-beam compensation studies should be advanced at the beginning of the year.
2. WP2 is not appearing in the master plan, this will be changed so to make more transparent the expected deadline for the specification of some components.
3. The budget profile is consistent with the requests with minor deviations. WP2 does not have strong financial requirements and the expenses are mostly related to manpower.

Nicolo introduces a new fellow Segey Antipov coming from Fermilab and now working on impedance.

Impedance Police: Y Chamber (B. Salvant)

Benoit reports problems in getting the drawings of the present Y-Chamber which was built by Berkeley. Both the beam directions have been checked, also including alignment errors, the resulting impedances are very small in all the directions and no modes are present below the cutoff frequency. These results are in agreement with previous studies from Bruno Spataro. Andrea Mostacci and Mauro Migliorati confirmed that the design with parabolic intersection is the best one.

Gianluigi asks if are Point 1, 5, 2, 8 are all using the same design, Ilias replies that the chambers were built by different laboratories, Massimo adds that non conformities are present. **Action: Benoit check with Samy and possibly obtain the correct drawings.**

The Y-Chamber for HL-LHC is bigger in size but preserves the LHC geometry. The design has been very recently adjusted to comply with the specifications, decreasing the diameter by 2 mm (still larger than the LHC one). The studies performed for the larger diameter found very similar results as the previous studies. With the latest update of diameter no significant changes are expected. The origin of the very small increase of the imaginary part of the longitudinal impedance is counterintuitive and not well understood, but the effect is anyway negligible. **Action: Benoit to investigate this aspect.**

In conclusion the geometry is very well optimised and is not expected to create issues.

Gianluigi asks about the coating. Ilias replies that it should have NEG. Benoit adds that it will not have a strong impact on impedance. Gianni points out that it is also important for background. Gianluigi reminds that typically NEG is better for vacuum pumping while A-C is better for SEY.

Ilias comments that the TAN may suffer from the larger aperture of the Y-Chamber. Riccardo replies that the current diameter of 85mm is a trade-off between aperture and energy deposition, the TCLX will also help.

Gianluigi asks about the sharpness of the junction. Gianni replies that it should not be an issue. Benoit adds that it was clarified that the entire chamber should have a good connection to ground. A double check can be made with vacuum.

Riccardo wonders if cross talks between the two beams may be driven by impedance and e-cloud. Gianni does not expect criticalities. Riccardo adds that if some issues are spotted one may optimise the tapering angle. Benoit comments that simulations with two beams are possible but criticalities are not expected.

Gianluigi asks whether a comparison with TDIS data can be made to get an idea of the expected electron cloud build-up pattern. Gianni replies that they are drift and the geometry is simple therefore simulations are expected to be easy. **Action: Gianni to verify the electron cloud build-up in the Y-chambers (present and HL-LHC parameters).**

Riccardo reports that a series of integration meetings have been taking place to coordinate the design of the vacuum layout from D1 to Q4, taking into account the input from optics, experiment interface, survey and collimation. The vacuum group aims at providing a first design that maximize the aperture, reusing existing components where possible and reducing needs of tapering. Gianluigi asks about the time scale to complete the setup and Riccardo replied that he is not aware of specific deadline. **Action: Gianluigi will clarify with Vincent time scales on shape design and coating.**

Parameter update for the nominal (standard, BCMS, 8b+4e) and 200 MHz scenarios (L. Medina Medrano)

The updates of parameters has been done for the new baseline scheme with 2 crab cavities for a total crossing compensation only up to 380 urad. The bunch length of 1.2 ns (for a Gaussian distribution) follows from the presentation of Elena at the 82th WP2. The new longitudinal profile has been included and is referred as binomial distribution according to Elena, although according to Yannis and Rogelio this belong to the class of Student-t or q-Gaussian distributions.

The crossing angle is fixed at 510 urad. In principle the normalized crossing angle could be reduced as beta is reduced together with the intensity decay as shown by Yannis and Dario. The more dynamic evolution presented by Yannis in Chamonix should be considered for the future.

The FWHM are tuned to the same values for Gaussian and binomial distribution, the result is shown in a plot together with the parameters of the distributions.

Summary tables are shown, a number of suggestions related to parameter settings are collected by Rogelio and will be included in the presentation for the technical committee and in future iterations.

The cross section for the burn-off calculation is assumed at 111 mb, corresponding to the total one. Indeed this assumption is pessimistic as particles that are elastically scattered at low angles are not lost. Larger losses as compared to those expected from the inelastic cross section are observed at the beginning of the physics fill. Additional studies will be needed before considering less pessimistic criteria.

The evolution of the luminosity, pileup density and length of the luminous region for the different sets of parameters are shown. The new longitudinal profile comes with an increase of virtual and integrated luminosities by 11 % and 2 % respectively, the pile up density is increased by 3 % and the RMS length of the luminous region is reduced by 5 %.

In the LHC at nominal bunch population some bunches are oscillating longitudinally when we reach flat top. We can expect similar phenomena for HL-LHC, therefore the corresponding luminosity loss resulting from the time offset is evaluated. For an oscillation amplitude of ± 30 ps during the whole fill (pessimistic), the loss of integrated luminosity is 0.1%.

Gianluigi asks if the spatial distribution of the luminous region has been checked. Luis replies that it is close to Gaussian in all the directions. **Gianluigi asks to verify whether the resulting distribution can be well fitted with a q-Gaussian. Action: Luis**

Gianni asks about the use of FWHM vs RMS for the stability threshold, Gianluigi replies Elena showed that it is almost constant for different distributions with the same FWHM, although detailed simulations with constant RMS were not performed.

Reported by Dario, Gianluigi, Riccardo and Rogelio.