

# A theory of the beam loss-induced vacuum instability applied to the heavy-ion synchrotron SIS18

E. Mustafin, O. Boine-Frankenheim, I. Hofmann, H. Reich-Sprenger, P. Spiller;

NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT VOLUME 510, ISSUE 3 (2003) 199-205; DOI: 10.1016/S0168-9002(03)01811-4

## Abstract

A theoretical model to describe the vacuum instability induced by the lost particles in heavy-ion accelerators is proposed and applied to the  $U^{+28}$  beam lifetime measurements in the SIS18 at GSI, where the instability is of concern for high-intensity operation. The method allows to derive values of the desorption yield, the charge-exchange crosssection and the total pumping speed from the measurements of the beam lifetime  $I(t)$ . The obtained desorption yields are comparable with those found in the other heavy-ion machines. Directions of possible cures are discussed.

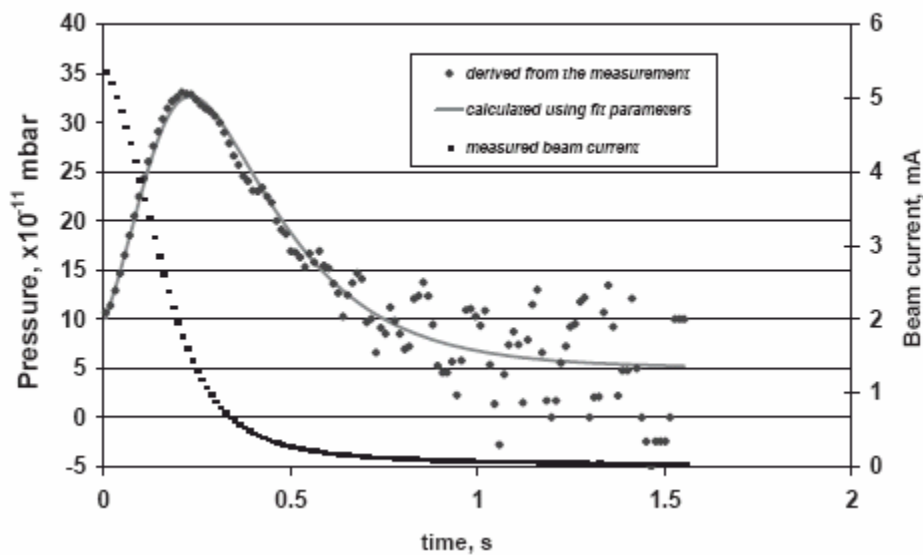


Fig. 2. Measured beam current of  $U^{+28}$  ions circulating at a constant energy  $E = 8.9 \text{ MeV } u^{-1}$  in the SIS18 and corresponding fit of pressure evolution. Injected current  $I_0 = 5.3 \text{ mA}$ .