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Inflationary Scalar and Tensor Hair

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All inflationary models, in spite of locally approaching the de Sitter space-time inside the Hubble radius, have scalar and tensor 'hair'–spatial inhomogeneity - outside it. This inhomogeneity does not disappear with time. Just the opposite, its amplitude at a given comoving scale typically remains constant not only during inflation but a long time after its end up to the moment of the second Hubble radius crossing of this scale. Moreover, a part of these scalar inflationary hairs have been already observed through measurements of CMB angular temperature anisotropy and polarization, and we expect the discovery of tensor hairs (primordial gravitational wave background from inflation) in the future. In terms of 'no-hair'theorems, this situation is similar but just opposite to that in General Relativity (GR), where we have the 'no-hair'property of black holes outside their event horizons, but not inside them. I consider the structure of these hairs in different classical and one-loop quantum models in GR and modified gravity both in linear and non-linear regimes. The description of scalar quantum hair in the non-linear regime during inflation is possible in the closed-form in the scope of the stochastic inflation formalism using the Fokker-Planck equation.

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