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First Experiments with Gasdynamic Ion Source in CW Mode

Vadim Skalyga^{1,2}, Ivan Izotov¹, Sergey Golubev¹, Alexander Vodopyanov^{1,2}, Olli Tarvainen³

¹*Institute of Applied Physics of Russian Academy of Sciences, 46 Ulyanova st., Nizhny Novgorod, Russia.*

²*Lobachevsky State University of Nizhny Novgorod (UNN), 23 Gagarina st., Nizhny Novgorod, Russia*

³*University of Jyväskylä, Department of Physics, Jyväskylä, Finland*

Corresponding Author: Vadim Skalyga, e-mail address: skalyga.vadim@gmail.com

A new type of ECR ion sources – a gasdynamic ECR ion source was invented recently at the Institute of Applied Physics (IAP RAS, Nizhniy Novgorod, Russia). The main advantages of such devices are extremely high ion beam current with a current density up to 600 – 700 mA/cm² in combination with low emittance i.e. normalized RMS emittance below 0.1 π ·mm·mrad. Previous investigations were carried out in pulsed operation mode under conditions of plasma heating with 37.5 or 75 GHz gyrotron radiation with power up to 100 kW at SMIS 37 experimental facility.

The present work demonstrates the first experience of operating the gasdynamic ECR ion source in CW mode. A test bench of SMIS 24 facility has been developed at IAP RAS. 24 GHz radiation of CW gyrotron was used for plasma heating in magnetic trap with simple mirror configuration. Initial studies of plasma parameters were performed. Ion beams with pulsed and CW high voltage were successfully extracted from the CW discharge. Obtained experimental results demonstrate that all gasdynamic source advantages could be realized in CW operation.