

IX International conference

Plasma Physics and Plasma Technology

Contributed papers



Minsk, Belarus
September 17 – 21, 2018

B.I. Stepanov Institute of Physics
National Academy of Sciences of Belarus

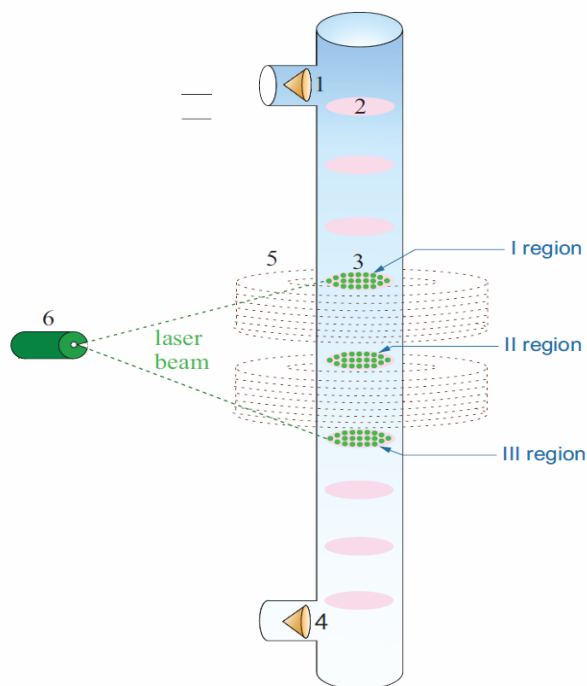
3.07	LASER ABLATION SYNTHESIS OF METAL OXIDE NANOSTRUCTURES FOR PHOTOVOLTAIC APPLICATIONS	177
	E.A. Shustava, A.V. Butsen, N.V. Tarasenko, S. Pashayan	
4.	NON-IDEAL AND DUSTY PLASMAS, FUSION AND ASTROPHYSICAL PLASMAS	
4.01	DISSIPATIVE DUST STRUCTURES IN PLASMA: EVOLUTION AND ENTROPY	183
	O. Petrov	
4.02	BROWNIAN MOTION OF MACRO PARTICLES IN A TWO-DIMENSIONAL DUSTY PLASMA SYSTEM UNDER DIRECTED EXTERNAL IMPACT. SIMULATION RESULTS	184
	I.I. Fairushin, O.F. Petrov, M.M. Vasiliev	
4.03	MELAMINE-FORMALDEHYDE PARTICLES IN COMPLEX PLASMA	188
	V. Karasev, E. Dzlieva, A. Gorbenko, V. Polischuk, S. Pavlov	
4.04	ITER DIVERTOR PLASMA FACING AND NEARBY COMPONENTS DURING TRANSIENT EVENTS	192
	V. Sizyuk, A. Hassanein	
4.05	DUST PLASMA IN THE STRATIFIED DISCHARGE IN MODERATE MAGNETIC FIELD	197
	S.I. Pavlov, V.Yu. Karasev, E.S. Dzlieva, L.A. Novikov	
4.06	FORCED VERTICAL OSCILLATION OF A SINGLE DUST PARTICLE IN A STRATIFIED GLOW DISCHARGE	201
	A.A. Kartasheva, Yu.B. Golubovskii, V.Yu. Karasev	
4.07	PLASMA-DUST STRUCTURES IN A DC DISCHARGE IN MAGNETIC FIELD	205
	A. Abdirakhmanov, M. Dosbolayev, T. Ramazanov	
4.08	DENSITY WAVES IN A STRUCTURE OF CHARGED PARTICLES IN THE ELECTRODYNAMIC TRAP	207
	V. Vladimirov, L. Deputatova, V. Filinov, D. Lapitsky, V. Pecherkin, R. Syrovatka, L. Vasilyak, O. Petrov	

Plasma-dust structures in a DC discharge in magnetic field

A. Abdirakhmanov, M. Dosbolayev, T. Ramazanov

Al-Farabi Kazakh National University, Almaty, Kazakhstan
abdirakhmanov@physics.kz

At present, there are several theoretical assumptions that the rotation of the plasma-dust structures in the stratum in a magnetic field can be caused by the presence of a number of irregularities such as the inversion of the radial ion flux, which is related either to the local reversal of the field, or to the onset of recombination on the dust structure; the effect of narrowing current channel /1-2/ and edge effects /3/. In the experiment /2/, a narrowing current channel (insert) is used to reduce the influence of the cathode spot on discharge stability and the formation of standing striations, and its position determines the position of the first standing stratum above the insert, that is, the dust trap, in a convenient place for observation.



1-anode; 2-strata; 3-plasma-dust structures; 4-cathode; 5-coil; 6-laser;

Fig. 1 - Experimental setup

In this work, the influence of an external magnetic field on the dust structure of a glow discharge suspended in strata without a narrowing current channel (the diaphragm in the form of a cone) was investigated /4/. The results were obtained in the experimental setup for studying the properties of dusty plasma and plasma-dust structures in a glow discharge plasma (Fig. 1). Experimental condition: gas-argon, pressure $P = 0.1-0.25$ Torr, discharge current $i = 0.5-1.5$ mA, induction of external magnetic field $B = 0-400$ mT. As dust particles, polydisperse aluminum with a characteristic size of 1 to 10 μm was used /3/.

The measurement was carried out in three areas, above (I region), under (III region) and between (II region) coils. During the experiment, it was found that the dust structure in the first region rotates only clockwise. In the second region, where the dust structure is located between the two coils,

rotational motion is not detected. The dust structure located at the under the coils rotates counter-clockwise direction.

By the results of the experiment the rotational motion of dust structures was detected, which direction of rotation of dust structures depends on the position of the location of the magnetic coils. The dependence of the average angular velocity of dust structures on the induction of the magnetic field for different regions was obtained.

Acknowledgements. This work was supported by the Ministry of Education and Science of the Republic of Kazakhstan under Grant AP05133536.

References

1. Nedospasov A.V, Motion of plasma-dust structures and gas in a magnetic field // Phys.Rev. E 79, 036401 (2009).
2. Karasev et.all , The Dynamics of dust structures under magnetic field in Stratified Glow Discharges// Contrib.Plasma Phys.56 (2016).
3. Abdirakhmanov A.R., Dosbolayev M.K., Ramazanov T.S. The Gas Discharge Dusty Plasma in a Uniform Magnetic Field// AIP Conference Proceedings 1925, 020007 (2018);
4. M.K. Dosbolayev, A.R. Abdirakhmanov, S.K. Kodanova, T.S. Ramazanov, Zh.A. Moldabekov Plasma-dust structures in the DC discharge // 15th Dusty Plasma Workshop, USA, 2018. - P.58.