

# Shell and fuel layer characterization of indirect–drive cryogenic target for laser thermonuclear fusion

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This paper presents the results of development control methods of parameters of the cryogenic target surfaces for laser thermonuclear fusion. Cryogenic target is spherical shell with a solid smooth, uniform in thickness hydrogen fuel layer, and its surfaces must meet high requirements: deviations from uniformity, concentricity, sphericity of the all target surfaces must be less than 1% [1]. The characterization method of the entire external surface of the shell using a confocal scanning is developed. The optical shadow and X-ray phase-contrast characterization methods of the cryogenic fuel layer are developed. A two-dimensional theoretical models of the visible radiation and X-ray beam propagation through a cryotarget by ray-tracing method are developed [2], [3]. The correlations between of the specific characteristics’ positions on the images and the surfaces parameters of cryotarget were obtained for both optical shadow and X-ray phase-contrast methods. The programs have been developed for shadow and X-ray phase-contrast control of the solid cryolayer parameters.

[1] Tianliang Yan Kai Wang Z Z 2021 *Optics and Laser Technology* **134** 106595

[2] E Yu Zarubina M A Rogozhina I A C 2024 *Moscow University Physics Bulletin* **79**(1) 25–38

[3] E Yu Zarubina M A Rogozhina I A C 2024 *FIZMAT* **2**(2) 134–154