Status of the IH-structure for REX-ISOLDE ◇

S. Emhofer, D. Habs, T. Sieber, H. Bongers, K. Rudolph, O. Kester [a], and U. Ratzinger [b]
[a] GSI, Darmstadt, Germany and CERN, Geneva, Switzerland
[b] Institut für angewandte Physik, Frankfurt am Main, Germany

For the REX-ISOLDE-project at CERN an IH-accelerator has been designed serving as booster accelerator for radioactive ions from an energy of 300 keV/u to an extraction energy, which can be varied from 1.1 MeV/u to 1.2 MeV/u by capacitive plungers [1]. In 2000 the modification to reach the final energy of 1.2 MeV/u was done by mounting copper plates inside the resonator that do a reduction of the undercut-length. With those plates the proper gap voltage distribution could be achieved [2]. This modification can be seen in fig. 1.

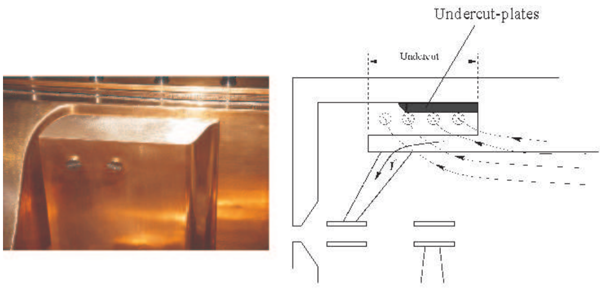


Fig. 1: The plates for the undercut-size-reduction fit well to IH-structure. Even the screws are copper-plated to guarantee good electrical properties.

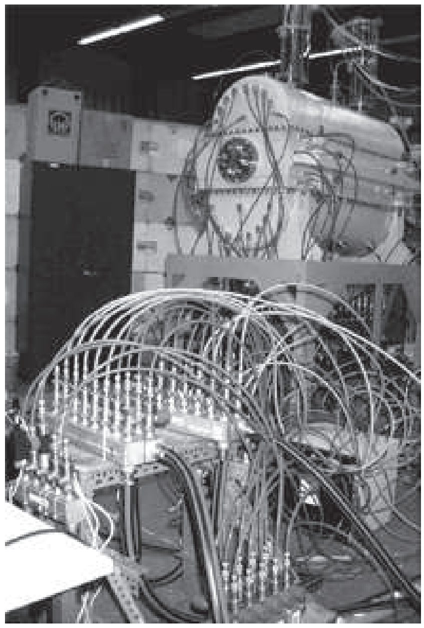
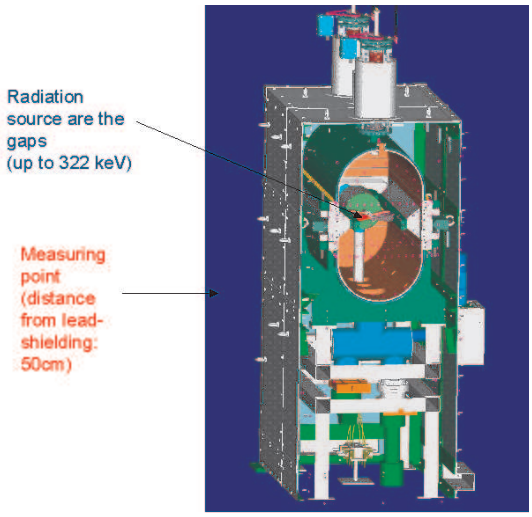


Fig. 2: The IH-structure without lead shielding. In the front you can see the main distributors for the cooling system.

The next step was to build up an efficient pressure-stable cooling system capable of cooling 100kW with 10% duty cycle. For black-steel components, which makes up the whole resonator-tank, a separate secondary cooling circuit with an heat-exchanger was build up to prevent it from rusting out. Within its 97 valves the total flux can be up to 10 m^3/h. The 10 most important valves are flux controlled to prevent the structure from overheating. The capacitive plungers are additionally heat controlled, to shut down immediately if a plunger resonance occurs. For several weeks the IH-structure has been conditioned up to 66kW. From calculations it could be shown that 60.5kW will be sufficient for operation with an A/q of 4.5. To verify this acceleration tension a bremsstrahlung-spectra was taken. Because of 20 gaps with different voltages there is no sharp edge of the spectra. For this reason though it is absolutely sure that the necessary operation power will be about 60kW one can't determine the exact power for operation. This will have to be done by beam-calibration. With stable operation it could be a assured that lead-shielding is sufficient. While on the surface of IH-structure the dose rate is above 2.9 mSv/h at 60kW inside the shielding the dose rate outside in 50 cm distance from shielding measured at the point in fig. 3 is 1.7 μSv/h. Though it was not necessary from CERN radiation limits which is 10 μSv/h in 1 meter distance the decision was taken to improve shielding. So at CERN additional to the 6mm lead on 6mm steel another 5mm lead are added. The structure was delivered to CERN and is currently build up.



power	dose-rate
60 kW	1.7 µSv/h
66 kW	5.0 µSv/h
72 kW	9.1 µSv/h

*Measured at a pressure of 1.8*10^{-7}mbar*

Fig. 3: A schematic cut through IH-structure. The dose rate is described in the lower chart in the picture.

References

[1] D. Habs etal, Nucl.Instr.Meth. **B139** (1998) 128
[2] S. Emhofer, diploma thesis, LMU München, 1999

◇ work supported by BMBF under contract 06 LM 868 I/TP:4