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Plasma Experimental Investigations to Analyze the Liquid-based THz Emission Mechanism

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Introduction. Modern basic and practical physics researchers are focusing their attention on the laser-induced plasma. The sources of THz radiation generation during filamentation in jets of different liquids are given special consideration [1].
Typically, the quasi-free electron density dynamics are used to describe how a laser-induced plasma produces THz radiation [2]. Since the generation of THz waves in this situation exhibits a variety of characteristics, it is crucial to analyze the plasma density while using different experimental scheme geometries [3]. In the situation of double-pulse stimulation of a liquid jet, a method for calculating plasma based on reflected radiation is provided in [4].

Body. This work studies the optical properties of plasma formed during filamentation in various liquid jets using double-pulse excitation. The dynamics of electron density and the efficiency of THz radiation generation are analyzed under the same experimental conditions. The technique used is based on reflected radiation and allows for the estimation of plasma density. The experimental setup includes a liquid jet plane that can be moved and rotated, enabling the measurement of angular dependence of third-harmonic reflection. The generation of the third harmonic is a result of plasma formation during filamentation in the air before the liquid jet plane. The obtained results showing the dependence of third-harmonic reflection intensity on the time delay between pulses and the angle of incidence of pump radiation. The data obtained correlates with previous studies [3] on THz radiation generation efficiency.

Conclusion. The obtained experimental data revealed peculiar correlation between third harmonic reflection and the THz radiation generation during filamentation in a liquid jet. These results shed light on the previously reported data on the plasma-based THz radiation sources [3,5].

List of sources used:

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