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Continuous photo-controlled deformable mirror based on silicon photoconductor

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The fabrication and characterization of a Silicon based photo-controlled deformable mirror (PCDM) for spatial light modulation and wavefront control is reported. The device is a 1-inch clear aperture membrane mirror (5 μm thick nitrocellulose membrane) coupled with a 1-inch monolithic non-pixelated Silicon photoconductive slab. A transparent ITO electrode is deposited on one side of the Silicon substrate. The device is electrically driven in AC and it is characterized by measuring the generated wavefront using a Shack-Hartmann sensor. The uniform illumination with a NIR LED induces a membrane deformation that increases with the applied voltage, its frequency and the light irradiance. The maximum deformation achieved is approximately 2 μm PtV (wavefront). The repeatability is tested confirming the reliability of the device. Concerning the time stability, this property is maintained in a timeframe suitable for this kind of devices. A response time of about 10 ms is measured. The device is suitable for an efficient adaptable focusing element with an important focus control.

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