

Internship, Research Labworks, Bachelor Thesis, Master Thesis

in the subject area of

Achromatic nano-optical phase plates

Phase plates are of high importance to control the polarization state in many different applications like optical metrology, polarimetry or ellipsometry, in polarization state generators, in tunable laser systems and many more. Optical retarders can be realized with high refractive index gratings, however, would exhibit a strong wavelength dependency which is often problematic for those applications. A solution could be provided by the combination of several nano-optical elements in a multilayer system. Beside the wavelength independency, such elements could be much more compact and can be integrated with other elements to form miniaturized complex devices.

The aim of the work is the development of corresponding design concepts, investigation of the optical interaction of the planes as well as the consideration of the technological aspects.

Covered subjects

- Simulation of achromatic retarders for the VIS wavelength range (450-700nm)
- Consideration of limitations due to manufacturing (maximum realizable phase, discrete rotation angles, deviations from the ideal structural shape)
- Comparison of different approaches (e.g. Pancharatnam, Saha, ...)
- Preparation of different designs with different numbers of elements (2,3,4)
- Consideration of the near-field coupling between the elements for different thicknesses of the layer between the elements
- Comparison with classical achromatic retarders (e.g. alignment of the fast axis, phase axis, variation of the phase retardation, angle of incidence)
- Realization of an experimental setup for the experimental verification of the theoretical simulations

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