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Bootstrapping One-loop Inflation Correlators with the Spectral Decomposition

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Phenomenological studies of cosmological collider physics in recent years have identified many 1-loop inflation correlators as leading channels for discovering heavy new particles around or above the inflation scale. However, complete analytical results for these massive 1-loop correlators are currently unavailable. In this work, we embark on a program of bootstrapping inflation correlators with massive exchanges at 1-loop order, with the input of tree-level inflation correlators and the techniques of spectral decomposition in dS. As a first step, we present for the first time the complete and analytical results for a class of 4-point and 3-point inflation correlators mediated by massive scalar fields at the 1-loop order. Using the full result, we provide simple and reliable analytical approximations for the signals and the background in the squeezed limit. We also identify configurations of the scalar trispectrum where the oscillatory signal from the loop is dominant over the background.

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