

Polarization aberrations in high NA lenses

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Polarization Aberrations in High NA Lenses Polarization ray tracing provides a straightforward method to understand the effects of multilayer coatings and other systematic polarization effects on the wavefront aberration function, apodization, diattenuation and retardance aberrations. Expanding the Jones pupil into basis functions similar to Seidel and Zernike polynomials provides an alternate method. These polarization aberrations can provide deeper insights into the polarization aberration and the opportunities for aberration compensation.

Short biography:



Russell A. Chipman received his BS from MIT in 1976. He then earned MS and PhD degrees in 1984 and 1987 from the University of Arizona. He has been there since 2002 as a Professor of Optics in the College of Optical Sciences. Chipman is the founder of Airy Optics, an optical design company. He is also a Visiting Professor at the Center for Optics Research and Education (CORE), Utsunomiya University, Japan. Previously, he worked in both industry and academia all across the USA.

He developed, at the University of Arizona, the Polarization Laboratory for coordinated research in polarimetry and polarization in optical design. With his students and research staff, more than ten polarimeters have been built. He is a Co-Investigator on NASA/JPL's Multi-Angle Imager for Aerosols, a polarimeter scheduled for launch into earth orbit around 2021 for monitoring aerosols and pollution in metropolitan areas. He is also developing UV and IR polarimeters for other NASA exoplanet and remote sensing missions. In 2005 he began developing a polarization ray tracing program for analyzing stress birefringence. Later he worked with students on the polarization ray tracing calculus to integrate the many polarization effects into a unified ray tracing algorithm. In 2009, he received a \$1.2M grant from the Science Foundation Arizona to develop a research polarization ray tracing program, Polaris-M, to demonstrate this integrated approach to polarization and optical design. Polaris-M underwent further evolution as it was applied to many problems in polarimetry, interferometry, and injection molding. The interest in the Polaris-M software grew beyond what could be supported from an academic laboratory. In 2016 he formed Airy Optics, licensed the software from the University, and has developed a team to commercialize Polaris-M and perform engineering services for a wide variety of markets. The unified development of this polarization platform also led to the textbook Polarized Light and Optical Systems.

Chipman is a Fellow of the Society and SPIE. He has received NASA's Tech Brief Award, SPIE's G.G. Stokes Award in Polarization, and the Joseph Fraunhofer Award/Robert M. Burley Prize.