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## Simultaneous storage of ions and electrons in the HITRAP cooling trap

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The HITRAP decelerator facility aims to decelerate and cool heavy, highly-charged ions (HCI) like  $U^{92+}$  [1]. After creation of the high charge states at relativistic energies, HITRAP decelerates these ions via a consecutive arrangement of linear deceleration stages and a cylindrical Penning trap. Within this so-called cooling trap, the ions can be cooled to low temperatures before they are ejected and transported to various precision experiments. The used cooling mechanism in the seven-electrode trap is sympathetic cooling with a cold electron plasma in a nested trap configuration.

We present the current status of the cooling trap and the ongoing progress to demonstrate electron cooling of extended amounts of heavy HCI for the first time. For commissioning, the 40 cm long cooling trap can be supplied with HCI from a small EBIT ion source and electrons can be produced externally from a GaAs photo cathode driven by a UV flash lamp. The ions from the EBIT (e.g.  $Ar^{16+}$ ) are transported through a low energy beamline towards the cooling trap [2]. By appropriate switching of the capture electrodes while the electrons are already stored in a nested potential, simultaneous storage can be achieved. In this configuration, an influence of the ions on the co-trapped electrons could be observed, but so far no energy loss of the ions could be observed.

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References:

[1] H.-J. Kluge, et al.: HITRAP - A facility at GSI for highly charged ions, *Advances in Quantum Chemistry* 53 83 (2008)

[2] Z. Andelkovic, et al.: Beamline for low-energy transport of highly charged ions at HITRAP, *Nucl. Instrum. Meth. A* (2015)

**Primary author:** HORST, Max Henrik (TU Darmstadt, GSI)

**Co-authors:** Mr RAUSCH, Simon (TU Darmstadt, GSI); Dr ANDELKOVIC, Zoran (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Dr SVETLANA, Fedotova (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Dr GEITHNER, Wolfgang (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Dr HERFURTH, Frank (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Dr NEIDHERR, Dennis (GSI, Darmstadt); Dr STALLKAMP, Nils Simon (JWGU Frankfurt, GSI); Dr TROTSSENKO, Sergiy (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Dr VOROBYEV, Gleb (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Prof. NOERTERSHAEUSER, Wilfried (TU Darmstadt, HFHF)

**Presenter:** HORST, Max Henrik (TU Darmstadt, GSI)

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