Contribution ID : **218** Type : **Plenary/section talk**

Universal Main Magnetic Focus Ion Source: A New Tool for Laboratory Research of Astrophysics and Tokamak Microplasma

Thursday, 13 October 2016 13:45 (15)

A novel room-temperature ion source for the production of ions with charges from 2^+ up to 80^+ in electron beam within wide ranges of electron energy E_e (500 eV $\leq E_e \leq$ 60 keV) and current density j_e (10 A/cm^2 $\leq$ $j_e \leq$ 20 kA/cm^2) is developed. Due to combination of two methods of sequential ionization of atoms, the device can operate both as conventional Electron Beam Ion Source/Trap (EBIS/T) and novel Main Magnetic Focus Ion Source (MaMFIS). In EBIS/T, ions confined in the potential well are stored in the smooth electron beam going through a few drift tubes with positive potentials applied at the edge sections. In MaMFIS, the local ion traps with extremely high electron current density are formed in crossovers of the rippled electron beam in a thick magnetic lens [1,2]. The device is suitable for generation of both the low- and high-density microplasma in steady state, which can be employed for investigation of a wide range of physical problems in an ordinary university laboratory, in particular, for astrophysics and Tokamak microplasma simulation. For the electron beam characterized by the incident energy $E_e = 10$ keV, the current density $j_e \sim 20$ kA/cm^2 and the number density $n_e \sim 2 \cdot 10^{13}$ cm^{-3} were achieved experimentally [1-3]. For $E_e \sim 60$ keV, the value of electron number density $n_e \sim 10^{14}$ cm^{-3} is feasible. The efficiency of MaMFIS for laboratory astrophysics significantly exceeds that of the existing warm EBIT at the National Astronomical Observatory of China and superconducting EBITs at the Lawrence Livermore National Laboratory and the Harvard-Smithsonian Center for Astrophysics.

References

[1] V. P. Ovsyannikov and A. V. Nefiodov, Nucl. Inst. Meth. B **367**, 1 (2016).

[2] V. P. Ovsyannikov and A. V. Nefiodov, Nucl. Inst. Meth. B **370**, 32 (2016).

[3] A. Borovik, Jr, J. Dreiling, R. Silwal, E. Takács, J. Gillaspy, R. Lomsadze, V. Ovsyannikov, K. Huber, S. Schippers, A. Müller, and Yu. Ralchenko, 18th Int. Conf. on the Physics of Highly Charged Ions, 2016, Kielce, Poland, Book of Abstracts, p. 44.

Primary author(s) : Dr. OVSYANNIKOV, VLADIMIR (Dresden MaMFIS Group)

Co-author(s) : Dr. LEVIN, Aleksandr (Dresden MaMFIS Group); Prof. NEFIODOV, Andrei (Petersburg Nuclear Physics Institute)

Presenter(s) : Dr. OVSYANNIKOV, VLADIMIR (Dresden MaMFIS Group)

Session Classification : Methods of experimental physics - parallel IV

Track Classification : Methods of experimental physics