

# Constraints on Holographic Multifield Inflation and Models Based on the Hamilton-Jacobi Formalism

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In holographic inflation, the 4D cosmological dynamics is postulated to be dual to the renormalization group flow of a 3D Euclidean conformal field theory with marginally relevant operators. The scalar potential of the 4D theory-in which inflation is realized-is highly constrained, with use of the Hamilton-Jacobi equations. In multifield holographic realizations of inflation, fields additional to the inflaton cannot display underdamped oscillations (that is, their wave functions contain no oscillatory phases independent of the momenta). We show that this result is exact, independent of the number of fields, the field space geometry, and the shape of the inflationary trajectory followed in multifield space. In the specific case where the multifield trajectory is a straight line or confined to a plane, it can be understood as the existence of an upper bound on the dynamical masses  $m$  of extra fields of the form  $m \lesssim 3H/2$  up to slow roll corrections. This bound corresponds to the analytic continuation of the well-known Breitenlohner-Freedman bound found in anti-de Sitter spacetimes in the case when the masses are approximately constant. The absence of underdamped oscillations implies that a detection of "cosmological collider" oscillatory patterns in the non-Gaussian bispectrum would not only rule out single-field inflation, but also holographic inflation or any inflationary model based on the Hamilton-Jacobi equations. Hence, future observations have the potential to exclude, at once, an entire class of inflationary theories, regardless of the details involved in their model building.