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# Outer regions of galaxy clusters as a new probe to test modifications to gravity

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We perform a stacking analysis of galaxy cluster velocity phase space using the caustic technique. By stacking 128 clusters, we create four robust stacked clusters with excellent agreement between caustic masses and binned medians. We model the gravitational potential using the NFW profile, validating the ΛCDM mass-concentration relation. Implementing the Chameleon screening model, we find constraints on modified gravity parameters consistent with ΛCDM, yielding stringent upper limits of $|f_{\rm R0}|$ $lesssim 4 \times 10^{-6}$ at 95% C.L. for $f(\mathcal{R})$ gravity. We also test the caustic technique's effectiveness in constraining MOND in individual clusters.

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