Deformation dynamics of sapphire windows in the exploding foils experiments

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In the case the duration of the dynamic experiments [1] is $1.5 - 2$ times larger than the acoustic time for the window material plates τ (the time during which an acoustic perturbation traverses the distance from the sample surface to the free surface of the plate) the deformation of the plates becomes non-one-dimensional. This leads to an additional error in the interferometer measurements of the thermal expansion of the sample and pressure. Since a certain interest are the measurements made up to the times 3τ, to estimate this error it is necessary to investigate the effects of the two and three-dimensional deformation of the windows. We consider here the problem of deformation of an isotropic elastic body in the form of a rectangular parallelepiped by a flat piston which pushes one of the surfaces of the body, while the other surfaces of the body are free. A solution of this problem, which describes the deformation dynamics during the time interval $t < 2\tau$ has been found earlier by expanding the equations of motion in powers of a small parameter of the problem [2]. The temporal dependence of the displacement of the lateral surface of the plate calculated using this solution turned out to agree well with a measured dependence while the calculated displacement of the frontal free surface noticeably differed from the measured one. In the present work with the aim to refine the solution [2] we study in more detail the dynamics of the elastic waves arising in the windows during the time interval $t < 3\tau$.

[1] Kondratyev A M, Korobenko V N and Rakhel A D 2022 *J. Phys.: Condens. Matter.* **34** 195601

[2] Ivanov A V and Rakhel A D 2022 *Scientific-Coordination Workshop on Non-Ideal Plasma Physics, November 30 - December 1, 2022, Moscow, Russia*