



Contribution ID: 283

Type: Oral Presentation

Position-Space Renormalisation of the Energy-Momentum Tensor Two-Point Function

Wednesday, August 10, 2022 3:20 PM (20 minutes)

In the Holographic Model, the two-point function of Energy-Momentum Tensor (EMT) of the dual QFT can be mapped into the power spectrum of the Cosmic Microwave Background in the gravitational theory. However, the presence of divergent contact terms poses challenges in extracting a renormalized EMT two-point function on the lattice. Using a ϕ^4 theory of adjoint scalars valued in the $\mathfrak{su}(N)$ Lie Algebra as a proof-of-concept motivated by Holographic Cosmology, we apply a novel method for filtering out such contact terms by making use of infinitely differentiable “bump” functions which enforce a smooth window that excludes contributions at zero spatial separation. The process effectively removes the local contact terms and allows us to extract the continuum limit behaviour of the renormalized EMT two-point function.

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Session Classification: Particle physics beyond the Standard Model

Track Classification: Particle physics beyond the Standard Model