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Dynamical Wald Entropy and Conformal Killing Horizons

We investigate the dynamical gravitational Wald entropy associated with spacetimes imbued with conformal killing horizons by using covariant phase space methods. We extend the Frobenius surface gravity formula to conformal Killing horizons, yielding a new generalized expression involving the conformal factor. The Wald entropy takes a modified form, with dependence on the conformal factor. We find a first law of thermodynamics for planar (cosmological) de Sitter, where the temperature is one half that of static de Sitter. We then connect the entropy associated with conformal Killing horizons to quantum extremal surfaces and the island formula. This offers an interesting new perspective on spacetimes with conformal symmetry, such as planar de Sitter, dilaton gravity models and Vaidya.

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