# SPECIFIC FEATURES OF AIR SHOCK WAVE PARAMETERS MEASUREMENTS BY THE ANALYSIS OF HIGH-SPEED VIDEO RECORDS

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**Abstract:** Some specific features of measuring the parameters of air shock waves by analyzing high-speed video records are considered. The authors pay attention to shading of the shock wave front in the shooting plane as a possible source of error in determining the shock wave velocity. Shading occurs due to distortions arising from changes in the refractive index of air as the shock wave travels in the area between the camera and the shooting plane. Using simple geometric calculations, it is shown that the error in measuring the shock wave front velocity can be up to 33% depending on the type of lens used. The article gives recommendations for choosing appropriate lens and estimating the effective distance for shooting an explosion for measuring shock wave parameters. A method is proposed to indicate (correct) the arising error using laser markers placed in the explosive field and creating several reference points to compensate the image distortion.

**Keywords:** air shock wave; high-speed video recording; shock wave front velocity

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## Figure Captions

**Figure 1** Schematic of the experimental site showing the location of video camera ($C$) relative to the shock front (circle of radius $AD$) and the cloud of detonation cloud (circle of radius $AF$)

**Figure 2** A frame of high-speed shooting of ground explosion of a 0.5-kilogram TNT charge illustrating the blurring of the contact surface between the detonation products and air due to gasdynamic instability

**Figure 3** Dependence of the fireball radius on the charge mass

**Figure 4** Dependence of the fireball size for a TNT explosion (in reduced radii) on the charge mass

**Figure 5** Dependence of the lens angle on the focal length: *1* — full frame; *2* — APS-H; *3* — APS-C; *4* — APS-Canon; and *5* — micro 4/3

**Figure 6** Laser markers used as reference points at experimental site for subsequent high-speed filming adjustments

**Figure 7** The reconstructing geometry of an image of the explosion with optical distortions produced by the shock wave propagating in the shooting area. The bottom picture is an example of reconstructed image

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