Status of the Compact LEBT Project

H. Vormann, S. Yaramyshev, A. Adonin, W. Barth, R. Berezov, L. Dahl, P. Gerhard, L. Groening, R. Hollinger, M. S. Kaiser, M. Maier, S. Mickat, K. Ochs, A. Orzhekovskaya, and C. Xiao
GSI, Darmstadt, Germany

To fulfil the intensity requirements for FAIR, a dedicated high current uranium ion source and Low Energy Beam Transport line will be built at the High Current Injector HSI [1]. This new injection line (Compact-LEBT) will be integrated into the existing complex with two branches, designed as a straight injection line without bending magnet (fig. 1). The joint use of the existing matching line (from switching magnet to RFQ) is foreseen.

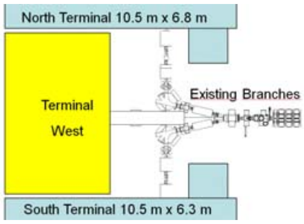

Figure 1: Scheme of the Compact-LEBT.

Design of the new Beam Branch

Preparing the design of the new branch, measurements directly behind the ion source had been available with different ions (e. g. argon, tantalum), but not with uranium beams. Now, such direct uranium measurements have been performed at the existing north terminal with the VARIS ion source [2]. The GSI standard mobile emittance device (horizontal and vertical) was used for emittance measurements behind the first triplet of the beam line. To measure the large beam directly behind the terminal, the emittance device from HOSTI was used (large grid size). Also tantalum beam was measured, to allow a comparison of the measurement results from HOSTI and from North Terminal. The good performance of the ion source was confirmed.

Simulations with the DYNAMION code, based on the measurement data, were used to optimize the designed beam line. For the recent design the use of a new quadrupole triplet in the crotch between the existing beam lines, and an already existing quadrupole quartet for focusing behind the terminal is proposed (fig. 2) [2].

Ion Sources

Measurements with different ion beams as tantalum and argon have been performed at the high current test injector (HOSTI), to investigate beam intensity and emittance for different extraction- and post acceleration geometries, long run tests of insulator materials, and the suitability of a solenoid magnet for high current operation [3].

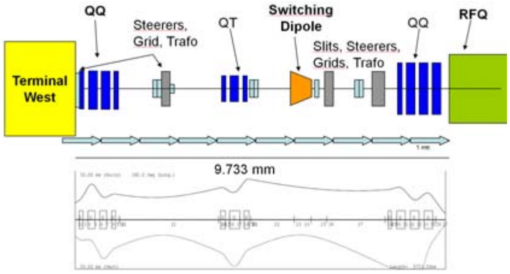

Figure 2: Recent layout of the Compact-LEBT.

A layout for the new uranium terminal (Terminal West) has been designed (fig. 3). The terminal contains a closed under-pressure system, it houses all sections like a high voltage area with power supplies, transformers and a working platform (closed electrical working area), and a service area with glove box (radiation protection controlled area).

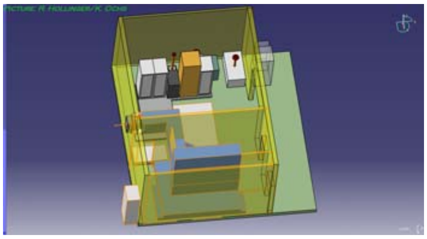

Figure 3: Principle layout of the Terminal West.

Components and Commissioning

While beam diagnostics components with larger apertures in the existing LEBT are already in operation since 2012, a new quadrupole quartet magnet with enlarged aperture (150 mm diam.) is not yet installed. It was delivered in late 2012, since then precise field mapping has been made. Tendering for the power supply is starting. A new switching magnet and steerers with larger aperture are under design, a new quadrupole triplet can be designed similar to existing triplets. Completion and commissioning are foreseen for 2017.

References

[1] L. Dahl, proc. LINAC 2006
[2] S. Yaramyshev et al., this report
[3] A. Adonin et al., this report

doi:10.15120/GR-2014-1-FG-UNILAC-02