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IFE/P6-09: Improvement of Characteristics of Laser Source of Ions by Changing the Interaction Angle of Laser Radiation

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Increased effort has been given in the past to improve the parameters of laser-source of ions [1], which can be done either by changing the parameters of the laser itself (intensity, frequency, laser pulse duration) or by modifying the target (target composition, structure, density) [2,3]. We have shown that [3] the intensity of the ions can be increased by varying the concentration of the light element in PbMg targets, due to the energy exchange between the plasma ions. We also found that [4] structural changes in the crystal structure of slid targets during the neutron irradiation have significant influence not only to the efficiency of the process of material evaporation and emission of plasma ions, but also on the efficiency of ionization and recombination processes.

Here, we report our investigations of the effect of the interaction angle of the laser radiation with the target (θ) on the parameters of plasma ions using the mass-spectrometric method. We found that for certain parameters of the laser radiation and geometry of the experiment, the electric field in the plasma region with a critical density sharply increase and oscillation in the electron density takes place. The electrons in this critical region accelerate and collection of high-energy electrons is formed. The emission of these electrons is restricted by the self-consistent electric field generated due to electron-ion separation. Taking into account the effect of the increase of the longitudinal component of the electric field in the region of the critical density we expect that for certain values of θ the parameters of the laser-produced plasma can be improved.

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