

Linac4 Beam Coordination Committee - Meeting 51 held on 13 October 2016

Present: J. Coupard, M. Giunta, J. Hansen, JB Lallement, J. Leidner, A. Lombardi, C. Martin, S. Mathot, B. Mikulec, D. Nisbet, R. Scrivens, M. Silari, J. Vollaire.

1. Introduction

A. Lombardi gave an introduction to the meeting ([Annex 1](#)). A Y shape vacuum chamber was installed inside the second horizontal bending magnet with the aim of having an emittance measurement with Laser stripping at the location. The Laser station will only be installed in 2018 and the location is free until then. The place could be used for medical application tests with a 160 MeV beam, during the commissioning, the Half Sector Test or the reliability run. They would require a special authorization and a modification of the Beam Interlock system (first bending magnet has to be turned on, the 2 others should be disconnected). The Linac4 can provide a large range of beam parameters: Energy from 50 to 160 MeV, pulse length from 1 to 600 μs , current from 0.1 to 20 mA. It could also provide shorter pulse length and smaller current, but the Linac4 operation cannot guarantee accurate measurement and reproducible beam parameters with the present configuration of the diagnostics.

Action: See with BI group whether the diagnostic resolution (especially the BCTs) could be increased to accurately measure beam current below 100 μA and pulse length shorter than 1 μs . (**A. Lombardi**).

2. ADAM IC installation and test at 160 MeV.

M. Giunta resented the setup and the needs for the ADAM ionization chamber tests at 160 MeV ([Annex 2](#)). She reminded the main results achieved at 50 MeV (already presented at the [previous BCC](#)). The main goals for the tests at 160 MeV are:

- Repeat measurements with a better charge quantitation setup (use of a Faraday cup)
- Try Nitrogen and Helium with a quench gas mix.
- Re-try the ACCT eliminating the 2 MHz noise (further from the ion source).
- Evaluate the use of a diamond detector.

The ACCT, Ionization chamber, diamond detector and Faraday cup will be installed directly after the vacuum window on a specific and independent support (under design). The readout setup is similar to the one used at 50 MeV and would just require few cable extensions. The position of the electronics still needs to be defined. Few days (2-3) are needed to complete the tests.

J. Vollaire said that the equipment should not be installed too early before the tests in order to limit their activation. The support and the equipment could be assembled in advanced and transported into the tunnel but should then be stored in the low energy area.

M. Giunta said that the vacuum window used at 50 MeV is compatible for the tests at 160 MeV. **J. Hansen** added that an adaptive piece is needed (it is a standard piece that can be ordered). If the window breaks, the HST and the L4T will be vented. We should also expect a small pressure rise in the PIMS and in the two dumps before the valves are closed.

JB. Lallement clarified that the installation will be temporary and will not require any drilling for fixing the support.

C. Martin and **D. Nisbet** said that these tests will require a modification of the bending magnets cabling and some masking in the BIS.

For what concerns the ADAM IC tests, no showstopper was identified.

3. GEMPix tests at Linac4

J. Leidner presented the setup and the goals of the GEMPix tests in a water phantom at Linac4 ([Annex 3](#)). The GEMPix aims at reconstructing in 3D the energy deposition of a hadron therapy beam. The setup will consist in an ionization chamber as a reference detector followed by the GEMPix inside a water phantom (250 l of water). In addition, the control electronics, a gas bottle and a laptop should be located in close vicinity of the experimental setup (5 to 10 meter) and could require some extra shielding. In order to get beam parameters as close as usually used in hadron therapy centres (approx. $10e8$ p/s) the beam current should be in the range of the nA and the beam pulse as long as possible (600 μ s).

M. Silari added that all the experiment will be installed on its own movable support. It can be stored on the low energy side when not used to avoid any extra activation. It can be ready at the beginning of 2017 and few days are needed to complete the measurements.

A. Lombardi reminded that the Linac4 operation cannot guarantee reliable current measurements for current below 100 μ A and do not take responsibly if something breaks while beam is sent to the experiment. **J. Leidner** said that he would check what the maximum current acceptable for the ion chamber is.

As for the ADAM IC tests, it will require modification of the BIS and of the bending magnets cabling. No showstopper was identified.

J. Hansen reminded that the vacuum window can break.

Action: **A. Lombardi** will check with **A. Funken** to which extent the Linac4 safety file should be modified.

R. Scrivens proposed to investigate the possible production of a very low intensity beam due to the residual gas stripping occurring in the straight section between the two bending magnets. It might be that the natural stripping can produce enough intensity for the GEMPix tests.

Action: It was decided to move one of the PMI installed in the Linac4 right after the second bending magnet to see if a beam production due to stripping is observed. It should be done at the next tunnel access (**J. Vollaire**).

The scheduling of these two tests will be discussed later, depending on the 160 MeV commissioning and HST planning. In any case, they will not take place before early 2017.

4. AOB.

There was no AOB.

Minutes reported by [JB Lallement](#) on the 17th October 2016.

Next meeting: To be defined.

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