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Finite-temperature bubble-nucleation with shifting scale hierarchies

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Focusing on supercooled PTs in models with classical scale symmetry, we investigate the limitations of derivative expansions in constructing a thermal EFT description for bubble nucleation. We show that derivative expansion for gauge field fluctuations diverges because the gauge field mass varies strongly between the high- and low-temperature phases. By computing the gauge fluctuation determinant, we show that these effects can be captured while accounting for large explicit logarithms at two loops. We show how this construction can improve nucleation rate calculations, providing a more robust framework for describing GW from supercooled PT in models like the SU(2)cSM.

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