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Phenomenology of Pseudoscalar Particle (A) Decays at the LHC

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Abstract

Recent experimental measurements at the LHC suggest the possible existence of a spin-0 particle with a mass different from that of the Higgs boson, motivating extensions of the Standard Model with an enlarged Higgs sector. In such models, the scalar sector typically contains five physical particles, including a pseudoscalar state A.

In this work, we use experimental constraints from the CMS Collaboration and other sources to obtain indirect bounds on flavor-changing couplings of the form Af_if_j, where f_i and f_j are fermions with $i \neq j$. These constraints are then used to calculate the one-loop vertex functions $\Gamma_{AZ\gamma}$ and Γ_{AZH} and their corresponding form factors $h_{1,3}^{AZ\gamma,AZH}$. We analyze their behavior as functions of the relevant model parameters and determine their characteristic orders of magnitude.

Finally, we discuss the implications of these one-loop amplitudes for possible CP-violating contributions in processes involving gluon fusion that could be investigated at the LHC.

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