

USE OF HIGH-ORDER BEAMS TO CALIBRATE SPATIAL LIGHT MODULATORS FOR MICROSCOPY

L. Turquet¹, M. Kauranen¹, and G. Bautista¹

1. Department of Physics, Tampere University of Technology, P.O. Box 692, FI-33101 Tampere, Finland
email: leo.turquet@tut.fi

Spatial light modulators (SLM) are highly programmable devices, widely used in optical setups. Easy to use and versatile, they have naturally appeared as substitutes for various optical components and enabled breakthroughs in different fields [1-3]. However, such devices need to be calibrated. Several reliable techniques have been developed, though usually based on separate interferometric systems [4, 5].

We present here a technique based on high-order laser beams to quickly calibrate phase-only SLMs for microscopy. This method uses the microscopy setup itself and therefore no extra setups or alignment are required.

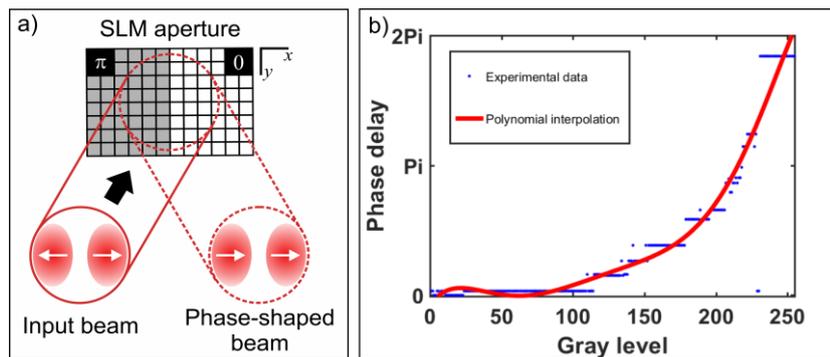


Fig. 1. a) Spatial distribution of the beam on the SLM. b) Calibration curve of the SLM

The beam of a pulsed femtosecond laser (Chameleon, Coherent) at 1060 nm is converted into a radially-polarized beam by means of a radial converter (Arcoptix). The HG₁₀ mode is obtained using a polarizer and steered toward a Hamamatsu phase-only reflective SLM (Fig. 1a). Its window is divided into two subwindows: one keeps a constant value of 0 whereas the other one sees its pixel value gradually changed from 0 to 255. A video of the focused beam reflected by a glass slide is recorded. By performing a cross correlation between each frame of the video, we can determine the unique matching pairs and plot the phase calibration curve (Fig. 1b).

- [1] D. G. Grier, [Nature 424, 810 \(2003\)](#).
- [2] J. W. Wilson, P. Schlup, and R. A. Bartels, [Opt. Express 15, 8979 \(2007\)](#).
- [3] A. Jesacher, C. Maurer, A. Schwaighofer, S. Bernet, and M. Ritsch-Marte, [Opt. Express 16, 2597 \(2008\)](#).
- [4] F. P. Ferreira and M. S. Belsley, [Opt. Express 18, 7899 \(2010\)](#).
- [5] Stephan Reichelt, [Appl. Opt. 52, 2610 \(2013\)](#).