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Impact of Background Processes in the $H \to Z\gamma$ Decay

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In the study of the rare $H \to Z\gamma$ process, both ATLAS and CMS collaborations reported an excess with $\mu = 2.2 \pm 0.7$ in the number of events. Initially, this was interpreted as a modification of the $HZ\gamma$ vertex. However, the $H \to Z\gamma$ process is reconstructed from the $H \to \ell\ell\gamma$ final state, and background contributions were previously neglected. In this work, we carefully analyze the background contributions to the $H \to Z\gamma$ process and propose an explanation for the excess as a new BSM physics background. We suggest an effective field theory approach, as well as a UV-complete model, both of which generate the required background to resolve this discrepancy.

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