Multinodal fifth-order optical aberrations of optical systems without rotational symmetry: spherical aberration.

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Multinodal fifth-order optical aberrations of optical systems without rotational symmetry: spherical aberration

Kevin P. Thompson

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Abstract

Building off an earlier work on multinodal third-order aberrations [J. Opt. Soc. Am. A **22**, 1389 (2005)], this is the first in a series of papers that derives and illustrates the characteristic multinodal geometry for each of the fifth-order aberrations. Part I (as this paper will be referred to) will present the spherical aberration family: specifically, W_{060}, W_{240M} and W_{242}, and W_{080} (fifth-order spherical, oblique spherical, and seventh-order spherical). Nodal aberration theory is proving to be very effective as both an optical design tool for fully unobscured off-axis telescopes and as an analysis method, particularly in the context of the response of any imaging optical systems to misalignment. It is important to recognize that this multinodal approach to aberration theory is not restricted to small perturbations. The remaining papers in this series will result in a complete presentation of the intrinsic characteristic multinodal properties of each of the fifth-order aberrations. As such, this series provides a definitive theory of the optical aberrations of (nonanamorphic) imaging systems with a circular aperture stop.

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