

Rethinking Quantum Field Theory



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**Rethinking
Quantum Field Theory**

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Restriction on the initial state for the absence of IR effect in single field inflation

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It has been claimed that the super Hubble modes generated during inflation can make loop corrections diverge. Even if we introduce an infrared (IR) cutoff at a comoving scale as an ad hoc but a practical way for the regularization, we encounter the secular growth, which may lead to the breakdown of perturbative expansion for a sufficiently long lasting inflation. We show that the IR pathology can be attributed to the presence of residual gauge degrees of freedom in the local observable universe.

We will show that choosing the Euclidean vacuum as the initial state ensures the invariance under the above-mentioned residual gauge transformations. We will also show that as long as we consider a gauge invariant quantity in the local universe, we encounter neither the IR divergence nor the secular growth.

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