

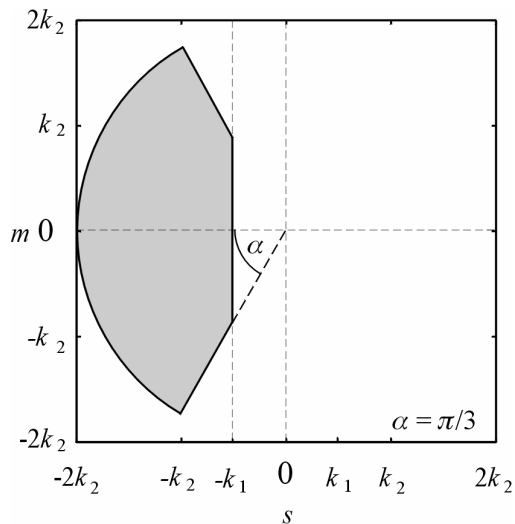
POLYCHROMATIC COHERENT TRANSFER FUNCTION FOR A LOW-COHERENCE INTERFERENCE MICROSCOPE WITH ACHROMATIC FRINGES

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Our system [1] of the low-coherence interference microscope is based on the Linnik configuration. A low-frequency diffraction grating is used as a beam splitter and the object and reference image planes are gently inclined. In this optical setup the achromatic interference fringes are formed in the image plane. The phase shift of the reference wave is proportional to the spatial coordinate and is independent of the wavelength. The phase shift changes from 0 to $2p$ within the transverse resolution limit of the microscope; hence the resulting interference structure is the image-plane hologram. Intensity and phase image components are reconstructed from the single hologram by the digital filtering algorithm. The image rate is not limited by the optical system.

An optical sectioning effect analogous to that of the confocal microscope results from the illumination by an extended spatially incoherent source (phase correlation effect). This sectioning could be substantially increased when also temporally incoherent illumination of a broadband source is used. Moreover, speckle patterns and unintentional interferences in the image are then suppressed.



The 3D polychromatic coherent transfer function of the microscope is derived as the correlation of the 3D polychromatic pupil functions of the objectives. This transfer function describes the overall imaging process including both sectioning effects. The influence of the spectral function of the source on the imaging characteristics of the microscope is studied theoretically and partially proved by the measurement.

Figure 1: Example of the support of the rotationally symmetric 3D coherent transfer function of the microscope for a broadband illumination with the wavenumber interval (k_1, k_2) and for the angular aperture $p/3$ of the objectives.

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REFERENCE

[1] R. Chmelík, Z. Harna, "Parallel-mode confocal microscope," *Optical Engineering*, **38**, 1635–1639 (1999).