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Tolman-Ehrenfest criterion of thermal equilibrium extended to conformally static spacetimes

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With insight from examples and physical arguments, the Tolman-Ehrenfest criterion of thermal equilibrium for test fluids in static spacetimes is extended to local thermal equilibrium in conformally static geometries. The temperature of the conformally rescaled fluid scales with the inverse of the conformal factor, reproducing the evolution of the cosmic microwave background in Friedmann universes, the Hawking temperature of the Sultana-Dyer cosmological black hole, and a heuristic argument by Dicke.

[Based on V. Faraoni and R. Vanderwee 2023, Phys. Rev. D 107, 06407 (arXiv:2301.09021)]

Keyword-1

Thermal equilibrium

Keyword-2

General Relativity

Keyword-3

Conformally static spacetime

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