

## Linac4 Beam Coordination Committee - Meeting 50 held on 17 March 2016

Present: Andrea Apollonio, Alberto Degiovanni, Veliko Dimov, Raul Gaur, Marina Giunta, Greta Guidoboni, Klaus Hanke, Joan Kozsar, Mukesh Kumar, Jean-Baptiste Lallement, Alessandra Lombardi, Christophe Martin, David Nisbet, Uli Raich, Maurizio Vretenar.

### 1. Minutes of the last meetings

The minutes of BCC 49 are approved.

### 2. 50 MeV results summary (V. Dimov).

**V. Dimov** presented the main results of the 50 MeV commissioning stage ([Annex 1](#)). The 3 DTL tanks RF settings were found with the Time of Flight, which gave a very good agreement with the simulations. The transverse emittances were reconstructed with the Forward method using the 3 profile monitors on the test bench while the longitudinal emittance was measured varying the tank3 phase and measuring the evolution of the bunch phase spread on the Bunch Shape Monitor. Emittances are within expected values.

**M. Vretenar** commented that the ToF results are very good and asked how close to the nominal can be set the RF parameters. **V. Dimov** answered that, given the ToF resolution, the RF settings can be set within +/- 0.5% for the field level and +/-1deg for the phase.

**D. Nisbet** asked how did the beam commissioning team notice about the reversed polarity PMQ in the DTL tank2. **V. Dimov** answered that several possibilities were simulated with beam dynamics codes and the location of the hot spot, the transmission and the beam transverse profile were in agreement with a polarity inversion of a PMQ close to the tank 2-3 intertank.

### 3. Experience with diagnostics at 50 MeV (M. Kumar).

**M. Kumar** presented some data analysis of the signals obtained with the diagnostics during the 50 MeV commissioning ([Annex 2](#)). Some halo was observed at the beginning of the beam pulse, representing 1.4 % of the nominal intensity. The beam is not stable in size and position during the first 40 us of the beam pulse and this should be looked in more details during the next commissioning stages. Some cross-talk was observed on the wire scanner (vertical wire signal when scanning the horizontal plane). It is nevertheless limited to less than 0.2% of the main signal. The longitudinal profile of the beam was measured with the BSM. It looks to be Gaussian when the DTL are operated at their nominal settings. The profile is distorted when going far from nominal operation settings. As for the transverse plane, it takes up to 40 us to get a stable beam profile in the longitudinal plane.

**U. Raich** added that the beam instability in the first 40 us of the beam pulse is certainly coming from the LLRF regulation at the beginning of the pulse. This effect was observed also after a relatively long chopped pulse (100 us). He also confirmed that the cross-talk is not an issue at 50 MeV.

### 4. BIS/SIS for the 100 MeV (D. Nisbet).

**D. Nisbet** presented the machine protection status for the 100 MeV ([Annex 3](#)). The general BIS layout was shown. The Master BIC RF and Chopper as well as the Slave BIC Linac4 present configuration are detailed. The BIS commissioning is documented in the EDMS documents 1016233 and 1310007. To follow the phased

energy increase of the machine, new equipment is gradually being added to the Linac4. Some users are required to take care of validating the new elements in their electronics: Vacuum (new valves added), L4 RF (new cavity added), L4 WIC (new magnet circuits to be included). The implementation of the new elements is under the responsibility of each group. Users are requested to inform D Nisbet of the tests made to validate the additional elements. The commissioning of the different systems with the BIS can be made on request (to Christophe Martin or Stephane Gabourin). REMINDER: if the user system electronics has been modified, the interlock team should be informed in order to take the relevant actions. **D. Nisbet** also highlighted the fact that only the status of the chopper is monitored, not its voltage level.

MPP is recommending that a mitigation strategy is implemented for running without BLMs at 100MeV (the proposal is to operate a watchdog BCT for the LINAC part). For the 100MeV operation, the vacuum, RF and WIC team shall demonstrate all systems are connected and operational.

#### **5. ADAM IC test results at 50 MeV. Another test at 100 MeV? (M. Giunta).**

**M. Giunta** presented the results of the Ionization Chamber tests done with the 50 MeV Linac4 beam ([Annex 4](#)). The LIGHT pulse time structure was not fully reproduced and it had not been possible to get two independent measure of the pulse charge because of issues with the ACCT measurement and with the beam pulse structure. The proposal is to complete the tests at 100 MeV:

- Adding a Faraday beam collector to measure the beam pulse charge and time profile more accurately.
- Trying nitrogen and helium.
- Trying the ACCT with a better 2 MHz noise filtering.
- Evaluate the use of a diamond detector.

The setup would be similar to the 50 MeV one and needed extra cables were already installed.

**A. Lombardi** said that the ADAM tests will take place at the end of the 100 MeV commissioning phase.

#### **6. Measurement program at 100 MeV (A. Lombardi).**

**A. Lombardi** presented the tentative program for the 100 MeV measurements ([Annex 5](#)). Given the present status of the LLRF (input from **P. Baudrenghien**), the 50 MeV recommissioning could start on the 06/04. From the 13/04 the 4 first CCDTLs could be operated, they would be turned on one by on to reach 80 MeV beam energy. From the 25/04, the last 3 CCDTLs and the first PIMS will be ready for beam at 105 MeV.

Laser tests and ADAM ionization chamber tests will take place in parallel to the 100 MeV commissioning, as it was the case at 50 MeV.

**U. Raich** pointed out the fact that many new diagnostics would be required for completing the 100 MeV line and that the test bench diagnostics will be ready for the 6<sup>th</sup> April.

#### **7. AOB.**

No AOB.

**Jean-Baptiste Lallement**

**Next meeting:** To be defined.

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