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Operation of a Double Frequency Heated ECRIS in cw and Pulsed Mode

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The FAIR facility will require low duty cycle intense heavy ion beams which cannot be produced by the CAPRICE Electron Cyclotron Resonance Ion Source (ECRIS) installed at GSI. In order to fulfill this requirement an upgrade of the high charge state injector is mandatory. An experimental investigation at the ECRIS testbench was carried out with the aim to enhance the extracted ion currents in pulsed mode.

An increase of current of the highly charged extracted ions, on a short time scale, is obtained by pulsing the microwaves feeding the plasma, according to the so called afterglow mode.

It was also demonstrated that the current of the highly charged ions can be significantly improved by applying microwave based techniques like the frequency tuning or the double frequency heating.

Recent experimental results proved that the microwave frequency tuning and afterglow operation mode combined together allow to further enhance the intensity of pulsed highly charged ion beams in comparison with modes where these two techniques are applied separately.

In order to analyze the effect of the superposition of different frequencies in pulsed and cw mode on the ion source performance, several experiments were carried out on the CAPRICE-type ECRIS. Different combinations of frequencies and operation modes have been investigated under different settings of the ion source. The results of this investigation are reported here.

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