Dynamics of short ultrasonic pulse propagation in the dissipative medium with the only resonant relaxation time: experimental study

Department of The General Physics and Wave Processes
Boykov Vasiliy Alexandrovich

DIPLOMA THESIS ABSTRACT

The dynamics of short ultrasonic pulse propagation in the medium with the only resonant relaxation time was studied experimentally. The optoacoustic conversion was used for excitation of the probe wide-band ultrasonic pulses. Gas-water solution micro bubbles (average diameter is 4 mm, their concentration in the solution is of the order of $3,7 \cdot 10^5$ micro bubbles per milliliter) are used as a medium with the only resonance relaxation process. The ultrasonic pulse profiles were detected at different depths in the range of 1,5 – 11,5 mm within the relaxation medium. It was shown that an initially short ultrasonic signal is divided during its propagation on to a high frequency oscillated “precursor” and a low frequency “body”. Frequency dependences of both the ultrasound attenuation coefficient and phase velocity inherent to the medium under study were calculated basing on experimental data. The comparison between experimentally obtained and theoretically calculated pulse profiles demonstrating a good agreement between them was performed. The possibility of determination of the resonant parameters for the dispersive-dissipative media, and namely: the relaxation time, resonance frequency and inertial angle from the measured pulse propagation dynamics has been demonstrated.

The supervisor //ass. Prof., Dr. Pelivanov I.M.