Summary

The subject of the graduation thesis is an experimental study of generation of broadband electromagnetic radiation in cluster jets excited by ultrashort laser pulses. We use two color scheme, where the fundamental optical frequency at ω is mixed with its second harmonic at doubled frequency 2ω. Cluster jet was formed by injection different gases in a nozzle: pure Ar, pure He and mixtures $(Ar + He), (He + CF_2Cl_2)$ with different partial concentrations of the components in mixture. We have investigated how terahertz pulse energy scales with various parameters, such as gas backing pressure, the time delay between laser pulse and the opening of the valve, focal spot position relative to the cluster jet, laser pulse chirp sign and duration. Optimal parameters for low-frequency generation in a cluster jet have been defined. We have studied polarization properties of terahertz radiation and transverse spatial distribution of terahertz beam intensity near an optical axis. In other experiment we have observed terahertz generation during optical breakdown in uniform gas. Laser energy conversion efficiency to terahertz radiation in uniform media and in a cluster jet have been compared. We also carried out the comparable analysis of optimal conditions for terahertz and X-Ray generation in a cluster plasmas.