

Minutes of the SPL working group

meeting no. 81

date: 16. August 2006

present: G. Bellodi, P. Bourquin, M. Eshraqi, R. Garoby, F. Gerigk, J.-B. Lallement, S. Lanzo, A. Lombardi, T. Meinschad, M. Paoluzzi, C. Rossi, E. Sargsyan, M. Timmins, J. Tückmantel, M. Vretenar

agenda

1. General remarks (Roland Garoby)
2. The "slim" SPL (Frank Gerigk)
3. Linac4 layout, south hall option (Marc Timmins)
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1. General remarks (Roland Garoby)

R. Garoby announced that Linac4 is to be discussed before the end of this year in the CERN council (probably October). In that context he reminded that it would be very useful to have at least a draft version of the Linac4 TDR ready for this occasion. In order to prepare for a management decision all cost and manpower information connected to the project has to be entered into APT (Activity Planning Tool). In accordance with the INPAC06 organizers RG will submit the original EPAC06 paper on Linac4 to the Indian conference. On the future of the SPL R. Garoby said that while it is very likely that Linac4 will be approved, the neutrino activities at CERN are again on the decline, making it less likely that the SPL will be approved as a neutrino factory proton driver at CERN. However, a "slimmed-down" version of the SPL may still be interesting as injector for a PS upgrade, replacing the PSB. Two possible scenarios will be studied: i) an extension of Linac4 to ~400 MeV followed by a Rapid Cycling PS Booster (RCPSB), ii) a "slim" SPL. During the next year, when the costing for the full SPL is done, we should also compile a costing document for the "slim" version of the SPL to be compared with RCPSB solution.

2. The "slim" SPL (Frank Gerigk)

F. Gerigk presented (slides) first ideas on how to reduce the costs of the full SPL in case it is only (or only in a first stage) used at a low duty cycle. For injecting into an upgraded PS, the SPL would still need a final energy of 3.5 GeV, but would operate at 1 Hz with a reduced pulse length of 0.4 ms and an average beam power of 56 kW. The machine has to deliver approximately 10^{14} protons per second. The "slim" SPL is likely to fit into the existing electrical infrastructure at Meyrin, meaning that no new high-voltage bay is needed at Preveessin, and no new high-voltage cable from Preveessin to Meyrin. It is likely that an RCPSB will consume more power on average and precise numbers will be needed in order to see if it can fit into the existing electrical infrastructure at Meyrin. Further savings on the SPL can be made in the water cooling installations and by running the SC section at 4.5 K instead of 2 K. The number of 704 MHz klystrons could be reduced from 44 to at least 27 by reducing the average pulse current from 40 mA to 20 mA. However, more RF splitters and more RF "piping" will be needed for this option. In general it is clear that if one wants to have a machine that at some stage can be upgraded to high-power, then the SPL is certainly the first choice. If no high-power proton user is expected in the mid-term future then the RCPSB may be an alternative.

3. Linac4 layout, south hall option (Marc Timmins)

M. Timmins presented (slides) his work on a 3D model for placing Linac4 in the South Hall. He has simplified an existing 3D model of the whole PS/PSB area and he is now adding all elements associated with the Linac4 installation. The present assumption is that the klystrons are placed on a gallery above the power supplies. Power supplies and low-level RF are in an air-conditioned area (it still has to be resolved if the power supplies need air-conditioning). This solution shortens the length between klystrons and power converters and it reduces the length of the wave-guides connecting the klystrons with the accelerating structures. The 4 new 704 MHz klystrons are installed in a vertical position taking less ground space and making use of the height of the hall. Presently there remains only 30 cm between the wave-guides and the crane in the hall, a situation that will have to be improved. Work has also started on implementing the transfer line with all magnets and cavities in the model. After that all existing equipment (PS, Linac2, Linac3, etc.) will be included in the model to assess possible clashes. R. Garoby remarked that one should also study if it is possible to place all elements on the ground instead of having a gallery for the klystrons. In the end the cheapest solution should be used.

Tour de table

- **C. Carli:** is working on the longitudinal aspects of H⁻ injection into the PSB.
- **C. Rossi:** reported that the brazing test has now been completed. It shows a non-homogeneous distribution of the brazing material on the surfaces. It was also found that the brazing material apparently remained in the groove which is not yet understood. There are indications that this may be caused by machining problems but further tests need to be done to resolve this problem.
- **A. Lombardi:** introduced Mohammad Eshraqi, a new doctoral student from the Teheran Institute for Studies in Theoretical Physics and Mathematics. He has started working on beam dynamics issues related to Linac4. Furthermore AL is looking at end-to-end simulations for Linac4 including the transfer line and using a beam distribution directly from the source. Apart from that, work is ongoing together with Luca Bruno on the Linac4 dump at the end of the linac.
- **M. Vretenar:** reported on his "worries" concerning the Linac4 TDR: i) so far he has received nothing from the vacuum group and ii) it seems also very difficult to get anything from the klystron group. Time permitting, he will soon start the actual editing. The CCDTL prototype is now in SM18 and connected to the klystron. At the moment the klystron power supply is limited to 58 kV even though it is rated for a maximum of 100 kV. This limits the power output of the klystron to 300-400 kW CW or to 200 kW in pulsed operation. While this is marginal for the CCDTL prototype it will certainly not be sufficient for the Russian prototypes to arrive next year. 100 kV will have to be restored to have enough power for these tests. There are now discussions ongoing with Novosibirsk about technical details like water connections for the CCDTL prototype under construction in Snezhinsk. On the other hand there are no news at all from Sarov on the construction of the DTL.
- **M. Paoluzzi:** is working on the power amplifier for the H⁻ source. The initial specs are for 100 kW at 2 MHz. The delivery date for the Russian chopper amplifier is now confirmed for mid-September.
- **F. Gerigk:** reported that altogether 800 copies of CDR2 have been printed. 200 are distributed by the library, while 600 were printed for the distribution by the SPL team. Up to now ~160 copies have been sent to the authors and various collaborators, leaving 340.
- **T. Meinschad:** reported that the source drawings from DESY are coming in little packages. After talks with DESY it was suggested to hire a temporary draughtsman there, paid by CERN, to speed up the finalisation of the drawings. After negotiations a price of 10k Euros was agreed upon (on paper) for a delivery at the end of October. R. Garoby approved this expenditure.
- **G. Bellodi:** data concerning all elements of the transfer line has been passed to T. Zickler and M. Timmins. She is now working on reducing the emittance growth in the initial parts of the transfer line (around the first achromat) by smoothing the transition from the linac to the transfer line. Presently there is around 40-50% rms emittance growth in this area.
- **E. Sargsyan:** is simulating the LEBT using different levels of space charge compensation and using Linac2/3-type solenoids. It was established that the beam divergence from the source is the main reason for emittance growth in the LEBT. He is then using this larger emittance for end-to-end

simulations of Linac4 to establish if the increased emittance is acceptable in the linac. Furthermore he is following up on the measurements of the ITEP quadrupole. The idea is to verify the tuning procedure with shims which was suggested by V. Skatchkov.

next meeting:

to be announced

-- FrankGerigk

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