Linac4 Beam Coordination Committee - Meeting 22 held on 9 December 2010

Present: Oliver Aberle; Bruno Balhan; Giulia Bellodi; Jan Borburgh; Christian Carli; Mariusz Cieslak; Julie Coupard; Alessandro Dallocchio; Alan Findlay; Margarita Garcia Tudela; Roland Garoby; Klaus Hanke; Thomas Hermanns; Michael Hourican; Ioan Kozsar; Jean-Baptiste Lallement; Stephan Maury; Bettina Mikulec; David Nisbet; Remy Noulibos; Mauro Paoluzzi; Gianfranco Ravida; Benoit Riffaud; Jan Schipper; Luc Sermeus; Jocelyn Tan; Maurizio Vretenar; Sylvain Weisz; Wim Weterings; Markus Widorski.

1. Minutes of the last meetings

The minutes of the BCC-21 are approved.

2. Follow-up of action items

No update.

3. Beam optics and painting schemes (C. Carli)

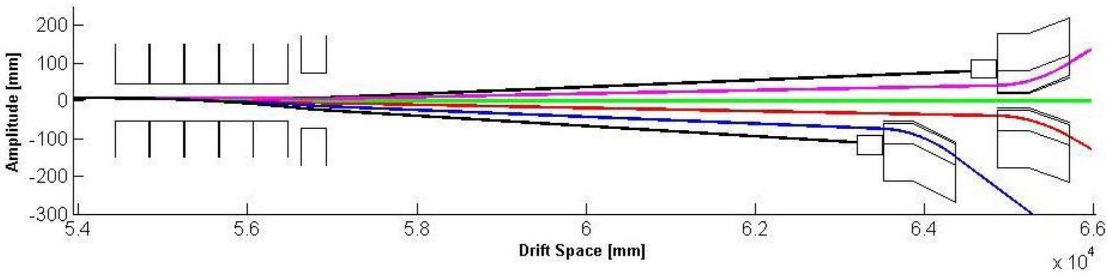
The perturbation generated by the injection chicane magnets (additional focusing) have to be compensated. Two possible compensation strategies were investigated:
The active compensation: Time varying quadrupolar fields in periods 3 and 14.
The passive compensation: Adding pole face rotation to the BS magnets.
Simulations indicate that both active and passive compensation give acceptable results. Additional power converters are required for the active compensation.
An aperture restriction ("beam scope" like window) is proposed in order to reduce the acceptance of the machine and bring the foil out of the circulating beam (after the painting bump decrease). The optimization of the transverse painting scheme is going on. The longitudinal painting study, with longer energy modulation period and lower current from Linac4, is started. We still need to construct and install the magnets BI.DVT/DHZ50 & 70 for the injection steering.

3.1. Discussion.

After discussion, the decision for going officially for the active compensation solution was approved by all the participants.

4. Beam distribution - BI.DIS & BI.SMV (M. Hourican)

The beam trajectories in the BI.DIS and BI.SMV is represented in the following figure.



The BI.DIS main modifications needed for the Linac4 operation are the replacements of the resistances, having the system HUV compatible and replacing the "Omega" shape cavity by a circular one. The magnets insertion and alignment system is presented. The mechanical stress Ansys simulation results are shown. The support and alignment system for the magnet DVT40 have to be investigated. Beam scrapers should be foreseen in order to preserve the magnets for beam halo losses. A 3D integration model of the distributor area will be done.

The BI.SMW concept is well advanced. It will be made of a vacuum tank housing 6 magnets (2 spares foreseen, for a total of 3 tanks and 18 magnets). Magnetic simulations with Opera do not show any magnetic saturation of the yoke in the beam path area. The tank also houses the head and tail dumps which can be easily dismantled and replaced (head dump for the top of the tank, and tail dump in the tank front cover). During normal operation dumps cooling is not needed, but the impact of an accident case (failure of the distributor, full Linac4 pulse) should be considered. The magnet insertion and alignment (in the tank) concept, cooling system, transformers positioning, electric connections and detailed dump assembly still need to be investigated. The responsible person for the vacuum in the injection area need to be identified (G. Vandoni or E. Mahner).

4.1. Discussion

B. Mikulec highlights that no beam scrapers are foreseen before BI.DIS and BI.SMV in order to protect the magnet yokes.
M. Vretenar suggests that beam scraping before the injection (in the transfer line) should be investigated.
Action: Look at the possibility of having a beam scraper in the transfer line, upstream the injection area (A. Lombardi).

5. BI.DIS PFN & KSW Painting Bumper (L. Sermeus)

The BI.DIS consists of 5 magnets and 5 Pulse Forming Network power converters (period varying from 20 to 420 μs). The present equipment cannot be upgrade because the pulse length and current have to be doubled, the capacitors are too old and the thyratron I.t product cannot be increased. The proposed BI.DIS system features are the following:

- 5 PFNs (6.25 Ohm instead of 25)
- PFN voltage up to 10 kV
- IGBT switch
- Fixed duration (≠ for each PFN, max 420 μs) with shortening possibility by IGBT switch-off.
- Short circuited magnets
- Recuperation of a large fraction of the PFN stored energy (> 50%)

Some extra space in the BCER should be allocated for the new PFNs. A PFN prototype validation is expected by the end of 2011.

Studies on KSW magnets are going on. TE/ABT will only provide the magnets, their supports and the ceramic vacuum chambers. Any other vacuum modification will not be included. The kick waveform has to be determined, according to the power supplies feasibility studies, as soon as possible in order to allow progress on the hardware design. It is very likely that 16 new magnets (plus their spares) will have to be made.

5.1. Discussion

K. Hanke highlights that N. Gilbert is in charge of the space management in the BCER.
L. Sermeus says that the BI.DIS0 magnet, as not really needed in normal operation, could be used as a spare.
B. Mikulec answers that we should absolutely keep it for the commissioning phase. Having it as a spare will depend on the performances of the pre-chopper.
M. Vretenar says that having longer beam pulse could be needed on day, and that we should reserve some extra space in the BCER for longer PFNs. In any case, the pulse should not be longer than 600 µs. Studies on PSB injection with 20-30 mA beam current from Linac4 should be performed and results shown by mid-2011.
KSW 1L1 will be moved to 16L1 and this section of the PSB shall be reserved for the KSW.

6. Injection chicane & Stripping - BI.BS & BI.BTS (W. Weterings)

The injection chicane provided by the BS magnets will house the stripping foil mechanism (BTS). The length of the BS magnets is limited to 380 mm by the vacuum chamber thickness. The first BS magnet will act as a septum. The stripping foil vacuum chamber will be placed between the BS2 and BS3 magnets. The BS4 magnet will house the H^0/H^- dump. The carbon stripping foil thickness should be around 1 µm (corresponding to 200 $\mu g/cm^2$) resulting of a compromise between stripping efficiency, losses and emittance growth. The foil exchanger unit is presented and detailed. According to simulations, the stripping foil temperature increase will be limited to 280°. A BVT screen is foreseen to measure the injected beam position and size. The position of a camera to inspect and visualize the foil still needs to be found. According to magnetic simulations, the foil offset of the stripping location falls in the magnetic leak field of the BS2 magnets and the effect of this needs to be studied. Magnets DVT50 and DVT70 have to be moved and the vacuum chamber modification of BHZ162 have to be studied.

6.1. Discussion

C. Carli says that the DVT70 should be moved downstream.
D. Nisbet asks to which project the PSB injection will be assigned in the future.
M. Vretenar and K. Hanke clarify that the Work Package will be transferred to the LIU-PSB project.

7. AOB

No AOB.

Jean-Baptiste Lallement

Next meeting: To be defined.