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The impact of dielectronic recombination on the charge state distribution at REXEBIS

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Dielectronic Recombination (DR) is a resonant process that describes the capture of an electron by a (highly charged) ion, occurring at sharply defined collision energies. In an electron beam ion source, where charge breeding is achieved through successive electron impact ionisation, DR transitions can be selectively driven by adjusting the electron beam energy. The increased recombination rate on a DR resonance can inhibit the breeding into higher charge states and shift the charge state distribution of the extracted ion beam. This study aims to understand the significance of DR for the operation a charge breeder and to learn if this effect can be exploited for a more selective charge breeding. We have performed simulations and measurements using REXEBIS at ISOLDE for the example of highly charged potassium ions (12+ to 17+). Here, we present our preliminary results which show a good agreement between the theoretical predictions and the measured charge state distributions. Our results suggest that the relevance of DR depends strongly on the ion species and the electron beam parameters. We conclude that DR can be of operational interest and potentially serve as a diagnostic mechanism in special cases.

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