

LASER DIGITAL LENSLESS HOLOGRAPHIC MICROSCOPY OF BIOLOGICAL SAMPLES USING SUPERCONTINUUM LASER

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The Application

In this application the FYLA SC500 (REF. 2000-500) Supercontinuum laser is used as an illumination source for an experience with Digital Lensless Holographic Microscopy (DLHM). Basically, in DLHM the light scattered from the object/sample interferes with the reference incident light to generate a holographic pattern at the camera plane. Then, the recorded intensity is numerically processed, and the object wavefront is reconstructed.

Applications of DLHM include for instance the investigation of in situ organisms and their motion in plankton with micrometer resolution, investigating microbial life forms, tracking micrometer sized particles with high NA, or analysing transparent phase objects under femtosecond illumination.

In this DLHM setup the microscopy objective is substituted by a diffractive lens (DL) of 50 mm focal length, which together with an small pinhole of only 2 microns can be regarded as a spectrometer. At this point, **we take advance from the huge spectral width of the FYLA SC500 Supercontinuum laser to obtain multispectral images of the biological samples.** In order to show the usefulness of this laser for the present application we included in this report reconstructed images of mosquito head and a dust mite taken for a spectral line of 567nm having a FWHM of about 6nm. Here, it should be mentioned that the minimum feature sizes of the samples in Fig. 1 are in the order of few microns. In addition, the ability of the technique **to reconstruct images of the same sample at different wavelengths allows achieving important information on certain optical properties (e.g., reflectance/absorbance of specific regions of the sample).** Of course, this is strongly related to the laser source characteristics.

The FYLA SC500 Supercontinuum laser was very easy and simple to add into the DLHM optical setup due to its compact form. The output average and its huge spectral width makes the FYLA SC500 Supercontinuum laser an extraordinary tool for spectral microscopy, so, high quality images can be obtained (as it is obvious from the results shown in Fig. 1) if one takes time averaged measurements.

BELOW. Reconstructed images from DLHM technique of a mosquito head (left) and a dust mite (right)

