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ECR-Source of an Intense Beam of Low-Energy Hydrogen Ions

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ECR-based ion source provide a continuous beam formation without maintenance, which is important for applications, for example, in industry and medicine.
The paper presents an ECR source under development with an intense beam of hydrogen ions with energy up to 8 keV and a current of up to 4 A, formed by a multi-aperture four-electrode ion-optical system. The hydrogen plasma is created by an ECR discharge at a frequency of 2.45 GHz. The magnetic system of the discharge consists of two radially magnetized rings of NdFeB. The rings have an internal diameter of 10 cm and are located at a adjustable distance of 60-90 mm. The resulting plasma flows through the hole in one of the rings and forms a plasma emitter.

The ion beam is formed by a fine-structure four-electrode multi-aperture ion-optical system with an emission diameter of 5 cm. In this system, molybdenum grids in the ion-optical system of fast hydrogen atom injector [1] FABS for a source of polarized ions OPPIS at BNL are used.

The first results on ignition of a microwave discharge at a power of 1.5 kW and the extraction of low-energy ions are obtained. The system was tuned to obtain an even distribution of the plasma density on the surface of the emission grid by matching the microwave path with the gas-discharge chamber and optimizing the magnetic system.

References

[1] A. Kolmogorov et. al., Rev Sci Instr, 85, 02A734, 2014.

Primary authors: KONSTANTINOV, Sergey (Budker Institute of Nuclear Physics); DAVYDENKO, Vladimir (Budker Instituteof Nuclear Physics); KOLMOGOROV, Anton (Budker Institute of Nuclear Physics)

Presenter: KONSTANTINOV, Sergey (Budker Institute of Nuclear Physics)

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