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SIMULATION OF SHOCK WAVE PROPAGATION IN A CYLINDRICAL CHANNEL *)

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In research on laser fusion (for example, [1, 2]), and the study of astrophysical phenomena, an important role is assigned to numerical modeling of supersonic vortex flows and the development of hydrodynamic instabilities (in particular, the Richtmayer-Meshkov instability [3, 4]). Hypersonic gas flow velocities (with Mach numbers greater than 10) can be achieved in laboratory conditions, in particular, using a laser shock tube (LUT) [5].

Using the NUTCY program [6], two-dimensional equations of gas dynamics are numerically solved in Eulerian cylindrical coordinates (r, z, t, t - time). In the calculations, the Mach number (Mx) was set, and the parameters behind the UV front were calculated using the Hugonio ratios [7].

The results of calculations of two problems are presented: 1) the interaction of the shock wave front (UV) with the roughness of the side wall of the LUT; 2) the interaction of the UV front with the film inside the channel.

Figure 1 shows the results of calculating the interaction of the UV front with roughness. The cylindrical region is filled with argon (Ar) with an initial pressure of 0.5 atm. The UV moves from top to bottom and has Mx = 10. By the time t = 1600 ns, the UV reached the bottom and was reflected. On the right side wall there are "roughnesses" in the form of 3 "protrusions" with a thickness of 25 microns and a length of 250 microns.

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