

On Derivative Interactions for a Spin-2 Field at Cubic Order

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Lorentz invariant derivative interactions for a single spin-2 field are investigated, up to the cubic order. We start from the most general Lorentz invariant derivative terms, which are polynomials in the spin-2 field as well as its first spacetime derivatives. Using a perturbative ADM analysis, we determined the parameters such that the corresponding Hamiltonian possesses a Lagrange multiplier, which would signify there are at most 5 degrees of freedom are propagating. The resulting derivative terms are linear combinations of terms coming from the expansion of Einstein-Hilbert Lagrangian around a Minkowski background, as well as the cubic "pseudo-linear derivative term" identified in [1]. We also derived the compatible potential terms, which are linear combinations of the expansions of the first two dRGT mass terms in unitary gauge [2].

References:

- [1] K. Hinterbichler, Ghost-Free Derivative Interactions for a Massive Graviton, JHEP 1310 (2013) 102, [arXiv:1305.7227].
- [2] C. de Rham, G. Gabadadze, and A. J. Tolley, Resummation of Massive Gravity, Phys.Rev.Lett. 106 (2011) 231101, [arXiv:1011.1232].