Diploma thesis abstract

PECULIARITIES OF HOT DENSE PLASMA FORMED ON METAL TARGET UNDER IRRADIATION BY FEMTOSECOND LASER PULSES

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This study is devoted to examination of hot dense plasma that appeared as a result of interaction of femtosecond laser pulses with intensity above 10^16 W/cm^2 with molten metals. We used Gallium, Indium and Bismuth as a material our target made of.

There was demonstrated that surface of Gallium heated to 270^{o}C can be used as a target for formation of femtosecond hot dense plasma on it. Such a plasma could be exploited both as effective hard x-ray source and as fast ion source. There is no difference between single shot and 10 Hz regimes with respect to plasma formation and hard x-ray generation. Mean energy of hot electrons equals to 9.3+/-0.9 keV at intensity of $2 \cdot 10^{16}$ W/cm^2 in both cases. The decreasing in hard x-ray yield was less then 25% and in mean hot electron temperature was about 5% over 50000 laser shots. This decreasing can be easy compensated by slight re-focusing by objective or metal temperature tuning. There was also demonstrated that the molted metal temperature have a great influence on the stability of the laser-plasma source. For example decreasing in hard x-ray yield by 25% happened over 4000 laser shots only at gallium temperature of 50^{o}C .

The feasibility of usage of other easily molten metals for spectral range expansion was also demonstrated using Indium and Bismuth targets. Also laser pulse contrast and polarization influence on x-rays yield and mean energy of hot plasma electrons was studied.