Radiative Decays of the Higgs Boson to a Pair of Fermions XING
WANG, Univ of Pittsburgh, TAO HAN, University of Pittsburgh — We revisit the
radiative decays of the Higgs boson to a fermion pair $h \to f\bar{f}\gamma$ in the Standard
Model (SM). We include the chirality-flipping diagrams at the order $\mathcal{O}(\dagger_{\bar{f}}^{\in}\alpha)$, the
chirality-conserving contributions at the order $\mathcal{O}(\dagger_{\sqcup}^{\in}\alpha^{\ni})$ and $\mathcal{O}(\alpha^{\triangle})$. The chirality-
conserving electroweak-loop processes are interesting from the observational point
of view. First, the branching fraction of the radiative decay $h \to \mu^+\mu^-\gamma$ is about
a half of that of $h \to \mu^+\mu^-$, and that of $h \to e^+e^-\gamma$ is more than four orders of
magnitude larger than that of $h \to e^+e^-$, both of which reach about 10^{-4}. The
branching fraction of $h \to \tau^+\tau^-\gamma$ is of the order 10^{-3}. All the leptonic radiative
decays are potentially observable at the LHC Run 2 or the HL-LHC. The kinematic
distributions could provide non-ambiguous discrimination for the underlying mecha-
nisms of the Higgs radiative decay. We also study the process $h \to c\bar{c}\gamma$ and evaluate
the observability at the LHC. We find it potentially comparable to the other related
studies and better than the $h \to J/\psi\ \gamma$ channel in constraining the charm-Yukawa
coupling.

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