Abstract Submitted
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Imaginary action and gravitational entropy[1] YASHA NEIMAN, IGC, Penn State — We present a candidate for a new derivation of black hole entropy. We begin by examining the on-shell action of gravity in bounded regions of spacetime. A careful consideration of the boundary term reveals an imaginary part, whose form resembles the formula for gravitational entropy. For stationary black hole solutions, we identify families of bounded regions for which the action's imaginary part precisely equals the black hole entropy. Thus, we have a fully Lorentzian calculation, with no assumption of stationarity and no reference to asymptotic infinity, which reproduces the known entropy formula for stationary black holes. The calculation is carried out for General Relativity with cosmological constant and minimally-coupled matter, as well as for Lovelock gravity. The results represent a step towards understanding gravitational entropy in non-stationary and cosmological contexts.

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