

# Gravitational waves in ultra-slow-roll and their anisotropy at two loops

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We use the in-in formalism to compute the non-Gaussian corrections to the energy density and anisotropies of gravitational waves induced after an ultra-slow-roll phase of inflation by using a diagrammatic approach and present the corresponding Feynman rules. Our two-loop calculation includes both the intrinsic non-Gaussianity of the inflaton perturbation  $\delta\phi$  and the non-Gaussianity arising from the nonlinear relation between the latter and the curvature perturbation  $\mathcal{R}$ . We apply our formalism to an analytical model in which the ultra-slow-roll phase is followed by a constant-roll stage with a non-vanishing second slow-roll parameter  $\eta$ , and address the renormalization of the one-loop scalar power spectrum in this scenario.

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