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Seeking Lensing Effects from Counting Galaxies

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Weak gravitational lensing induces flux dependent fluctuations in the observed galaxy number density distribution. This cosmic magnification (magnification bias) effect in principle enables lensing reconstruction alternative and independent to cosmic shear and CMB lensing. However, the intrinsic galaxy clustering overwhelms the lensing signal, and hindered its application. We developed various novel methods to extract the lensing magnification signal with different assumptions and under various circumstances. The statistical significance and the potential systematics are quantified using simulations heading at Stage IV survey conditions. The predicted S/N for magnification-shear cross correlation can achieve 200 for LSST-like survey. Finally, we present a weak lensing convergence map reconstructed from the clustering of DECaLS galaxies of the DESI imaging surveys. The detection of the magnification-shear cross correlation over 1/5 sky area reaches $\sigma/\sigma=10$.

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