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Characterization of the 2.45 GHz DREEBIT ECRIS via optical spectroscopy

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ECR ion sources are widely used to provide ions for various experimental setups. DREEBIT GmbH aims to industrialize this type of ion source technology for efficient and reliable use in, e. g., hadron cancer therapy as well as ion implantation of semiconductors. Our goal is to build table-top sized ion sources which can easily be handled as part of a larger machine such as a particle accelerator or target irradiation facility, thereby fulfilling high requirements on beam current, quality, stability as well as reproducibility in serial production. To achieve this, we have already optimized the microwave injection system and magnetic plasma confinement by introducing a simple method to allow for injection of circularly polarized waves and adjusted the magnetic field distribution which led to an 80 % increase of beam current. In the present work, we show how optical emission spectroscopy was used to gain deeper information about the plasma of this specific type of ion source, independent from its ion extraction system. The plasma characterization includes studies of the electron energy distribution and the density of atomic and molecular hydrogen showing that the previous design changes of introducing circularly polarized microwaves and optimizing the magnetic field distribution have led to a well-optimized ECR ion source concerning plasma heating and proton production inside the plasma, indicating how the source performance can be enhanced in further steps.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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