Photocontrolled deformable mirror

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Purpose

We present a novel design of deformable mirror. In our scheme an electrostatic membrane mirror is actuated through the change of resistivity of a photoconductor substrate[1] rather than using a matrix of segmented pads where each of them is connected to an high voltage amplifier. The layout of the device is illustrated in Fig. 1. The Optically addressable Deformable Mirror (ODM) is composed by a Bismuth Silicon Oxide (BSO) photoconductive substrate, and a nitrocellulose metallized membrane connected to an AC power supply. The auxiliary light source is a blue Light Emitting Diode modulated by a high resolution LCD panel.

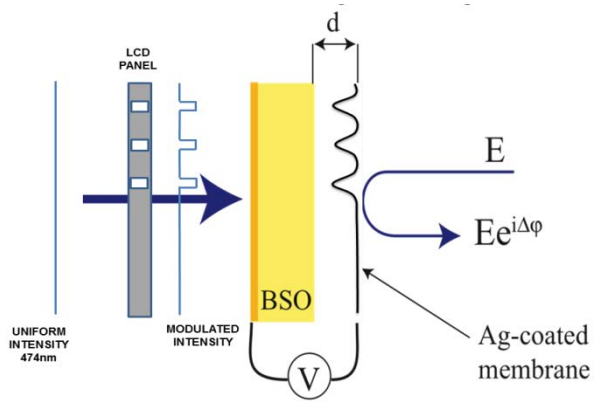

Fig. 1: photocontrolled optically addressable deformable mirror layout.

Thus a first advantage of this device is the extreme reduction of hardware complexity since just on high voltage line is used as power supply. A second important advantage is that the addressing of the DM can be obtained by the modulation of the light intensity of an auxiliary light source. Hence the resolution of the device is limited just by the membrane rather than the actuators density.

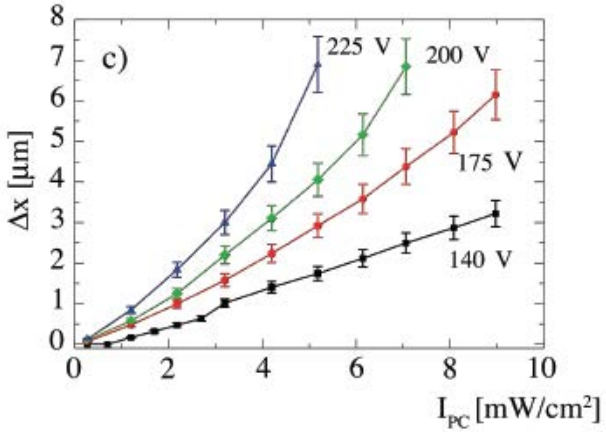

Fig. 2: characterization of the stroke of the ODM in function of the power supply voltage and the driving intensity.

The device parameters have been characterized in function of the driving voltage power supply and frequency, and in function of the source intensity.

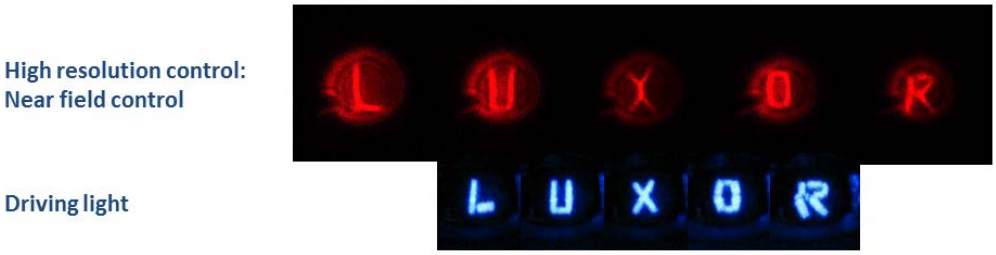

Fig. 3: example of high resolution near field projected images (top row) obtained by the illumination driving pattern in the bottom row, showing the name of our Lab.

Fig 3 shows some example of high resolution addressing. We present the characterization of the device in terms of Zernike polynomials generation, stroke and working conditions in functions of the device parameters.

References

1. U. Bortolozzo, S. Bonora, J. P. Huignard, and S. Residori,Continuous photocontrolled deformable membrane mirrorAppl. Phys. Lett. **96**, 251108 (2010); doi:10.1063/1.3457443