

**Minutes of the Linac4 Diagnostics Working Group Meeting held on 4 February 2008**

**Present:** E.Bravin, C.Dutriat, K.Hanke, T.Lefevre, R.Scrivens, E.Sargsyan, B.Dehning, B.Holzer, L.Soby, Y.Cuvet, G.Tranquille, B.Mikulec.

**Agenda:**

1. Communications
2. Follow-up of open actions
3. Status of diagnostics for source and LEBT
4. BLMs in Linac4 and at PSB injection

**1. Communications**

K.Hanke reported that there were no specific follow-up items to be taken care of by the Linac4 diagnostics team after the first meeting of the Linac4 machine advisory committee that took place from 28-30 January 2008 (see <http://indico.cern.ch/conferenceDisplay.py?confId=26842>).

As the diagnostics ensemble for the LEBT cannot be used further down the line, it has been discussed in the previous meeting that CEA could perhaps take over the fabrication of a movable diagnostics bench for Linac4 commissioning. It was felt that the SNS D-plate could act as guideline for the design. U.Raich has to prepare a cost estimate to be able to compare the 2 solutions. This issue should be treated specifically in the next meeting.

Assigned to	Start date	Description	State	Result
U.Raich	2008-02-06	Prepare cost comparison between CEA and CERN fabrication of movable diagnostics bench.		Movable diagnostics bench will most probably not be fabricated by CEA. <span style="float: right;">edit</span>

**2. Follow-up of open actions**

Tests of the new CERN controls card seem to be underway. U.Raich will be asked to report on the results.

G.Tranquille reported on the design status of the emittance scanner for the Linac4 part after the LEBT. Currently, simulations are performed as well as paper studies. The power load is the main concern. Pepper pots were mentioned as a possible alternative solution (used by Brookhaven, GSI and Saclay), but it seems that the emittance measurement cannot easily and reliably be obtained. For the slit+grid solution D.Gerard is continuing to investigate different cooling approaches.

U.Raich still has to fill in the EVM document for the Linac4 diagnostics including a budget breakdown.

The alignment of the pickups (brought up in the previous meeting) inside the quadrupole-steerers is an issue to be followed closely. As the magnets will be aligned with respect to their magnetic center, a metrology step of the pickups is obligatory afterwards and needs to be planned in.

**3. Status of diagnostics for source and LEBT**

- *Emittance scanner:* The design for the scanner for 45 keV is almost finished. There are a few months (acceptable) lead time for the order of the linear alignment mechanics. The whole design will go through an approval process before fabrication. Planned availability for the emittance scanner: June 2008. An open question is still whether the SEM-grid can be made with 0.75 mm spacing (the same

physical SEM-grid will also be used for beam size measurements between the 2 solenoids). A PLC will control the stepping motor. The readout electronics are based on the available preamplifier from C.Dutriat and either the INCAA card or the new CERN ADC card (U.Raich). An important open point is who is going to develop the application software. It was proposed that the Linac4 core team should make an official request.

Assigned to	Start date	Description	State	Result
G.Tranquille	2008-02-06	Clarify feasibility of 0.75 mm wire spacing for SEM-grid of emittance meter.		down to 0.35mm feasible; reported 18 February 2008 <a href="#">edit</a>
K.Hanke	2008-02-06	Ask for an official request by the core team to clarify the responsibilities for the development of Linac4 application software.		Done. It seems that OP is responsible. <a href="#">edit</a>

- *Faraday cup* (FC): There will be two FCs provided; one retractable and one fixed. The material is available. What concerns the retractable FC, cleaning still needs to be done. It should be ready for April. The IN/OUT movement requires compressed air, but there seems to be no distribution system in place (action: R.Scrivens). The design for the fixed FC is not yet finalised.

Assigned to	Start date	Description	State	Result
R.Scrivens	2008-02-06	Contact R.Principe and C.Rossi to remind them that a compressed air distribution system will soon be required.		Completed. R.Scrivens has contacted R.Principe, who has contacted BI, VAC and ATB to clarify requirements. Reported in e-mail of 20.02.2008. <a href="#">edit</a>

- *Transformer*: For the LEBT transformer the study for the manufacturing drawings has started 2 weeks ago and will finish end of March. F.Lenardon expects the manufacturing to be finished in September. (information obtained after the meeting)

#### 4. BLMs in Linac4 and at PSB injection

B.Dehning presented some of the characteristics of the LHC BLMs. The detector consists of an ionisation chamber with 16 parallel plates. The collection time of the produced electrons is approximately 100 ns and for the ions 100 us. The Linac4 request for increased time resolution of the order of 2 us seems therefore in principle possible (with 50% of the signal), but excludes already the use of the LHC readout electronics. This request is based on the wish to distinguish fast losses during RF ramping from slower beam losses as it is already done in Linac2. 2 Hz data logging is sufficient for Linac4, but maybe not for Linac4 operation with the SPL. Are we planning to implement an interlock system based on BLMs? A more detailed specification list will have to be prepared.

Rack space for the BLM electronics needs to be urgently requested in the equipment hall!

Assigned to	Start date	Description	State	Result
B.Dehning	2008-02-06	Contact urgently C.Rossi to request rack space in the Linac4 equipment hall for the BLM electronics.		B.Dehning has contacted C.Rossi by e-mail on 4 February 2008 <a href="#">edit</a>

E.Sargsyan mentioned that simulations yield the largest losses in the region between DTL and CCDTL (at the end of tank 3). It is certainly wise to provide BLMs at each transition between tanks.

- *DTL*: The placement of the BLMs is most critical for the DTL due to limited space and low proton energy. Y.Cuvet will try to place one BLM per inter-tank region in his drawing as close as possible to the beam pipe (at right angle to beam pipe due to space limitation). It might be necessary to add neutron monitors at very low energies as the sensitivity of the BLM might not be sufficient there. E.Sargsyan will provide the simulated loss distribution, which should then be used as input for FLUKA or GEANT simulations. B.Holzer will try to find somebody willing to work on the FLUKA simulations.

Assigned to	Start date	Description	State	Result
B.Holzer	2008-02-06	Try to identify somebody available to do FLUKA simulations for Linac4.		See minutes 19/05/2008. <a href="#">edit</a>

- *CCDTL*: Up to now, one BLM was foreseen after the 1st, 3rd, 5th and last module. E.Sargsyan has to cross-check these location with the simulated loss distribution.
- *PIMS*: Up to now, one BLM was foreseen after the 3rd and 9th module. Another BLM needs to be added after the last module. E.Sargsyan has to cross-check these location with the simulated loss distribution.
- *Transfer line*: BLMs have to be distributed along the new transfer line. Here M.Eshraqi has to propose the optimal locations.

Assigned to	Start date	Description	State	Result
B.Dehning	2008-02-06	Provide BLM drawings to Y.Cuvet.		Done. <a href="#">edit</a>
Y.Cuvet	2008-02-06	Add BLMs to the drawings for the DTL, CCDTL and PIMS.		<a href="#">edit</a>
E.Sargsyan	2008-02-06	Provide detailed beam loss distribution along Linac4 to allow the determination of the ideal locations for the BLMs.		<a href="#">edit</a>
M.Eshraqi	2008-02-06	Provide detailed beam loss distribution along the Linac4-to-PSB transfer line to allow the determination of the ideal locations for the BLMs.		Done. See minutes of April 7th 2008. <a href="#">edit</a>

-- BettinaMikulec - 06 Feb 2008

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