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The ellipticity of galaxy cluster halos from satellite galaxies and weak lensing[1] TAE-HYEON SHIN, JOSEPH CLAMPITT, BHUVNESH JAIN, GARY BERNSTEIN, Department of Physics and Astronomy, Univ of Pennsylvania, ANDREW NEIL, Department of Astronomy as Astrophysics, Univ of Chicago, EDUARDO ROZO, Department of Physics, Univ of Arizona, ELI RYKOFF, SLAC National Accelerator Laboratory — We study the ellipticity of galaxy cluster halos as characterized by the distribution of cluster galaxies and as measured with weak lensing. We use monte-carlo simulations of elliptical cluster density profiles to estimate and correct for Poisson noise bias, edge bias and projection effects. We apply our methodology to 10,428 SDSS clusters identified by the redMaPPer algorithm with richness above 20. We find a mean axis ratio = 0.573 ± 0.002 (stat) ± 0.039 (sys). We compare this ellipticity of the satellites to the halo shape, through a stacked lensing measurement using optimal estimators of the lensing quadrupole. We find a best-fit axis ratio of 0.56 ± 0.09 (stat) ± 0.03 (sys), consistent with the ellipticity of the satellite distribution. Thus cluster galaxies trace the shape of the dark matter halo to within our estimated uncertainties. Finally, we restack the ellipticity measurements along the major axis of the cluster central galaxy's light distribution. From the lensing measurements we infer a misalignment angle with an RMS of $30^\circ \pm 10^\circ$ when stacking on the central galaxy. We discuss applications of halo shape measurements to test the effects of the baryonic gas and AGN feedback, as well as dark matter and gravity.

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