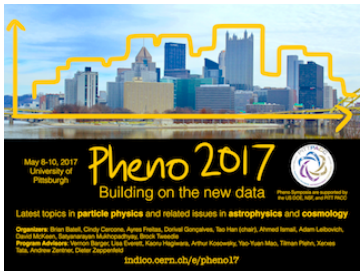

Contribution ID: **297** Type: **parallel talk**

Radiative Decays of the Higgs Boson to a Pair of Fermions

Monday, 8 May 2017 15:00 (15 minutes)

The radiative decays of the Higgs boson to a fermion pair $h \to f\bar{f}\gamma$ is revisited, where f denotes a fermion in the Standard Model (SM). Both the chirality-flipping diagrams via the Yukawa couplings at the order $\mathcal{O}(y_f^2\alpha)$, and the chirality-conserving contributions via the top-quark loops of the order $\mathcal{O}(y_t^2\alpha^3)$ and the electroweak loops at the order $\mathcal{O}(\alpha^4)$, are included. The QED correction is about $Q_f^2 \times calO(1\%)$ and contributes to the running of fermion masses at a similar level, which should be taken into account for future precision Higgs physics.

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.

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The kinematic distributions for the photon energy or the fermion pair invariant mass provide non-ambiguous discrimination for the underlying mechanisms of the Higgs radiative decay. The process $h \to c\bar{c}\gamma$ and evaluate the observability at the LHC will be discussed. It turns out to be comparable to the other related studies and better than the $h \to J/\psi\,\gamma$ channel in constraining the charm-Yukawa coupling.

Summary

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