

# Decay of Kaluza-Klein Vacuum via Singular Instanton

*Tuesday 25 June 2024 17:00 (15 minutes)*

In our research, we studied the decay of the Kaluza-Klein vacuum via an instanton solution, which has a singularity. For the Kaluza-Klein vacuum, there is a non-perturbative decay channel where literally a “bubble of nothing” expands and overwhelms the spacetime. The instanton solution that mediates this decay is the Euclidean 5D Schwarzschild solution, and, in general discussion, we fix the periodicity of the imaginary time to an appropriate value to avoid a singularity at the location of the event horizon. We relax this smoothness condition and evaluate the contribution of the singularity based on the conical deficit regularization. This contribution is always negative and finite and works to reduce the Euclidean action. If this argument is correct, decay via singular instantons may be a more dominant process in higher-dimensional theories. Moreover, we also reproduce the bounce action using thermodynamic functions and attempt a thermodynamic interpretation of the aforementioned catalytic effects.

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**Session Classification:** Parallel session