

Phase space growth during RF capture in the GSI heavy ion synchrotron SIS18

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Abstract

This study reports on the optimization of the radio frequency capture phase during the operational cycle of the SIS18 synchrotron at Gesellschaft für Schwerionenforschung mbH, Darmstadt, Germany. The ion species studied were $^{238}\text{U}^{+28}$ and $^{238}\text{U}^{73+}$ at an injection energy of 11.4 MeV/u.

The longitudinal relative momentum spread derived from Schottky spectra of the coasting beam at injection provides a value of $|\Delta p/p_0|_{\text{full-width}} \sim 5 \times 10^{-3}$. Simulation results from the synchrotron tracking code ESME (FermiLab) were compared with beam-current profile measurements obtained from a pickup. To gain further insight, the Tomography program (European Organization for Nuclear Research) has been used to derive the longitudinal phase space development from waterfall plots of the measured beam current profile, which may then be compared against simulation. Possible causes of this nonadiabaticity are discussed and solutions are proposed.

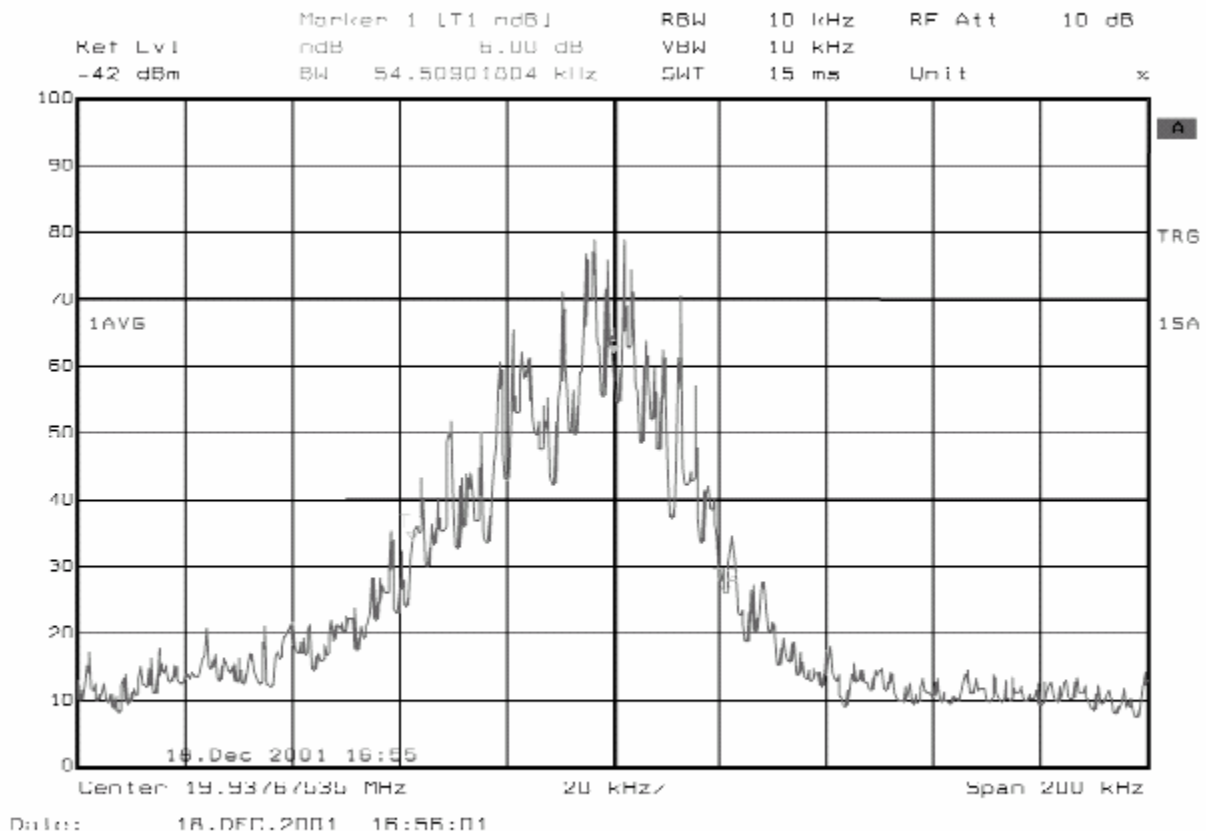


Fig. 1. Schottky spectrum of an uncooled U^{73+} coasting DC beam.