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Multidimensional Quantum Tunneling: A Perturbative Approach

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We revisit multidimensional quantum tunneling, as a model for studying the state of the inflaton after a tunneling transition from a false vacuum. Previous approaches to the subject make some technically incorrect assumptions about the validity of the WKB approximation. I will present a new method that avoids these mistakes, in more carefully treating the separation between the tunneling and transverse directions. When the transverse modes begin in the adiabatic ground state in the false vacuum, we compute excitations of the transverse degrees of freedom above the adiabatic ground state as it exits the potential barrier, and the dependence of this excitation on the false vacuum and the barrier configuration. I will discuss the full field theory problem in this context.

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