
Contribution ID: **73** Type: **not specified**

# Testing generalized scalar-tensor theories of gravity with the Sunyaev - Zel'dovich effect (pressure profile) of the galaxy clusters

*Tuesday, 29 June 2021 16:15 (20 minutes)*

Degenerate higher-order scalar-tensor (DHOST) theory is the most general scalar-tensor theory, which can be considered as a generalized framework for testing gravity. DHOST theory introduces modifications to ΛCDM in the background evolution as well as in the small-scale to the gravitational potential in static systems such as galaxy clusters. Assessing these small-scale predictions provides complimentary testing grounds for modifications to GR and so are of utmost importance. To this end, we utilize the well-compiled X-COP catalog consisting of 12 clusters with both the Sunyaev-Zeldovich (SZ) pressure and the X-ray temperature measurements in the radius range of 0.02 Mpc $\leq$ r $\leq$ 2 Mpc for each of the individual clusters. We perform a fully Bayesian analysis modeling NFW mass profile and allowing for the extra degrees of freedom(s), to constrain the DHOST parameter(s) which modifies the hydrostatic equilibrium. Carefully selecting suitable clusters to present our results, we find a mild to moderate, i.e, $\sim 2\sigma$ significance for a deviation from the GR scenario. However, in a comparison of Bayesian evidence, we find that GR remains to be the preferred theory of gravity, while the modifications are not ruled out. While individual clusters do not immediately suggest a modification to GR, we find that a tentative redshift-dependent behavior could be observed at a larger significance. This indeed makes it essential to test the current formalism against larger well-observed samples such as the NIKA2 SZ large program consisting of a larger sample size of 45 clusters, in a larger redshift range.

**Primary author:** Dr HARIDASU, Balakrishna Sandeep (SISSA)

**Co-authors:** Dr KARMAKAR, Purnendu (University of Rome, La sapienza); CARDONE, Vincenzo Fabrizio; DE PETRIS, Marco (ROMA1); Prof. MAOLI, Roberto (University of Rome, La Sapienza)

**Presenter:** Dr HARIDASU, Balakrishna Sandeep (SISSA)