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A test of MOND and Emergent Gravity with SMACS J0723.3-7327 using eROSITA observations

We implement a test of MOND and Verlinde's Emergent Gravity using the galaxy cluster SMACS J0723-7327, which has been recently imaged using the eROSITA X-ray telescope as well as with JWST. We test MOND using two independent methods. The first method involves comparing the dynamical MOND mass and baryonic mass, while the second method entails a comparison of the MOND-estimated temperature with the observed temperature. We then compare the unseen mass predicted by Emergent Gravity with the estimated dark matter mass. We find that MOND is able to explain the mass discrepancy at large radii but not in the central regions. The observed temperature profile is also in slight disagreement with that in the MOND paradigm. Likewise the Emergent Gravity Theory shows a marginal discrepancy in accurately accounting for the dynamical mass in the inner regions. Our results are qualitatively consistent with the earlier tests on other clusters.

Track type

Dark Energy and Modified Gravity

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