

A compact 0.74 T room temperature EBIT

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Research on moderately and highly charged ions (HCIs) is of great interest not only for atomic physics but also fundamental studies. Electron beam ion traps (EBITs) have proven to be versatile and indispensable tools for the production and study of such ions.

In an EBIT, an electron beam is compressed by a strong, inhomogeneous magnetic field to breed the ions efficiently. Usually the field is generated by superconducting magnet coils. To ease operation we introduce a novel magnetic design based on permanent magnets for a 0.74 tesla EBIT. It allows operation at room temperature, resulting in a low-cost and low-maintenance apparatus. An open trap design offers access to the trap center with a large solid angle.

Our EBIT is intended to serve as a reliable source for HCIs. Additionally a new off-axis gun is under construction, which will enable the trap to be used for energy calibration at synchrotron and free-electron laser light sources by means of spectroscopy on HCIs. The photon beam can pass through the EBIT and is available for beamline users.

Currently, first experiments with a prototype are carried out regarding trapping and extraction of HCIs.

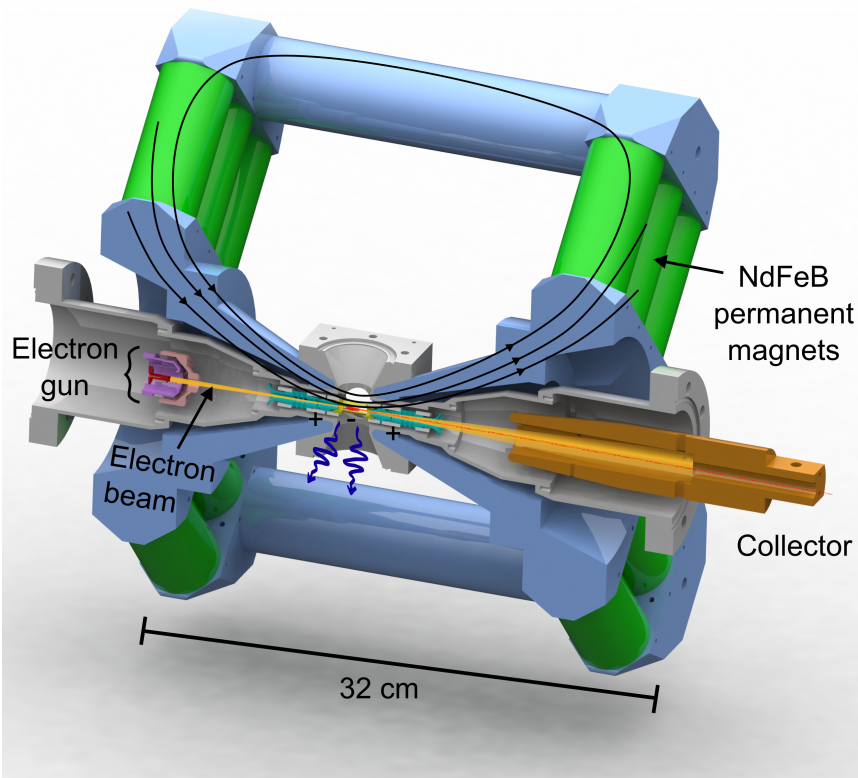


Figure 1: A cross section of the EBIT showing vacuum chamber, magnetic system, and electrode configuration. The design gives a measured magnetic field of 0.74 T at the trap center. Four ports for optical access with an opening angle of 60° are available.