

Top-quark mass from diphton mass spectrum

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We study $gg \rightarrow \gamma\gamma$ amplitudes by including $t\bar{t}$ bound-state effects near their mass threshold. In terms of the non-relativistic expansion of the amplitude, the LO contribution is an energy-independent term in the one-loop amplitude, and a part of the NLO contribution is described by the non-relativistic Green function. We find that due to the interference of these terms, the diphoton mass spectrum shows a characteristic dip-and-bump shape near the threshold. In addition, the position of the dip and the bump is determined by the 1S mass of the $t\bar{t}$ resonance which is well predicted in terms of the short-distance mass of top-quark in NRQCD. Thanks to the simple and clean nature in its experimental measurement, it can give a superior method to determine the top-quark short-distance mass at hadron colliders.

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