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Simulation of the Permanent Magnet System for Compact 14 GHz ECR Ion Source

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Multiple charge state ion beams are of special interest in the fields of atomic physics, material physics and other applications. Electron cyclotron resonance (ECR) ion source can produce high intensity ion beams of high charge state in cw or pulse mode.
For high-voltage applications the problem is the power consumption of devices, and as the room available in the high-voltage terminal of the accelerator is much limited, the ion source should be very compact.
All permanent magnet ECR ion sources have many advantages over traditional ECR ion sources composed of several axial room temperature solenoids and one permanent hexapole magnet, which make them suitable for heavy ion facilities based on high voltage platforms and Van de Graaff Accelerators.
The article presents the results of simulations the magnetic system of the compact 14 GHz ECR Ion source based on permanent magnets for the production of multiply charged ion beams. The magnetic system consists of 7 permanent magnet rings (NdFeB), the size of the system is Ø190×200 mm, that ensures its compactness. For different plasma chamber diameter, the optimal configuration of the magnetic system has been determined to obtain the Binj, Bext and Bmin values in the required range.

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