1. Smyk*,* [*smykholography@gmail.com*](mailto:smykholography@gmail.com), A. Shurygin

Direct hologram recording on metal surface 18

***Abstract***

***The results on flat metals was studied and described for a series of experiments with steel that produce most stable structure with high diffraction efficiency. Experimental setup was based on 1064 nm high-frequency pulsed laser. Beam-shaping device looked necessary due to a threshold character of the interaction. The gratings obtained have 275 lines/mm and nearly sine profile. We expect the technique to increase security level of holographic images on spare parts, steel components, etc.***

***Keywords: holography, direct engraving, beam shaping, pi-shaper, IR laser.***

***References***

1. *Smyk, A., Shurygin, A.,* "Symmetric profiles in surface-relief holograms," World of Technique of Cinema, 2018-1(12). С. 23-30.
2. *Lasagni, A.F.*,"Laser interferenz strukturierung Hochprazise bei Hochstgeschwindigkeit. Laser in Electronikproduktion & Feinwerktechnik," Seminar LEF, 232-245 (2015).

3. *Takahashi, H., Hasegawa, S., Hayasaki, Y.*,"Holographic femtosecond laser processing using optimal-rotation-angle method with compensation of spatial frequency response of liquid crystal spatial light modulator," Applied Optics46(23), 5917-5923 (2007).

4. *Hermann, J., Noël, S., Itina, T.E., Axente, E., Povarnitsyn, M.E*., "Correlation between ablation efficiency and nanoparticle generation during the short-pulse laser ablation of metals, "Laser Physics, 18(4), 374-379 (2008).

5. *Kuang, Z., Liu, D., Perrie, W., Cheng, J., Edwardson, S.P., Dearden, G., Watkins, K.G.,*"Fast parallel diffractive multi-beam laser surface micro-structuring," Proceedings of the 36th International MATADOR Conference, 469-472 (2010).

6. *Kunze, T., Roch, T., Gofman, T., Fedyna, E., Konovalov, V., Ulyanov, D., Lazagni, A.,* "Precision direct laser interference with high-power Q-switched lasers," Photonics, 5(53), 34-39 (2015).

7. *Lasagni, A.F., Roch, T., Berger, J., Kunze, T., Lang, V., Beyer, E.,* "To use or not to use (direct laser interference patterning), that is the question," Proc. SPIE 9351, Laser-based Micro- and Nanoprocessing IX, Paper 935115 (2015).

8. *Moiseev, K.V., Kuzenov, V.V.,* "One-dimensional numerical simulation of the propagation of heat flows in various metallic barriers," Slate, 1 September 2008, <http://www.chemphys.edu.ru/pdf/2008-09-01-042.pdf> (1 September 2008).

9. *Anisimov, S.I., Lukyanchuk, B.S.,* "Selected problems in the theory of laser ablation," Successes of physical sciences, 127, 301 (2002).

10. [Tables of physical quantities], Handbook, *ed. acad*. *Kikoin, I.K.,* Atomizdat, Moscow, 1008 (1976).

11. *Laskin, A., Laskin, V., Ostrun, A.,* "Refractive beam shapers for optical systems of lasers," Proc. SPIE 9346, Paper 93460R (2015).

12. *Laskin, A., Juzumas, V., Urniežius, A., Laskin, V., Šlekys, G., Ostrun, A.,* "Building beam shaping optics for micromachining," Proc. SPIE 9346, Paper 934615 (2015).