Increasing the accuracy of the heterodyne-interferometer method in gas-dynamic investigations with the use of guns

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At present, in the world practice of studying the shock-wave and strength properties of materials, gun-type barrel loading installations are actively used. Laser interferometric methods, such as VISAR and heterodyne interferometer (PDV), are widely used for continuous recording of the parameters of realizing wave flows.
The results of the adaptation of the heterodyne interferometer (PDV) method for conducting gas-dynamic studies using barrel loading installations are presented. To match the measuring channels in terms of registration times, direct measurements of the relative time corrections of the heterodyne interferometer were carried out with an accuracy of up to 0.1 ns using a correlation analysis of the transit times of femtosecond pulses with different repetition periods through the measured fiber lines. To determine the angle of impact of the projectile with the test sample, a linear regression method is proposed that allows the most complete use of the entire volume of experimental data and statistically determines the confidence intervals of the obtained estimates. For reliable recording of the parameters of an elastic wave, a method of active-passive diagnostics of a heterodyne interferometer is proposed, which makes it possible to completely eliminate the interference reference line and, accordingly, increase the resolution of the interferometer in time and speed.