Laser-driven shock wave in Subcritical plasma [[1]](#footnote-1)\*)

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Theory and computational results are presented of the generation and propagation of a plane laser-driven shock wave in a substance with a density less than the critical plasma density. A model of the phenomenon is developed, the essence of which consists in the formation of pressure behind the front of the laser-driven ionization wave, which provides hydrodynamic motion with the speed exceeding the speed of the ionization wave front and the sound speed in unperturbed matter ahead it. These dependences demonstrate a strong increase in the duration and distance of the shock wave formation with a decrease in the density of the substance and the wavelength of the impacting laser pulse. The duration and distance of the shock wave for mation increases with a decrease in the density of the substance, respectively, as *ρ*−8/3 and *ρ*−3. With a decrease in the wavelength, both values increase as *λ*−2. An important and interesting feature is that the duration and distance of the shock wave formation increases with the laser intensity, respectively, as *I*2/3 and *I*. The results are discussed for the conditions of irradiation of targets with a density up to 0.1 mg/cm−3 by a pulse of short-wavelength radiation of the 1st–3rd harmonics of Nd-laser with intensity of 1012−1015 W·cm−2.

The results of the theory confirmed in numerical calculations are of great practical importance for the selection of experimental conditions for the cumulative pressure increase during the transition of a shock wave from a less dense to a denser substance, as well as for the selection and optimization of the parameters of a low-density The results of the theory confirmed in numerical calculations are of great practical importance for the selection of experimental conditions for the cumulative pressure increase during the transition of a shock wave from a less dense to a denser substance, as well as for the selection and optimization of the parameters of a low-density absorber of ICF targets that equalizes the inhomogeneities of heating by a finite number of laser beams.

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/It/ru/DC-Yakhin.docx) [↑](#footnote-ref-1)