Sensitivity study of $H \to Z\gamma$ with Dual-Readout Calorimeter at future e^+e^- colliders

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Dual-readout calorimeter (DRC) has been developed by DREAM and RD52 collaborators for last 20 years. It offers high-quality energy measurement for electromagnetic particles, hadrons and jets which is essential for the successful future lepton collider experiment [1]. CEPC (China) and FCC-ee (CERN) projects, the next e^+e^- colliders for Higgs factory and other electroweak processes, are under discussion by world-wide HEP community as a next generation experiment. The DRC has been proposed as a calorimeter of the IDEA detector concept published in Conceptual Design Reports of both future collider projects [2, 3]. The DRC would meet sufficient performance required by the CEPC and FCC-ee to achieve high precision measurements and indirect new physics searches.

The future e^+e^- colliders will provide an excellent opportunity to measure the decay of a Higgs boson to a Z boson and a photon ($H \to Z\gamma$). The current small experimental sensitivity on $H \to Z\gamma$ can be enhanced by exploring the hadronic channel ($H \to Z\gamma \to qq\gamma$). At the future e^+e^- colliders, the hadronic channel analysis benefits from clean signatures of e^+e^- collision events and the absence of large QCD background processes that make the analysis challenging at LHC. In particular, the DRC will allow a precise reconstruction of hadronic Z boson decays, which is essential for the success of the hadronic channel analysis. Therefore in this study, we will study the feasibility of the measurement of $H \to Z\gamma \to qq\gamma$ at the future e^+e^- colliders using the DRC detector information.

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References

[1] S. Lee, M. Livan, and R. Wigmans, "Dual-readout calorimetry," *Reviews of Modern Physics*, vol. 90, no. 02, p. 5002, 2018.

[2] The CEPC Study Group, "CEPC Conceptual Design Report: Volume 2 – Physics & Detector," arXiv:1811.10545.

[3] The FCC Collaboration, "FCC-ee: The Lepton Collider," *The European Physical Journal Special Topics*, vol. 228, pp. 261–623, 2019.