On the rate of gravitational inflaton decay via gauge trace anomaly

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We analyze decay processes of the inflaton field, phi, during the coherent oscillation phase after inflation in f(phi)R gravity. It is inevitable that the inflaton decays gravitationally into gauge fields in the presence of f(phi)R coupling. We show a concrete calculation of the rate that the inflaton field decays into a pair of gauge fields via the trace anomaly. Comparing this new decay channel via the anomaly with the channels from the tree-level analysis, we found that the branching ratio crucially depends on masses and the internal multiplicities (flavor quantum number) of decay product particles. While the inflaton decays exclusively into light fields, heavy fields still play a role in quantum loops. We argue that this process in principle allows us to constrain the effects of arbitrary heavy particles in the reheating. We also applied our analysis to Higgs inflation, and found that the gravitational decay rate would never exceed gauge interaction decay rates if quantum gravity is unimportant.

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