This paper presents a novel image sensor architecture that uses on-die diffractive optics to form images. The diffraction gratings are formed using the metal layers in a conventional CMOS process, and are intended to be cheaper to fabricate than conventional microlenses (which require extra process steps). Previous work on this sensor architecture found that severe blurring and aberration was caused by the diffractive optical elements.

This paper describes the use of two types of filter to approximately deconvolve the blurring. The first approach, Wiener filtering, attempts to produce an optimal deconvolution filter that restores a flat spectrum of spatial frequencies to the best degree possible. Finite impulse response (FIR) versions of the Wiener filter that are cropped in the space domain are also tested. The second approach builds a very small FIR filter that acts as a differentiator, approximately restoring the envelope of the frequency spectrum without performing optimal reconstruction.

Sample images deconvolved with FIR filters of varying window radii, and with a differentiating filter, are shown on the right.