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Can the simplest generalizations of the null inertial mass density alleviate the H_0 tension?

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“In this talk, we overview dark energy models with negative energy density values in the past can alleviate the H_0 tension. We investigate whether two minimal extensions of the Λ CDM model, together or separately, can successfully realize such a scenario: (i) the spatial curvature, which, in the case of spatially closed universe, mimics a negative density source and (ii) graduated and simple- graduated dark energy, which promote the null inertial mass density of the usual vacuum energy to an arbitrary function/constant—if negative, the corresponding energy density decreases with redshift similar to the phantom models, but unlike them crosses below zero at a certain redshift. We find that, a spatially closed universe along with a simple-gDE of positive inertial mass density, which work in contrast to each other, results in minor improvement to the H_0 tension. The joint dataset, BAO+SN+H+PLK presents no evidence for a deviation from spatial flatness but almost the same evidence for a cosmological constant and the simple-gDE with an inertial mass density of order $O(10^{-12})$ eV⁴. We will talk about further inertial mass density parameterizations such as linear/oscillatory generalizations in scale factor as well as redshift of the vacuum energy. We then will close the talk with the possibility of obtaining effective sources such varying inertial mass densities from modified theories/extensions of gravity as like the constant inertial mass density (Simple gDE) arises from barotropic perfect fluid via the energy-momentum squared gravity of the logarithmic form. This talk is based on the works: [1] Simple-graduated dark energy and spatial curvature, G. Acquaviva, Ö. Akarsu, N. Katirci, J. A. Vazquez, Phys. Rev.D 104 (2021) 2, 023505, 2104.02623 [astro-ph.CO]. [2] Screening Λ in a new modified gravity model, Ö. Akarsu, J. D. Barrow, C.V.R. Board, N.M. Uzun, J. A. Vazquez, Eur.Phys. J.C 79 (2019) 10, 846, 1903.11519 [gr-qc]. [3] Graduated dark energy: Observational hints of a spontaneous sign switch in the cosmological constant, Ö. Akarsu, J. D. Barrow, L.A. Escamilla, J. A. Vazquez, Phys.Rev.D 101 (2020) 6, 063528 1912.08751 [astro-ph.CO]. [4] Dynamical analysis of logarithmic energy-momentum squared gravity, G. Acquaviva, N. Katirci, 2203.01234 [gr-qc].”

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