

A first prediction of the electromagnetic rare decays $\eta' \rightarrow \pi^0 \gamma \gamma$ and $\eta' \rightarrow \eta \gamma \gamma$

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The invariant mass spectra and the branching ratio of the electromagnetic rare decays $\eta \rightarrow \pi^0 \gamma \gamma$ [1]–[7] and $\eta' \rightarrow (\pi^0, \eta) \gamma \gamma$ [8] are analysed in terms of scalar and vector meson exchange contributions [9, 10] using the frameworks of the linear sigma model and vector meson dominance, respectively. The measured $\eta \rightarrow \pi^0 \gamma \gamma$ process serves as a test of our approach while the non yet measured $\eta' \rightarrow (\pi^0, \eta) \gamma \gamma$ reactions are predicted for the first time. Our prediction for the $\eta \rightarrow \pi^0 \gamma \gamma$ decay agrees with recent experimental reported values [6, 7], thus supporting the validity of our framework. Therefore, our predictions for the $\eta' \rightarrow \pi^0 \gamma \gamma$ and $\eta' \rightarrow \eta \gamma \gamma$ decays should be taken as a first indication of the possible shape of the invariant mass spectra and the values of the branching ratios. We hope these predictions to be interesting and useful for the experimental collaborations such as CLEO, KLOE-2 [11], Crystal Ball, Crystal Barrel, WASA, and BES-III where these processes are expected to be measured in the next future.

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