LHC Injection and Beam Dump

Coordination meeting #79 - TDI redesign meeting no. 5

Summary notes of the meeting held on 11th December 2012

Present: W.Bartmann, V. Mertens, O. Aberle, A.Perillo-Marcone, R.Losito, R.Jacobssen, A.Lechner, N. Shetty, C.Bracco , B.Goddard, S.Redaelli
CC: M.Meddahi, V.Mertens, R.Schmidt, V.Baglin, W.Riegler, A.Di Mauro, G.Bregliozzi, V.Venturi, V.Kain, F.Cerutti, A.Masi, A.Bertarelli, A.Mereghetti, J.Uythoven, D.Wollmann, A.Grudiev, H.Burkhardt

1. Minutes of the last meeting

The functional specification (draft version) still remains to be updated (J.Uythoven). The energy deposition in the coating will be calculated before the next meeting (A.Lechner). There were no further comments on the minutes of the last TDI meeting.

2. Broken LVDT on TDI presently in operation

Although not on the agenda, but because all the required experts were present at the meeting, it was discussed what to do with the LVDT on the TDI upper jaw in IP2. On this jaw the secondary LVDT is used for the interlocking and it started to drift over several 100 microns the day before the meeting, in the cold direction. The plan is to replace the broke LVDT and set-up the LVDTs again. Chiara will contact the ccc. News at the moment of writing the minutes: the new LVDT was recalibrated and a large off-set between settings and readings was found. After the TS4 and the interventation on both TDIs another calibration with beam took place. This time the settings and reading were again in agreement.

3. TDI redesign: materials, beam parameters and impect scenarios (A. Lechner).

Anton showed the updated table of materials, including new ones from last meeting. Different desntiy materials are to be used, from light to heavy. Brenan: no Inconel was listed, but has already been used: low coefficient of expansion, good in between titanium and tungsten.

The updated beam parameter list, as given by Brennan was also presented. It considers 25 ns bunch spacing only. The two beam scenarios of impact were described: full impact and grazing impact scenario. It is assumed that in the second case all bunches can be grazing. Considered load on D1 & triplet and load on TDI. For grazing the number of interaction lengths is not that important. For load on D1 the higher intensity, LIU maximum, is more demanding. The TCDD, is Cu mask: required to not have damage in case of grazing. TDI load: both beam scenarios are to be

considered. Direct impact on high-density materials to be avoided by putting in an off-set relative to the lighter materials. Richard is interested in fluxes in the cavern – Anton to give them a 'scoring plane', to see what escapes from the secondary showers of the TDI.

The next step is to define number the of modules – impedance issue - and integrated lengths. Impedance can be low in parking, and higher at injection. Check if impedance is important at injection or at full energy: check with impedance team (Alexei). Collimator tank: 1m length of absorber – will need five modules. Pump in between modules. Involve vacuum people in the discussion – invite/check Vincent.

First propose the sandwich materials. Can in principle mix materials within one unit, it needs to be checked if this is required. Then more detailed simulations.

4. Update on the preliminary TDI design (N. Shetty)

Nikhil showed FLUKA simulation results fed into ANSYS calculations for a preliminary TDI design in the full impact case, with the aim of assessing the possible material of the blocks. As a reulst B4C (= boron carbide) was ruled out as material because of too high stresses. Other different compositions were simulated and carbon compounds seem to be acceptable, with a preference for CfC 165 g/cm3. Next different composite blocks of 5 m were simulated. Two curves are shown (slide 4) for the two beam definitions, LIU nominal and LIU max, for three different material sandwiches. C165 with SiN and Glidcop seems to do the job.

The leakage for the new case and the presently installed case taking into account the diferent proton intensities, with 14 and 13 interaction lengths resp., is shown: no big difference is found which is a good sign. In the situation of a shorter sandwich, total length, 4.2 m, one will need to have a more high density material to obtain an obsorbtion of 14 interaction lengths, resulting in a larger power depositon (max around 4 kJ/cm3).. For the more realistic case of five modules of 1 m, seperated by 0.5 m vacuu, the situation is more favourable as the shower opens up between the blocks.

In the discussion it was proposed to check on vacuum and impedance, see above, and then decide on the number of tanks. Setting up with short 1 m modules is relative fast (alignment can be automated). The plan is to have a smaller coffee meeting in the beginning of the new year and report end January / feb. on simulated energy deposition in between tanks on the flanges (outside shower) etc.

5. Next meeting

The next meeting will take place end of January / beginning of February 2013.

- Calculated temperature increase of Ti coating due to grazing beam (Anton/ Fluka team)
- Impedance and vacuum implications (Vincent/Alexei)
- Update on design proposals for the new TDI (Nikhil/Anton).