

## THE OPTICAL VORTEX SCANNING MICROSCOPE – SIMPLE IMAGING PROCEDURES

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The Optical Vortex Scanning Microscope (OVSM) is based on the Mach-Zender interferometer with carrier frequency. The conventional Gaussian beam (from He-Ne laser) passes through the spiral phase plate and is focused on the sample plane, where it interacts with the investigated object. The sample plane is magnified and imaged into the CCD camera. The interferometer's reference arm enables detection of the interference fringes, from which the internal structure of the object beam can be recovered. An analytical description of the OVSM in the scalar Fresnel approximation was presented in paper [1]. The first image recovery procedures were proposed basing on this theory and was tested with simple phase objects. This first results were presented in paper [2]. In this presentation we shortly discuss the theory of the OVSM. The special attention is put to the internal scanning method (ISM). The ISM enables scanning the sample just by vortex point at the sample plane, while the whole focused beam stays in place. This method is very precise and resistant to mechanical vibration. The images resolved with resolution exceeding the classical diffraction limit are presented. At this stage the simple phase structures can be imaged. The possible directions of the OVSM development are discussed in brief.

[1] Ł. Plociniczak, A. Popiołek-Masajada, J. Masajada, and M. Szatkowski, *Appl. Opt.* 55(12), B20-B27 (2016).

[2] Agnieszka Popiołek-Masajada, Jan Masajada, Mateusz Szatkowski, "Internal scanning method as unique imaging method of optical vortex scanning microscope", *Opt. and Lasers in Eng.*, In press