

# Chromomagnetic and chromoelectric dipole moments of the top quark in the 4GTHDM

## Abstract

The contributions to the chromo magnetic dipole moment (CMDM) and chromo electric dipole moment (CEDM) of the top quark are calculated at the one-loop level in the framework of the two-Higgs doublet model with four fermion generations (4GTHDM), which is still consistent with experimental data and apart from new scalar bosons and fermions predicts new sources of  $CP$  violation via the extended  $4 \times 4$  CKM matrix. Analytical expressions for the CMDM and CEDM of a quark are presented both in terms of Feynman parameter integrals and Passarino-Veltman scalar functions, with the new contributions arising from loops carrying the scalar bosons accompanied by the third- and fourth-generation quarks. The current bounds on the parameter space of the 4GTHDM are discussed and a region still consistent with the LHC data on the 125 GeV Higgs boson is identified. It is found that in such a region the top quark CMDM, which receives contributions from all the scalar bosons, can reach values of the order of  $10^{-4} - 10^{-3}$ , with the dominant contribution arising from the fourth generation quarks, though all the partial contributions may also interfere destructively for some parameter values, thereby giving a negligible CMDM. As for the top quark CEDM, it only receives contributions from the charged scalar boson and can reach values of the order of  $10^{-18}$  ecm for relatively light  $m_{H^\pm}$  and large  $m_{b'}$ . The latter would be an interesting prediction of this model.

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