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FAR FIELD DIFFRACTION ANALYSIS OF A PDMS MOEMS PRESSURE SENSOR BY MEANS OF THE FINITE ELEMENT METHOD

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Abstract. We present the far field diffraction analysis of a polydimethylsiloxane (PDMS) diffraction grating intended to be used as an optical passive microsensor for pressure measuring. The working principle of the sensor and a detailed study of the mechanical properties of the PDMS were performed in preceding works. Diffraction analysis was carried out using the ray-tracing method. The microsensor is based on a deformable membrane that has a diffraction grating embedded, being a part of the chamber where the fluid to be monitored is located. As the pressure inside the chamber varies, the optical properties of the grating are modified. So, it is of fundamental importance to have a proper model of both the optical and mechanical behaviour of the system. In this work, we report the advances made in the optical model wherein the shape changes of the diffraction patterns are evaluated using the Finite Element Method (FEM). Far field analysis of the diffracted light is performed both in transmission and reflection scenarios in order to get a better understanding of the PDMS grating as it is subjected to mechanical deformations due to pressure variations. The results obtained from FEM diffraction analysis are compared with those previously achieved by means of the ray-tracing method.