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Real dynamics of thermal false vacuum decay

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We revisit false vacuum decay in relativistic field theory and with a heat bath. We find the decay rate due to classical thermal fluctuations of the field. We do this numerically, by performing real-time simulations of the field evolution from the initial state in thermal equilibrium. We compare our findings with predictions of the well-known Euclidean formalism. We find agreement at the level of leading semiclassical exponent and corresponding Euclidean solution (sphaleron). However, we find the discrepancy at the level of prefactor, and the measured decay rate significantly lower than the Euclidean prediction. We identify physical effects leading to this discrepancy and pointing to limitations of the Euclidean formalism to describe the thermal decay rate. We discuss implications of our findings for cosmology and quantum matter.

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