

## UNILAC Status Report

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### Maintenance Activities

In 2013 no beam has been provided by the UNILAC; the full year was dedicated to maintenance instead. This chapter summarizes the major works while the second one lists the ongoing upgrade design activities.

#### *Media systems*

The water distribution circuit providing cooling for the fourth Alvarez cavity and the IH cavity of the High Charge Injector (HLI) has been split into two independent circuits. The measure enhances the temperature stability of the two cavities which in the past suffered repeatedly from difficult incoupling of rf-power. General maintenance was done at the water pumps of the other circuits. The cooling water conduit of the Alvarez section and of the transfer channel was renewed, including provision of de-ionized water for the drift tubes, couplers, and tuners. Many pumps underwent maintenance of the ball bearing and the exchange of oil. The ventilation systems of the High Current Injector (HSI) and the Alvarez section were completely revised.

#### *Cavities*

The UHV seals of some Alvarez cavities have been replaced by new ones produced on-site. The repair of UHV leakages at the junction between cavity A2a and the subsequent cavity BB5 required much more resources w.r.t. time and personell as expected. Repeated leakage occurred after remounting the spokedwheels. The same type of work was done at one single gap resonator. The cause of increased reflection of incoming rf-power at the HLI RFQ was identified as mechanical vibrations of the rods, being resonantly amplified at specific time structures of the rf-pulses [1]. The rf-power line to the RFQ of the HSI has been systematically checked in order to identify the origin of rf-reflection; the line proved not to be the cause, we rather assume sparking in the RFQ cavity.

#### *Miscellaneous*

The misalignment of the transfer channel beamline due to ground water settlement was quantified. Systematic beam loss surveillance was extended to the areas “transfer channel” and “experimental hall”; several steerers have been equipped with new bipolar power converters.

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### Upgrade Activities

#### *Compact LEBT*

The FAIR requirements on beam intensity of uranium and on the handling of the related infrastructure indicate the installation of a dedicated uranium source terminal together with the subsequent beam transport system. It shall be located between the existing terminals which feed the HSI. As a consequence the latter will not provide uranium in the future. This new branch (Compact LEBT) is under design, aiming at simplified beam optics, i.e. omission of bending magnets and shortening of the line. The expected gain in beam quality will be benchmarked to the today's performance. Details are summarized in dedicated reports [2, 3]. The activities include also studies on improved beam transport through the existing HSI as well as extensive measurements of the beam parameters provided by the existing high intensity uranium source.

#### *Replacement of Alvarez DTL*

The existing Alvarez-type DTL, providing acceleration from 1.4 to 11.4 MeV/u, is in operation for several decades. To ensure reliable operation for FAIR it ought to be replaced by a new DTL. The design activities of this new so-called HE-Linac have been started in close collaboration with the Goethe University of Frankfurt. Several options w.r.t. the cavity type are under investigation to ensure that the best choice is made for FAIR w.r.t. beam quality and cost efficiency. For details we refer to [4].

#### *EmTEx*

An Emittance Transfer Experiment (EmTEx) aims at demonstration of tailoring the 4d-phase-space distribution of the beam from the UNILAC such that its properties better match to the requirements of the synchrotron SIS18. The proof-of-principle with deuteron beams is foreseen in summer 2014. Last year saw the installation of the set-up in the transfer channel [5, 6].

### References

- [1] P. Gerhard et al., this report.
- [2] H. Vormann et al., this report.
- [3] S. Yaramyshev et al., this report.
- [4] S. Mickat et al., this report.
- [5] C. Xiao et al., PRST-AB **16** 044201 (2013).
- [6] M. Maier et al., this report.