LASER-DRIVEN PROTON ACCELERATION AT TARGET IRRADIATION WITH LONG-FOCUS PARABOLIC MIRROR

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We present the results of experiments on laser-driven proton acceleration from 6–13 um aluminum targets which were irradiated by femtosecond laser pulses of 70 TW peak power. It was found that convergence angle of laser beam from off-axis parabolic (OAP) mirror to the target affects significantly the quality of charged particle beam. Substitution of short-focus *f*/2.5 OAP by long-focus *f*/10 OAP in spite of laser pulse intensity reduction by factor of 12 (to $2 \cdot 10^{19}$ W/cm^2) led to increase in the proton angular yield by more than order of magnitude, up to $3 \cdot 10^{12}$ 1/sr (for protons with energies higher than 0.6 MeV). Proton beam spatial profile measurements have shown that opening angle of the beam is reduced to 5° (FWHM) in experiments with long-focus OAP. The observed effect can be explained by laser pulse self-trapping in underdense plasma [1] which is produced by amplified spontaneous emission prepulse near the target surface.

References

1. **Bychenkov, V. Yu.**, Lobok M. G. // Pis'ma v ZhETPh. – 2021. – Vol. 114. C. 650. (In Russian).