

Powerful multi frequency pulsed terahertz sources - the pass to new diagnostic technologies

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Abstract: We study the phenomenon of intense laser pulses interaction with the nano-cluster beams with the aim of development of effective sources of pulsed THz, X-ray and multi-frequency radiation. .

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Interactions of laser radiation with nano-gas targets is a subject of intensive studies during the past two decades. The best example of nano-gas medium is a cluster targets consist of noble gas atoms. Cluster jet, obtained by the adiabatic condensation of gas into vacuum, has pronounced nonlinear optical properties and combines the advantages of solid-state and gas target. Cluster inherits high local density, strong ionization and this implies high value of nonlinear response. At the same time cluster beams are not exposed to ablation and renew their properties before each act of interaction with the laser pulse. There were observed and predicted various nonlinear effects during interaction of intense laser pulses with cluster jets: generation of X-ray radiation, generation of optical harmonics, self-focusing, Stimulated Raman Scattering etc. It was shown theoretically and experimentally that absorption of laser radiation in cluster beam can reach high value (up to 95%) which is related to linear (Mie) and nonlinear resonance interactions. Resonance absorption of pulse energy results in efficient production of X-Ray, fast charged particles acceleration and coherent UV and visible radiation. In this way, further studies of interaction of intense laser pulses with clusters seems reasonable due to the possibility of usage in various practical applications and solving fundamental problems of behavior of matter under intense laser fields.