Method for calculating an aplanatic spherical lens with an axial linear refractive index

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The article proposes a method for the synthesis of aplanatic gradient lenses, which are limited by spherical surfaces. Gradient lenses with the axial linear refractive index were derived from homogeneous lenses with the corrected third-order coma at the location of the entrance pupil in the plane of the lens. The effectiveness of this method of synthesis is shown on the basis of two types of gradient aplanatic lenses. One type had a gradient layer adjacent to the first surface, the other type had a gradient layer on the entire axial thickness of the lens.

Keywords*: gradient lens, aplanatic correction of aberrations, a gradient layer, the refractive index, the axial distribution.*

REFERENCES

[1] Alimov A.E. *Svoistva bazovykh sfericheskikh linz s osevym raspredeleniem pokazatelya prelomleniya.* Kand. Diss. [Properties of basic spherical lenses with axial refractive index. Ph.D. Diss.], Moscow, 2012, 265 p.

[2] Rovenskaya T.S., Alimov A.E. *Inzhenernyi zhurnal: nauka i innovatsii — Engineering Journal: Science and Innovation*, 2013, iss. 7. Available at: http://engjournal.ru/catalog/pribor/optica/942.html

[3] Zakaznov H.P., Kiryushin S.I., Kuzichev V.I. Teoriya opticheskikh sistem [The theory of optical systems]. 4th ed. Sankt-Petersburg, «Lan'» Publ., 2008, 448 p.

[4] Rovenskaya T.S. *Metody proektirovaniya opticheskikh sistem s gradientnymi elementami* [Methods of designing optical systems with gradient elements]. Moscow, Bauman MSTU Publ., 1994, 39 p.

[5] *Paket programm avtomatizirovannogo proektirovaniya opticheskikh sistem OPAL-PK.: Ruk. dlya pol'zovatelya. Optimizatsiya tsentrirovannykh opticheskikh sistem (raboty OPT, OPTW, OPTZ).* [Package of computer-aided design of optical systems OPAL PC: User Manual. Optimization of centered optical systems (work OPT, OPTW, OPTZ). El. prog., Leningrad, Institute of Precision Mechanics and Optics, Sankt-Petersburg, 1992.

[6] ZEMAX Optical Design Program. User's Guide. Version 10.0. Focus Software, Incorporated, Tucson, Arizona, USA, 2003, 478 p.

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