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Resonance-continuum interference in 750GeV diphoton excess: signal enhancement and peak shift

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If the 750GeV diphoton excess is due to a scalar resonance produced via gg -fusion, the signal necessarily interferes with the continuum Standard Model background $gg \rightarrow \gamma\gamma$. The interference can not only change the resonance shape, but also enhance or suppress the excess rate. We take two representative examples exhibiting each effect and study how fit to the excess data changes. With 3-6 fb excess rate, the signal can be enhanced by 2-1.6, or the peak can be shifted by $O(1)$ GeV (while overall shape is close to the Breit-Wigner). If the excess decreases in the future, the interference effects become relatively more significant and can provide non-trivial evidence/test of a scalar resonance hypothesis.

Summary

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