Diffraction mask for three-dimensional caustic transformation

M.A. Zavyalova [1], *I.G. Palchikova* [1]
[1] *Institute of Automation and Electrometry of the Siberian Branch of the Russian Academy of Sciences*

Abstract

The authors have developed and investigated a diffraction mask allowing to redistribute the laser beam energy to the outer surface of the lens caustic. The results of mathematical simulation of energy distribution near the focus are presented and confirmed by the results of an experimental study of the caustics of a modulated zone plate with the transmission function of the proposed mask encoded into its structure.

Keywords: diffraction mask, caustic transformation, laser beam, lens caustic, mathematical simulation, modulated zone, transmission function.

Citation: Zavyalova MA, Palchikova IG. Diffraction mask for three-dimensional caustic transformation. Computer Optics 2003; 25: 63-70.

Access full text (in Russian)

References

[1] Duley W. Laser processing and analysis of materials. New York: Springer Science+Business Media; 1983.
[2] Soifer VA, ed. Methods of computer optics [In Russian]. Moscow: "Fizmatlit" Publisher; 2000.
[3] Korolkov VP, Koronkevich VP, Mikhaltsova IA, Palchikova IG, Poleshchuk AG, Sedukhin AG, Sokolov AP, Churin EG, Yurlov YI. Kinoforms: technologies, new elements and optical systems [In Russian]. Avtometriya 1989; 3: 95-102.
[4] Korolkov VP, Koronkevich VP, Mikhaltsova IA, Palchikova IG, Poleshchuk AG, Sedukhin AG, Sokolov AP, Churin EG, Yurlov YI. Kinoforms: technologies, new elements and optical systems [In Russian]. Avtometriya 1989; 4: 47-64.
[5] Haskal H. Apparatus for controlling a beam of coherent electro-magnetic wave. U.S. Patent 3705758, Published December 30, 1969.
[6] Weldkamp W. Laser beam profile shaping with binary diffraction gratings. Opt Commun 1981; 38(5-6): 381-386.
[7] Karnakis DM, Fieret J, Rumsby PT, Gower MC. Microhole drilling using reshaped pulsed Gaussian laser beams. Proc SPIE 2001; 4443: 150-158.
[8] Koronkevich VP, Palchikova IG, Poleshchuk AG, Yurlov YI. Kinoform optical elements with a ring impulse response [In Russian]. Preprint. Novosibirsk: 1985.
[9] Palchikova IG, Poleshchuk AG. Kinoforms for laser recording systems [In Russian]. In Book: Abstracts of the V All-Union Conference "Laser Optics". Leningrad: "GOI" Publisher; 1986: 269.
[10] Born M, Wolf E. Basics of optics. 4th ed. New York, London: Pergamon Press; 1965.
[11] Koronkevich VP, Palchikova IG. Modern zone plates. Avtometriya 1992; 1: 86-100.