Abstract Submitted
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Constraining Gravity at Large Scales with Clusters of Galaxies[1]

D. RAPETTI, Univ. of Colorado, Boulder & NASA ARC, M. CATANEO, U. of Copenhagen, F. SCHMIDT, Max Planck Inst. for Astrophys., L. LOMBRISER, U. of Edinburgh, B. LI, Durham U., A. MANTZ, Stanford U., S. ALLEN, Stanford U. & SLAC Nat. Accel. Lab., D. APPLEGATE, Argelander Inst. for Astron., P. KELLY, UC, Berkeley, A. VON DER LINDEN, Stony Brook U., R. G. MORRIS, SLAC & Stanford U. — I will present the most recent constraints on $f(R)$ modifications of gravity from the abundance of massive galaxy clusters. Our analysis self-consistently and simultaneously incorporates survey, observable-mass scaling relations, as well as weak gravitational lensing data to accurately calibrate the absolute cluster mass scale. Using this advanced cluster analysis in combination with CMB data, and other cosmological constraints, we obtain upper bounds on $f(R)$ gravity that are about an order of magnitude tighter than those from such previous studies. The robustness of our results derives from our high quality cluster growth data out to redshifts $z \sim 0.5$, a tight control of systematic uncertainties, accounting for the covariance between all parameters, and the use of the full shape of the halo mass function (HMF) over the mass range of the data. Based on the current highest resolution N-body simulations, I will also describe our new modeling of the $f(R)$ HMF. This includes novel corrections to capture key non-linear effects of the Chameleon screening mechanism that will allow us to obtain the next generation of cluster constraints on this model.

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