

Two-loop Prediction of the Anomalous Magnetic Moment of the Muon in the Two-Higgs Doublet Model with GM2Calc 2

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We present an extension of the GM2Calc software to perform the calculation of new physics contributions to the anomalous magnetic moment of the muon (a_μ^{BSM}) for the two-Higgs doublet model (2HDM). The 2HDM is one of the simplest and phenomenologically-rich extensions of the Standard Model. It is one of the few single field extensions that can give large contributions to the anomalous magnetic moment of the muon. In particular it has been shown that the inclusion of two-loop corrections are essential and when included this model can explain the long standing discrepancy between the Standard Model prediction and the experimental measurement. We implement all significant two-loop contributions for the general, flavour violating, 2HDM as well as for the flavour aligned 2HDM and the type I, II, X and Y flavour conserving variants. GM2Calc 2 also provides an uncertainty estimate of the two-loop calculation of a_μ^{BSM} in the 2HDM. Input parameters can be provided in either the gauge basis or the mass basis, and we provide an easy to use command-line input with an SLHA-like interface to specify these. The interface also allows one to select between different 2HDM types and choose which corrections to apply. In addition we also provide interfaces in C++, C, Python and Mathematica, to make it easy to interface to other codes. Thus, GM2Calc 2 can be used as a standalone tool for studies of a_μ in the 2HDM, or to explore the 2HDM phenomenology more broadly it can be used in combination with other codes via its interfaces.

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