# REMOTE FOCUSSING IN HIGH-RESOLUTION SYSTEMS BY DIFFRACTIVE TUNABLE LENSES

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With the need of fast volumetric imaging, focus-tunable optics plays an increasingly important role in biomedical imaging. In recent years we have developed tunable lenses based on a pair of diffractive optical elements (DOEs). As a rotational variant of the Alvarez-Lohmann principle, the pair of DOEs together form a Fresnel lens with a refractive power which is adjustable by the rotation angle between the two elements [1-3].

We show how this remote focusing approach can be adapted to remain feasible under high-NA imaging conditions, and we demonstrate experimentally that it is capable of shifting the focal spot produced by a NA 1.25 objective over more than ±80 μm with largely unhampered focus quality. The correction of spherical aberrations introduced by refractive index mismatch can directly be incorporated into the DOE lens design, so that they are compensated for at all focus positions.

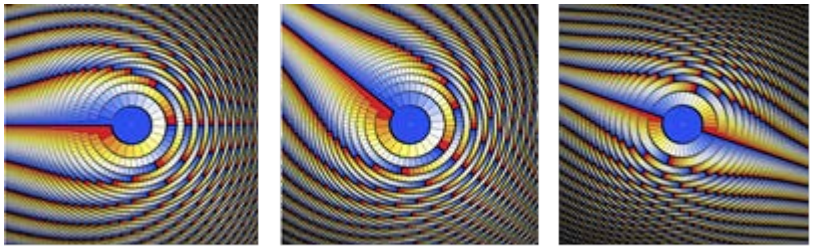

Figure 1: Phase profiles used to create a tunable Fresnel lens actuated by rotation of one of the two diffractive elements.

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