

CONTINUOUS AND PULSED OPERATION OF A HIGHLY EFFICIENT 18 GHz PLATEAU-ECRIS

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Abstract

A highly efficient 18 GHz Plateau-ECRIS (PECRIS V) has been developed. The magnetic field on axis has a flat plateau-minimum. Together with a very strong permanent magnetic hexapole it creates a large resonance volume. In this resonance volume electrons are electron-cyclotron-resonance-heated more efficiently than in standard ECRIS and the maximum density of the plasma is obtained near the axis from where ions are primarily extracted. The plasma chamber is designed as a microwave resonator with specific end-plates to achieve high microwave amplitudes on the axis in spite of the low microwave power of <500 W. Up to 4 microwave frequencies have simultaneously been used. By the use of several frequencies at, above, and below the plateau, we become less sensitive on density variations in the plasma. We also present a technique for the extraction of intense short pulses of highly charged ions. This technique temporarily reduces the magnetic field on the extraction side and is an interesting alternative to the afterglow, in particular for the highest charge states. The design and the highly efficient operation of PECRIS V may thus serve as guideline for the future conceptions of ECRIS.

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