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Automatic evaluation of UV and R_2 terms for beyond the standard model Lagrangians: a proof-of-principle. (English) [Zbl 1351.81006](#)
Comput. Phys. Commun. 197, 239-262 (2015).

Summary: The computation of renormalized one-loop amplitudes in quantum field theory requires not only the knowledge of the Lagrangian density and the corresponding Feynman rules, but also that of the ultraviolet counterterms. More in general, and depending also on the method used in the actual computation of the one-loop amplitudes, additional interactions might be needed. One example is that of the R_2 rational terms in the OPP method. In this paper, we argue that the determination of all elements necessary for loop computations in arbitrary models can be automated starting only from information on the Lagrangian at the tree-level. In particular, we show how the R_2 rational and ultraviolet counterterms for any renormalizable model can be computed with the help of a new package, which we name NLOCT and builds upon FEYNRULES and FEYNARTS. To show the potential of our approach, we calculate all additional rules that are needed to promote a Two Higgs Doublet Model Lagrangian to one-loop computations in QCD and electroweak couplings.

MSC:

81-04 Software, source code, etc. for problems pertaining to quantum theory Cited in 2 Documents
81T18 Feynman diagrams
81-08 Computational methods for problems pertaining to quantum theory

Keywords:

BSM; automated one-loop computation; ultraviolet counterterms; rational terms

Software:

GoSam; 2HDMC; MadGraph5_aMC@NLO; CutTools; MadGraph; FeynRules; R2SM; FeynArts; NLOCT; Mathematica

Full Text: [DOI](#)

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