CMS found a 750GeV spin-2 resonance ?!

CMS PAS EXO-15-004

The Randall-Sundrum (RS) effective coupling

$$\tilde{\kappa} = \sqrt{8\pi}\kappa / m_{pl}$$

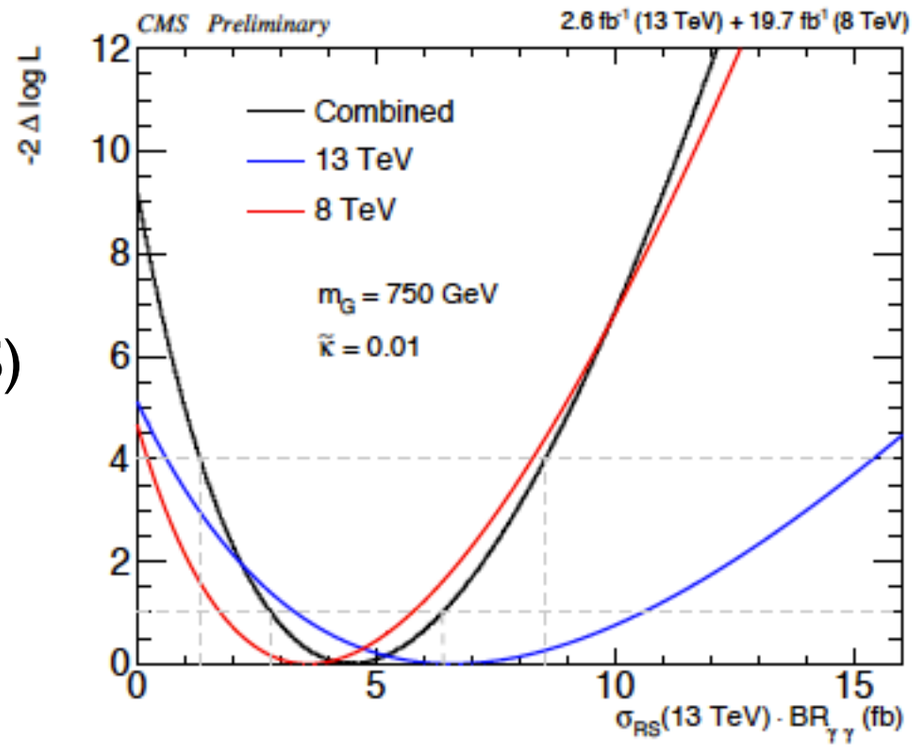

Figure 11: Likelihood scan for the cross section corresponding to the largest excess in the combined analysis of the 8 and 13 TeV datasets. The 8 TeV results are scaled by the expected ratio of cross sections predicted for an RS graviton resonance.

Diphoton excess

in phenomenological spin-2 resonance scenarios

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Laboratoire de Physique Subatomique et de Cosmologie

1601.05729 (21 Jan 2016) with A. Martini (UC Louvain) and D. Sengupta (LPSC)

$$\mathcal{L}_{\rm eff} = -\frac{1}{\Lambda}\left[\kappa_\gamma\, T^\gamma_{\mu\nu} + \kappa_g\, T^g_{\mu\nu} + \kappa_q\, T^q_{\mu\nu}\right] X_2^{\mu\nu}$$

FeynRules HC model: http://feynrules.irmp.ucl.ac.be/wiki/HiggsCharacterisation
MadGraph5_aMC@NLO: https://launchpad.net/mg5amcnlo

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(=10TeV in this study)

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non-universal coupling parameters

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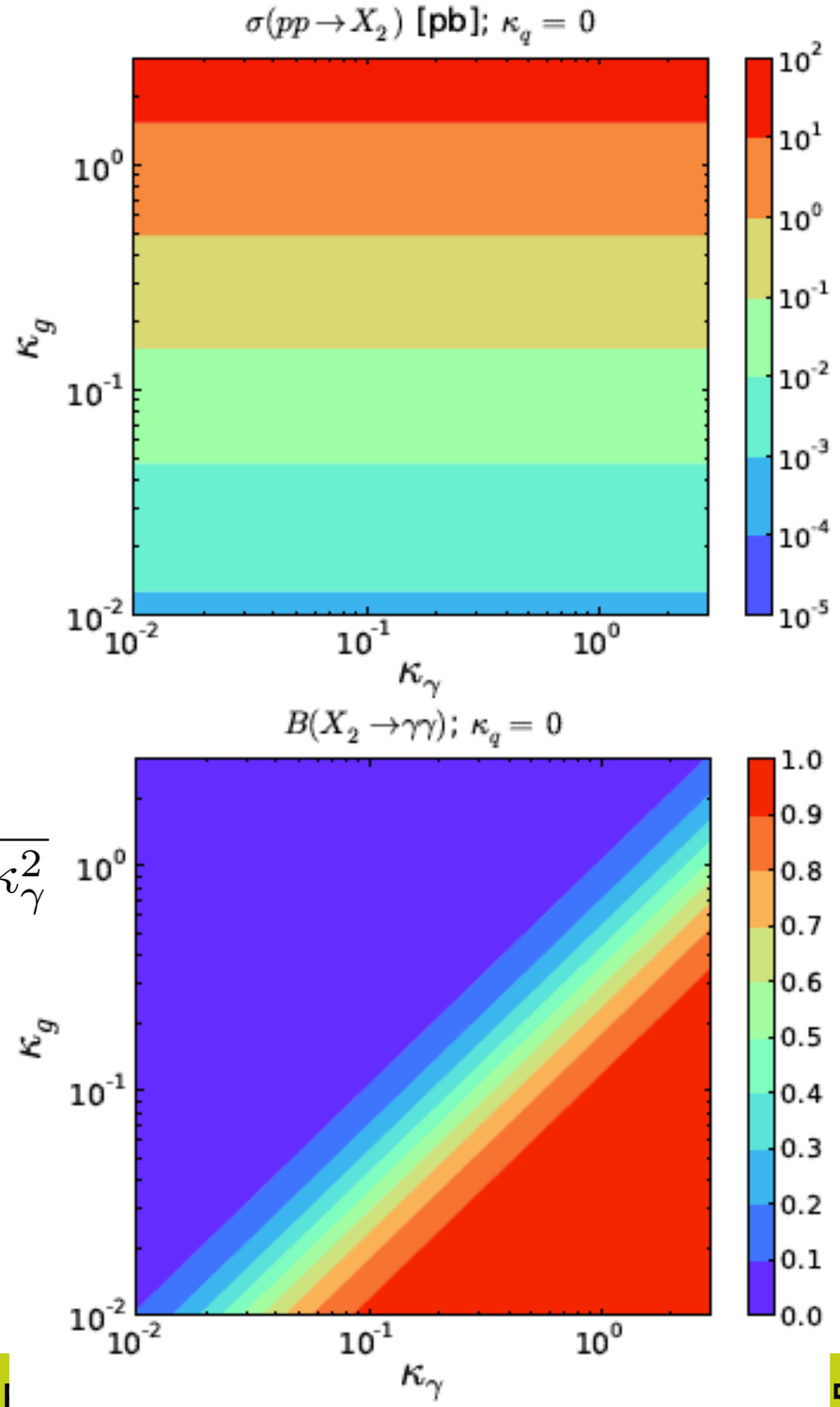
diphoton excess vs. dijet constraint (I)

I: $\kappa_g \neq 0,\ \kappa_q = 0$ (gluon dominant scenario)

$$\sigma_{X_2} \propto \kappa_g^2$$

$$B_{\gamma\gamma} \propto \frac{\kappa_\gamma^2}{8\kappa_g^2 + \kappa_\gamma^2}$$



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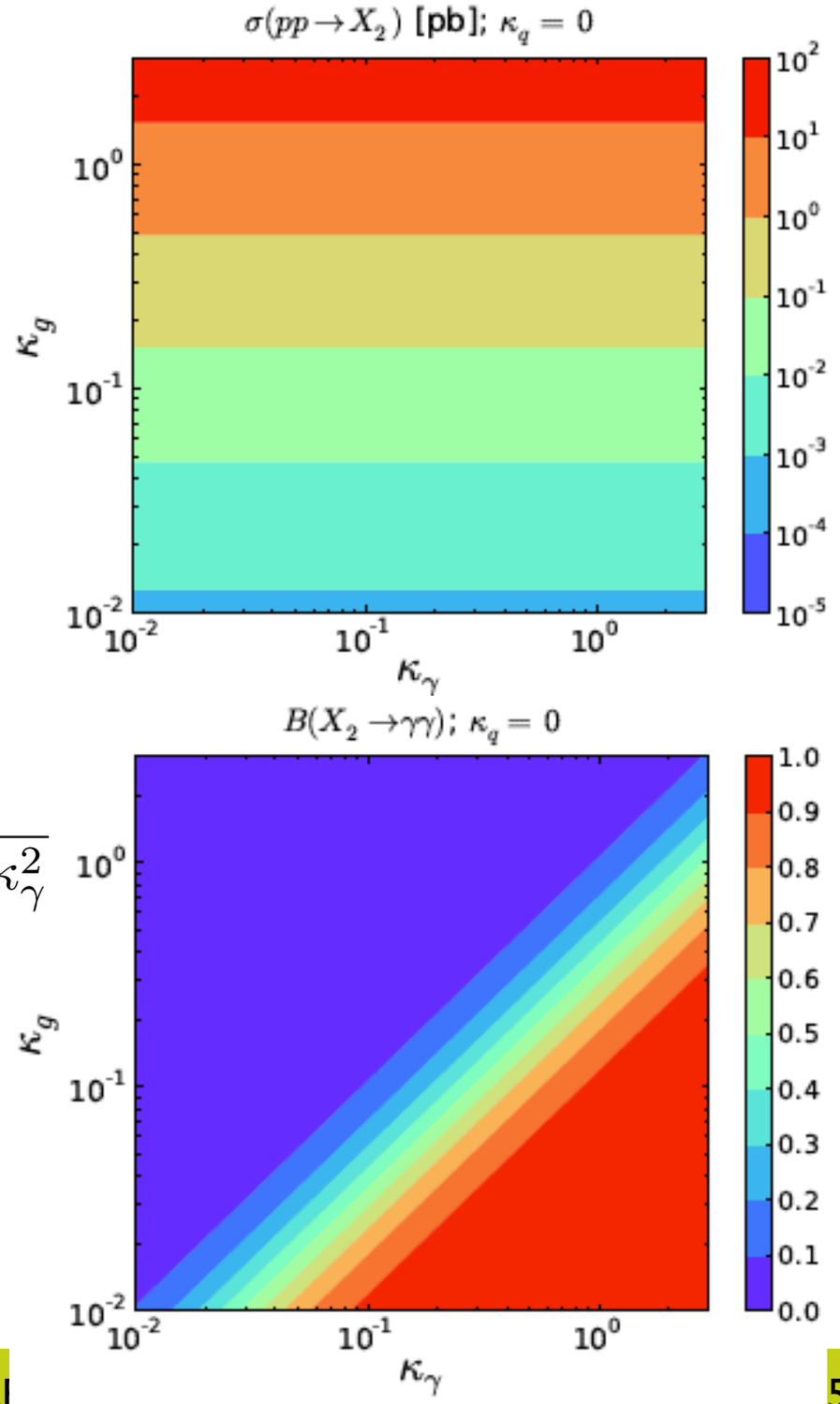

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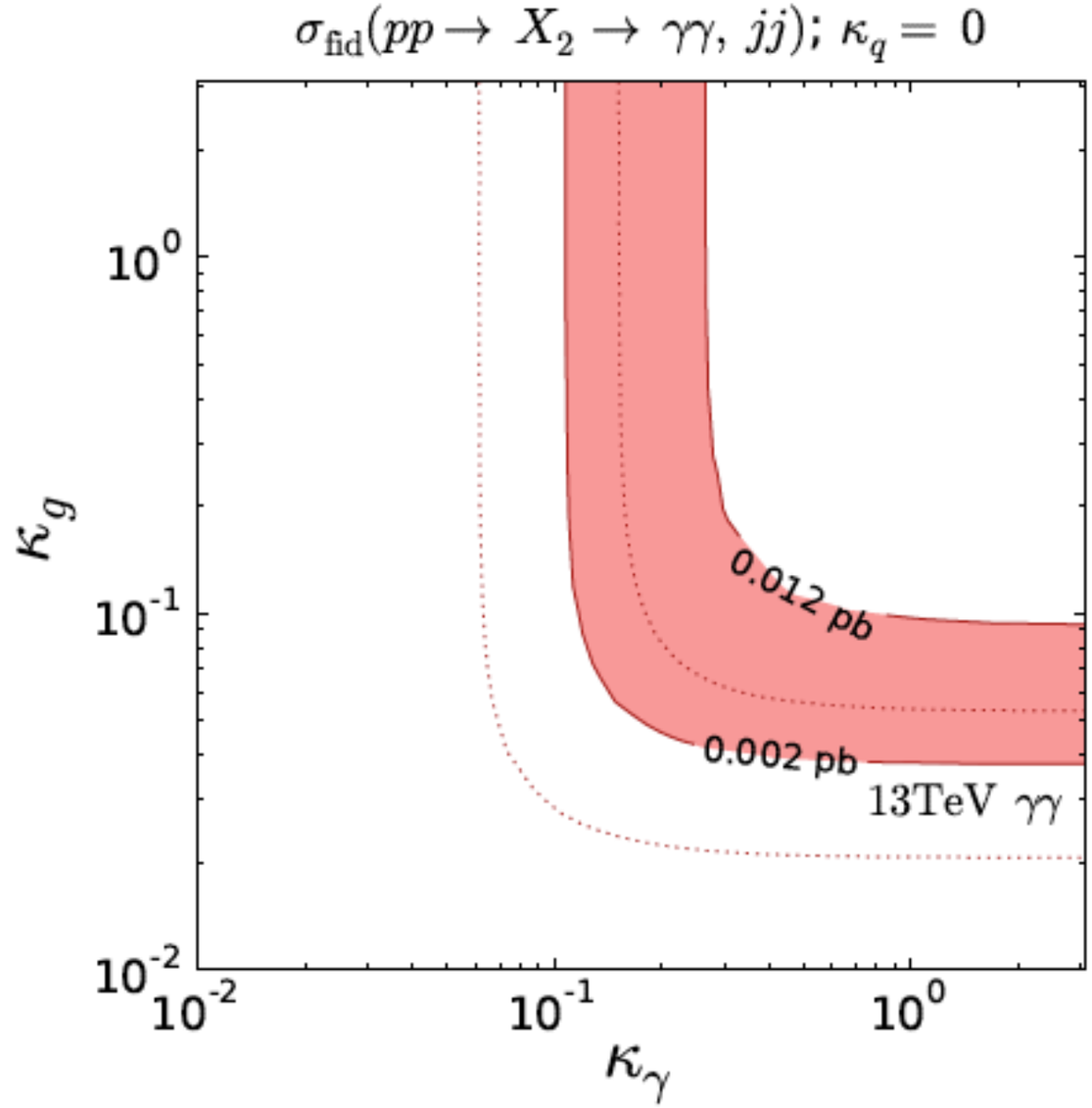

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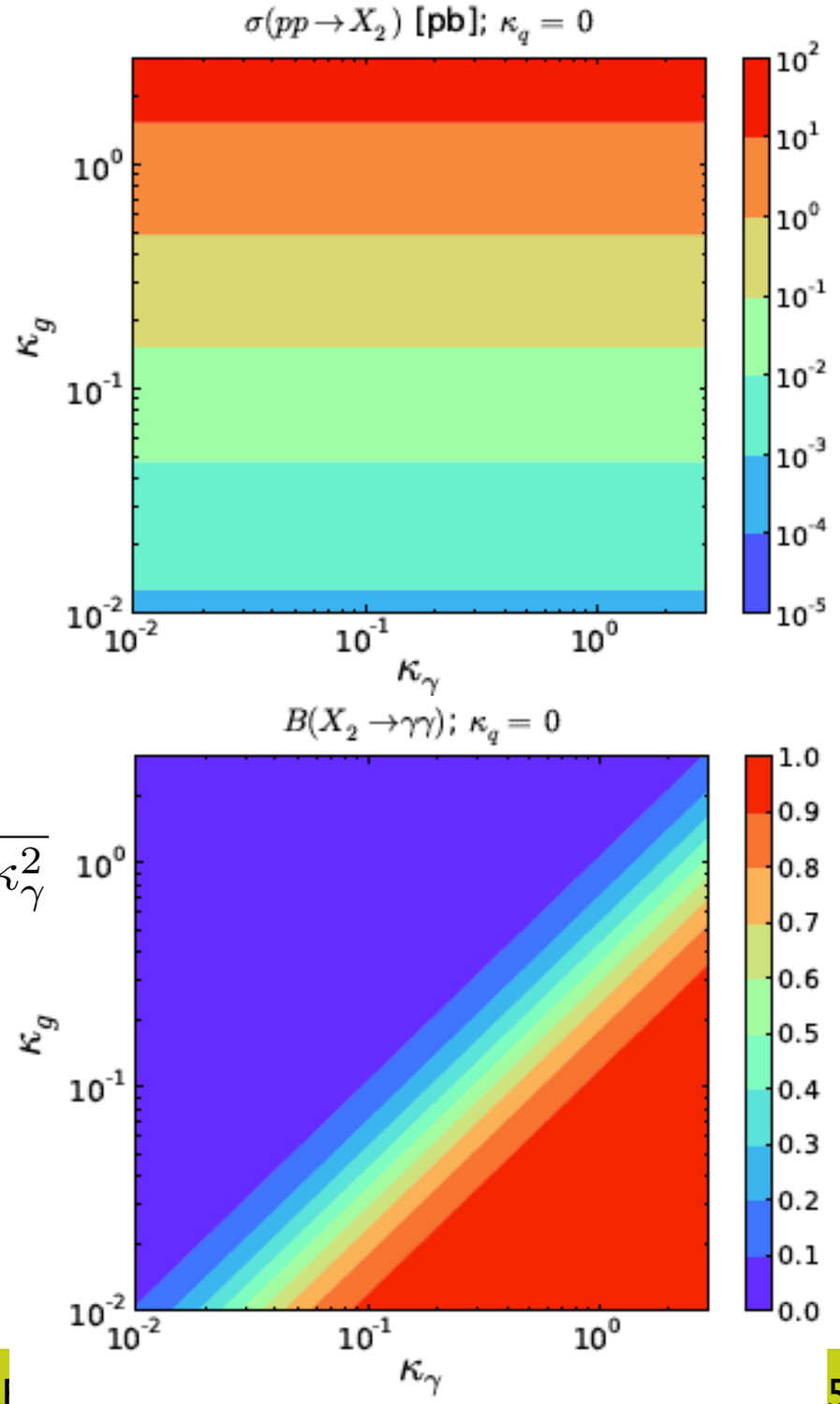

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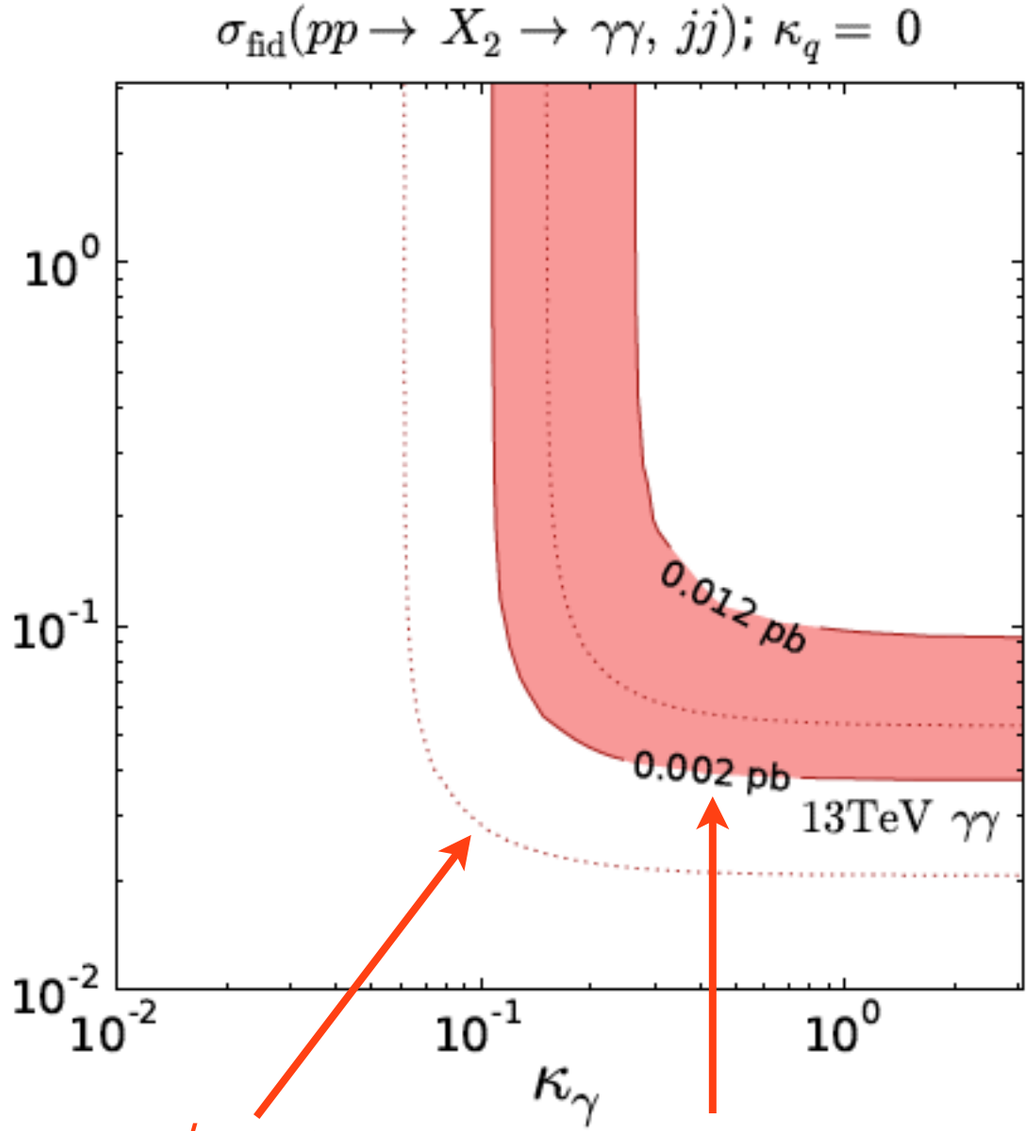

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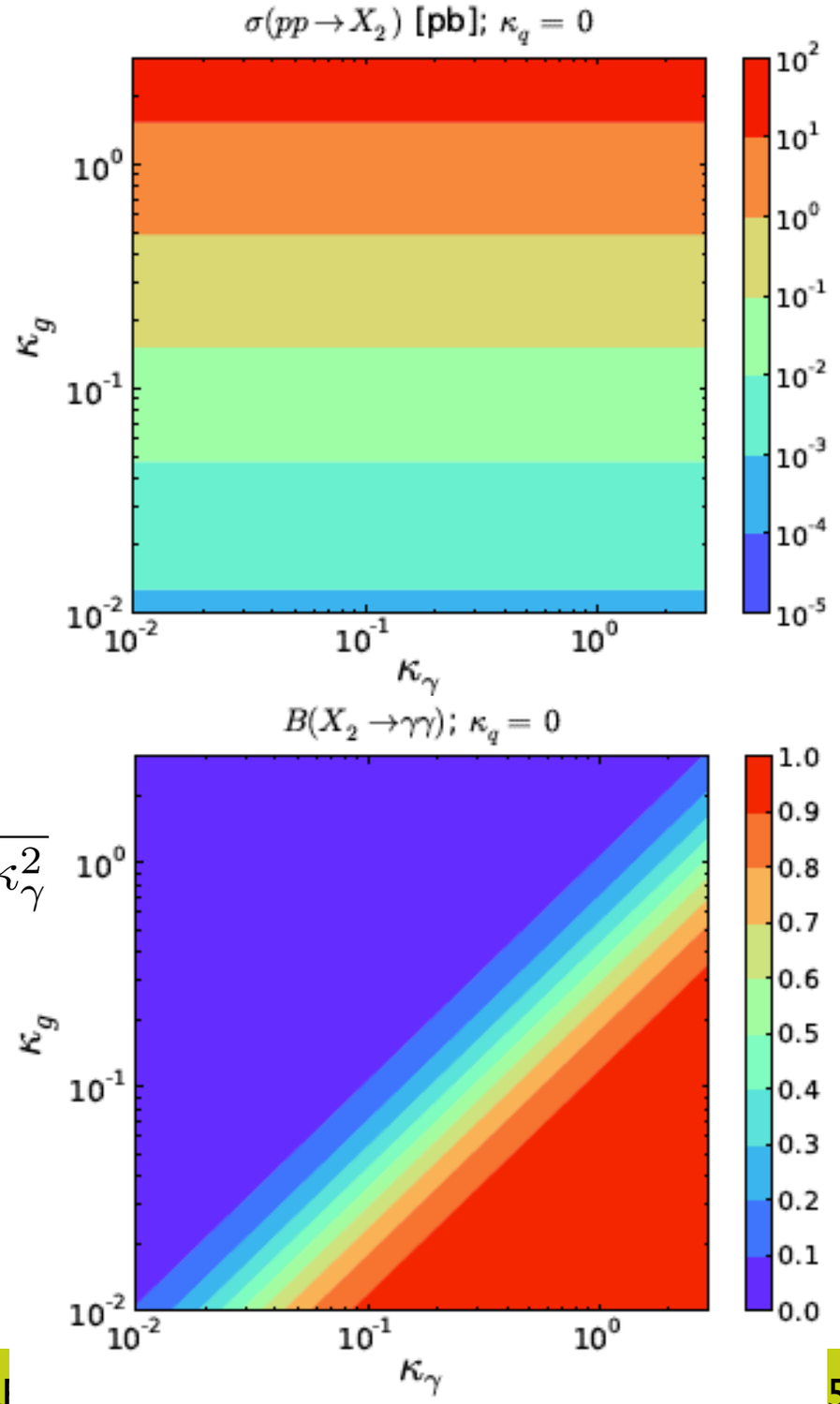

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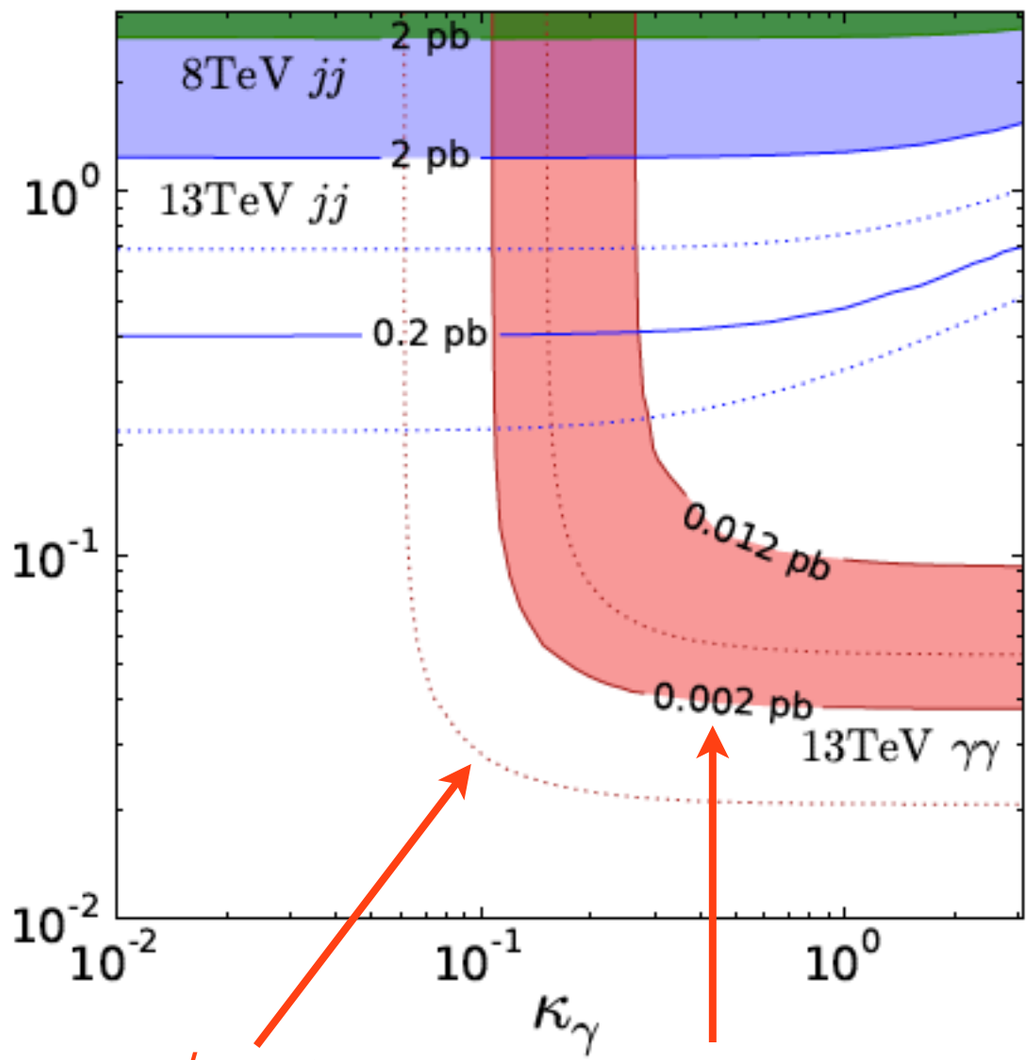
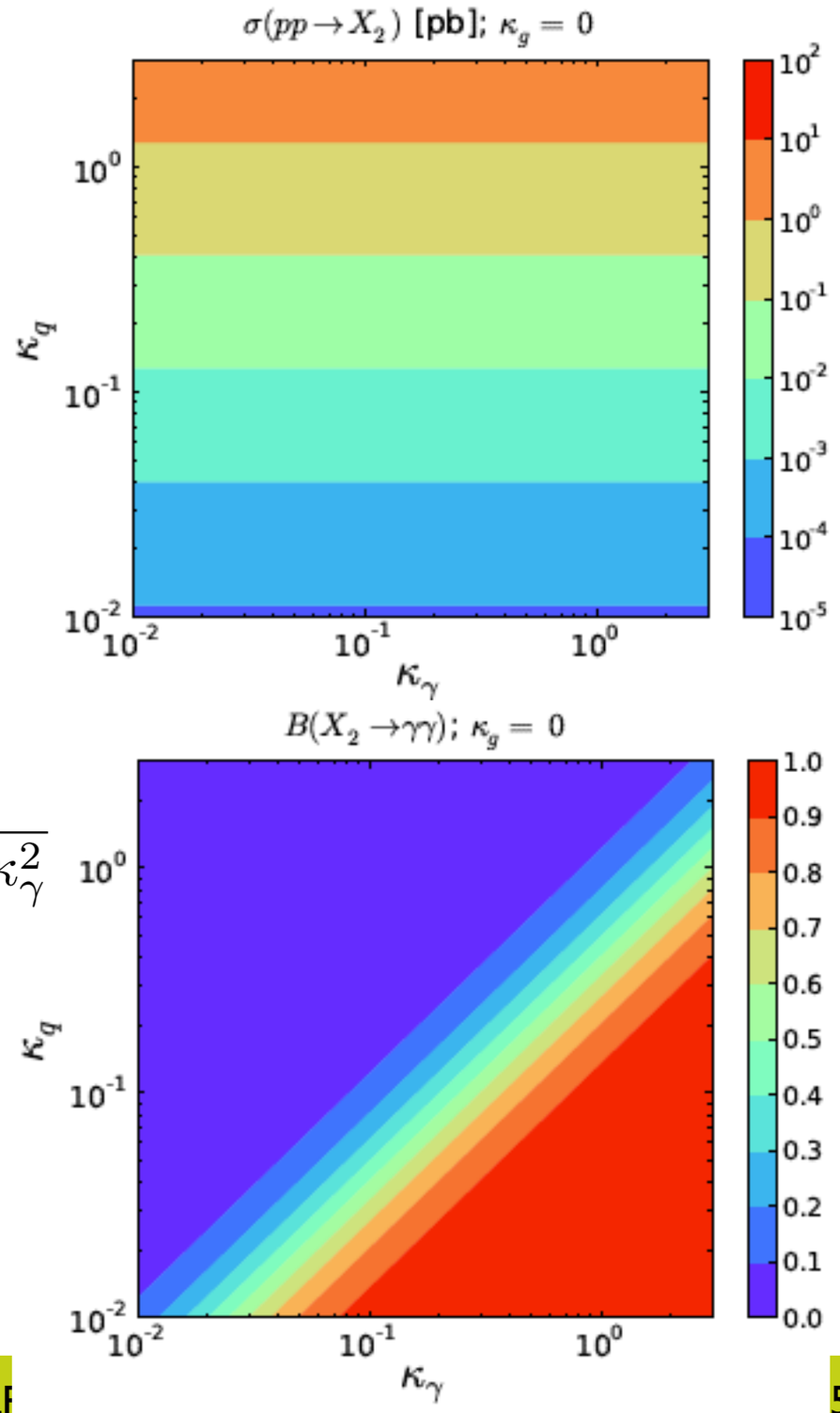


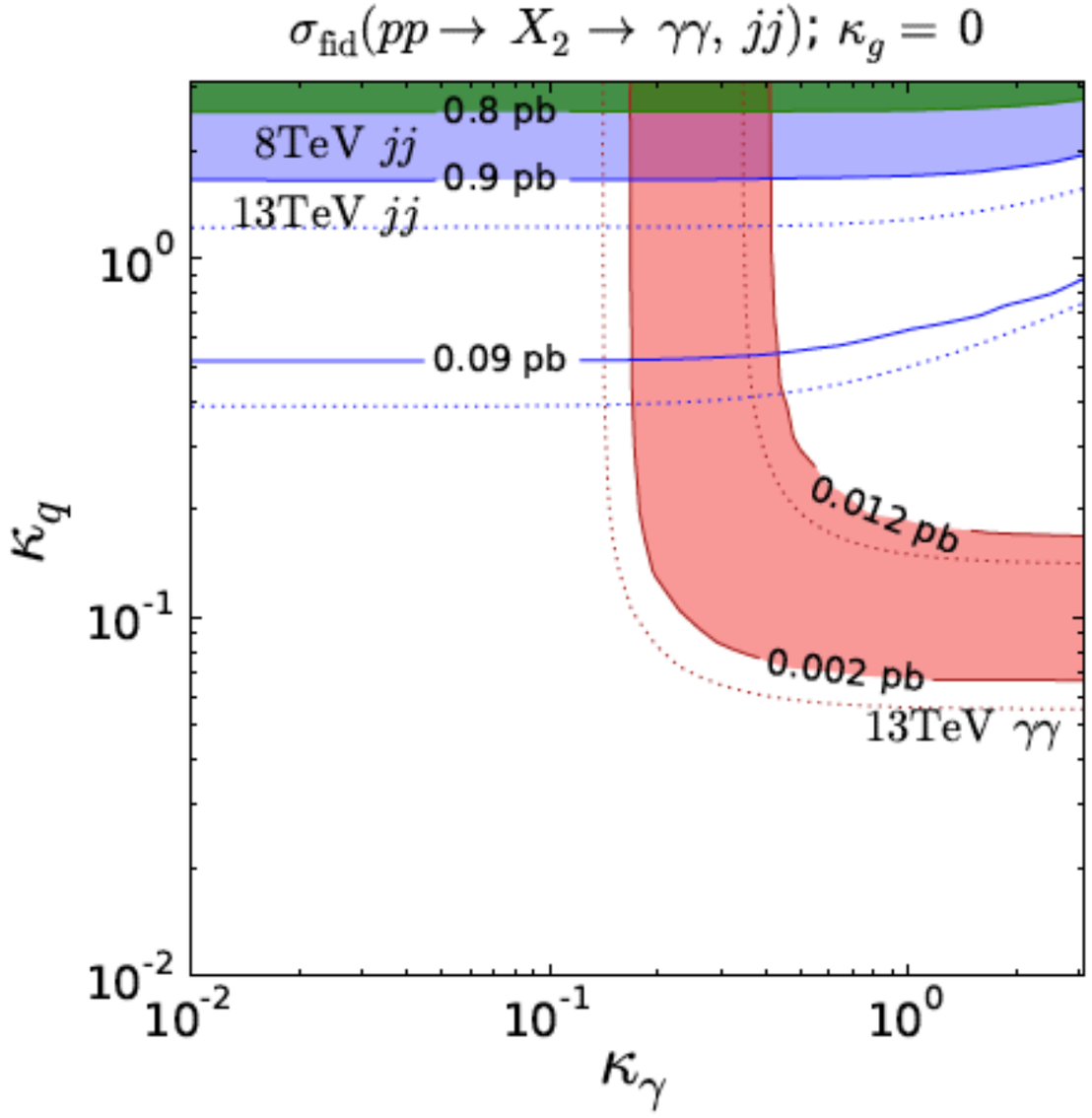
diphoton excess vs. dijet constraint (II)

$\sigma_{X_2} \propto \kappa_q^2$

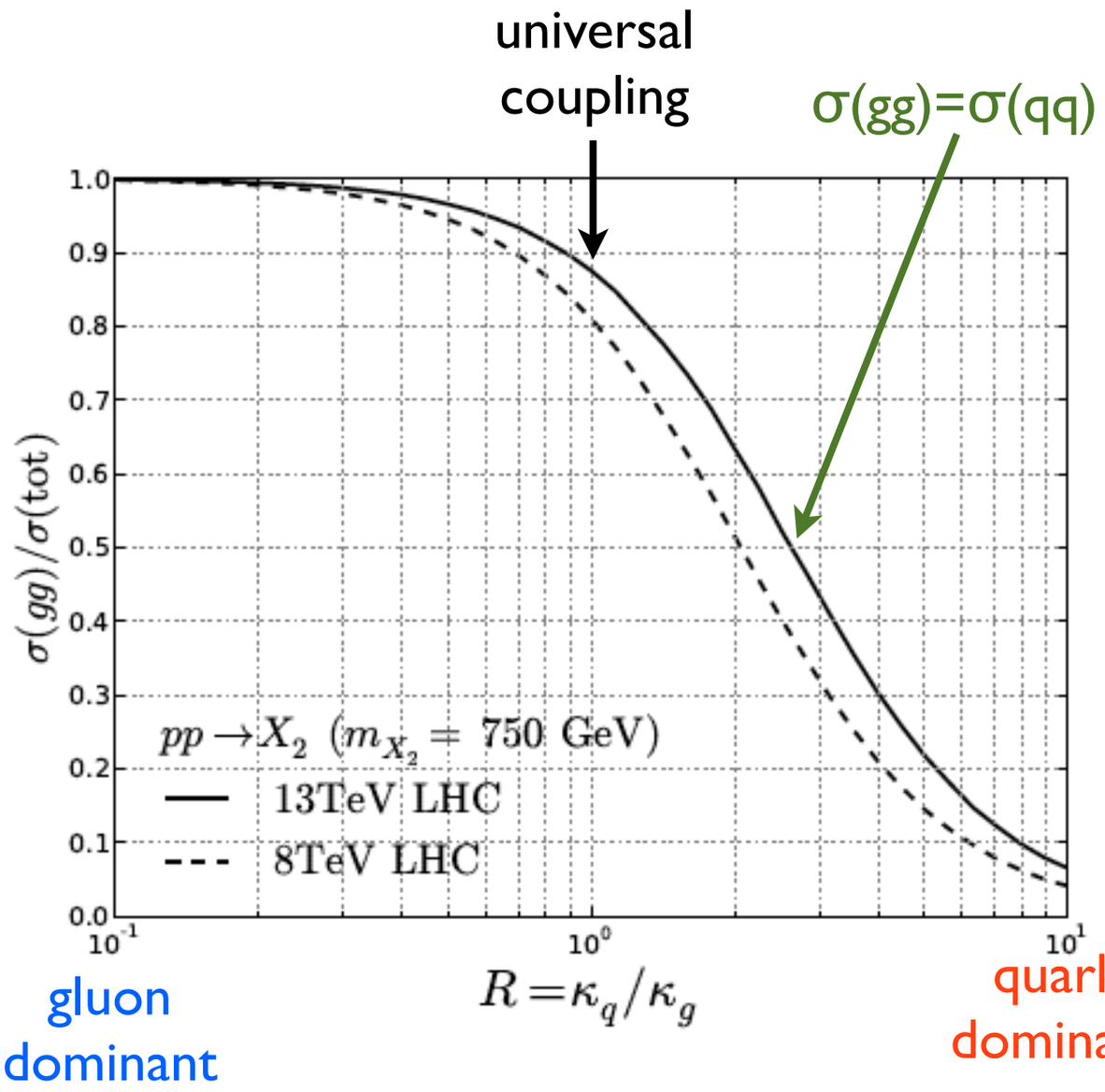
$B_{\gamma\gamma} \propto \dfrac{\kappa_\gamma^2}{6\kappa_q^2 + \kappa_\gamma^2}$



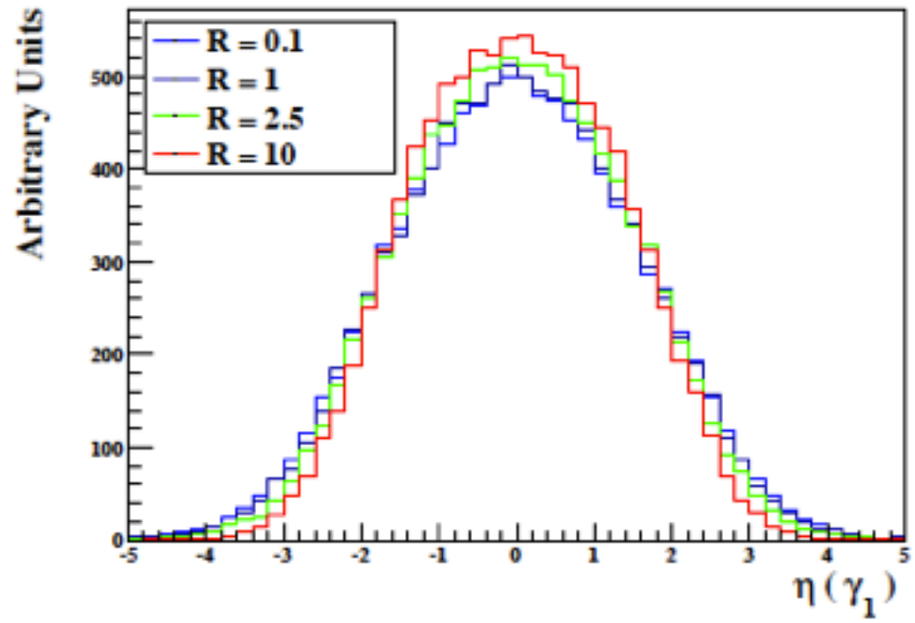
II: $\kappa_g = 0$, $\kappa_q \neq 0$ (quark dominant scenario)

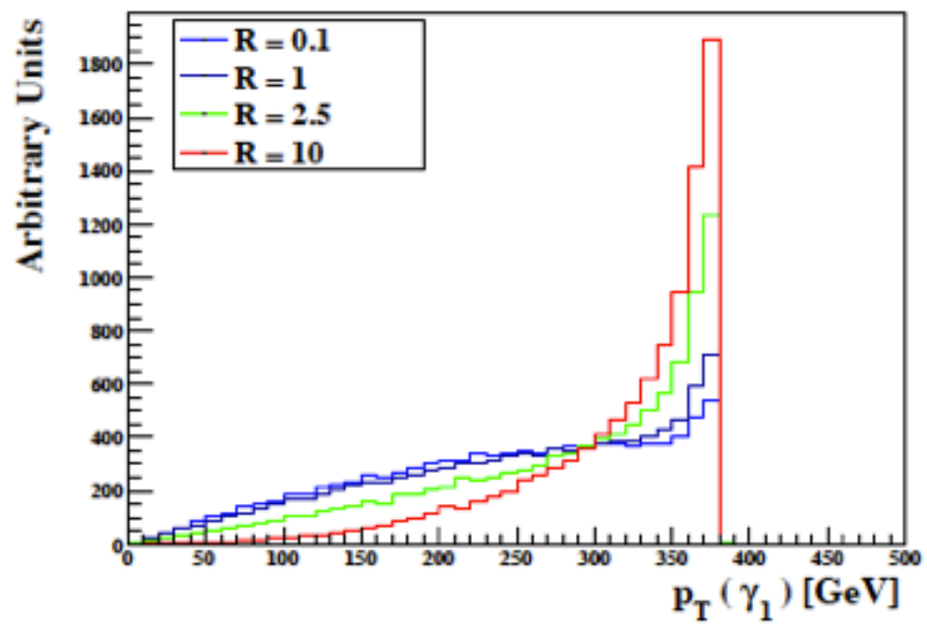


gg vs. qq in diphoton events



III: κ_g, $\kappa_q \neq 0$ (mixed scenario)





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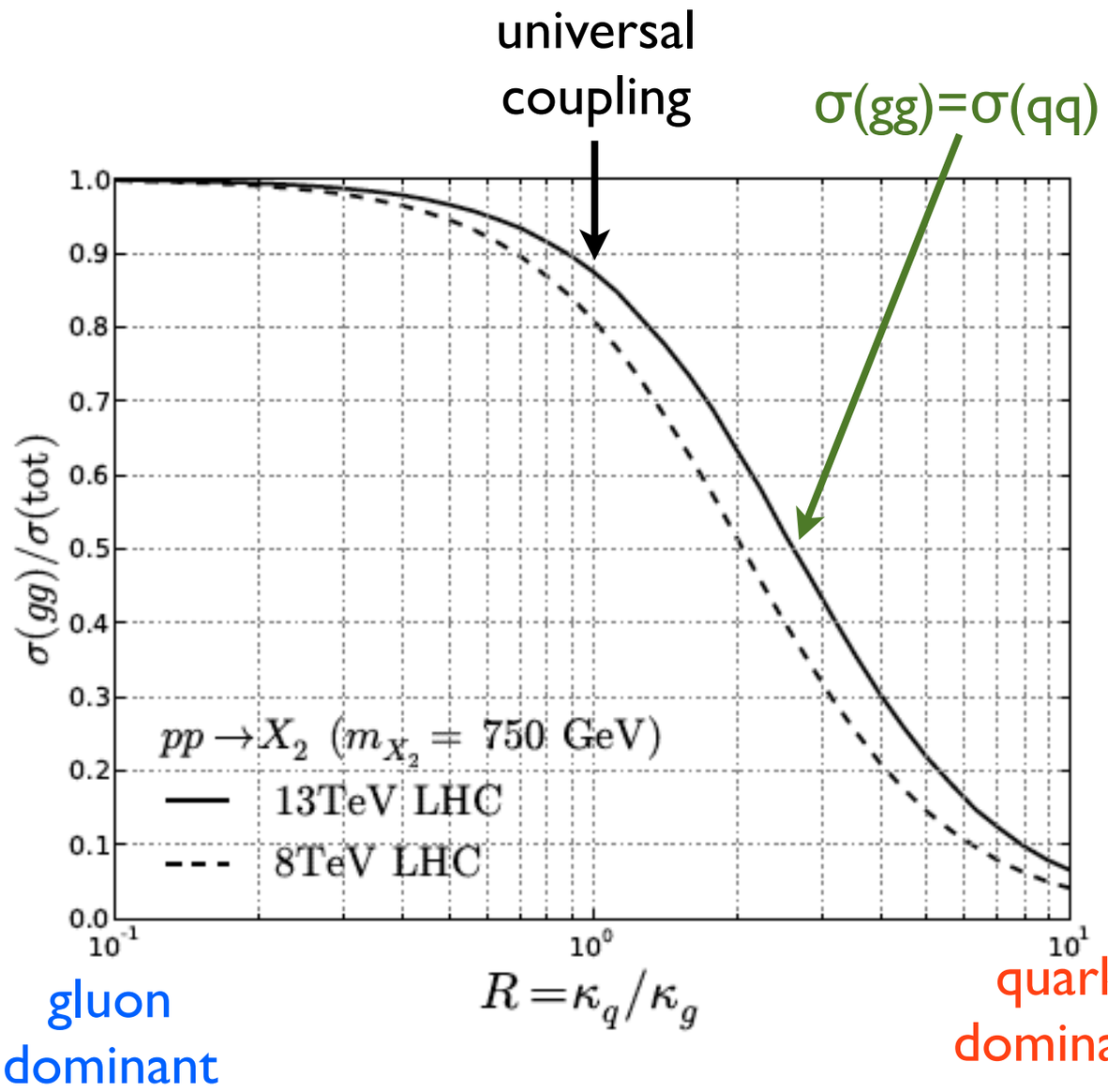

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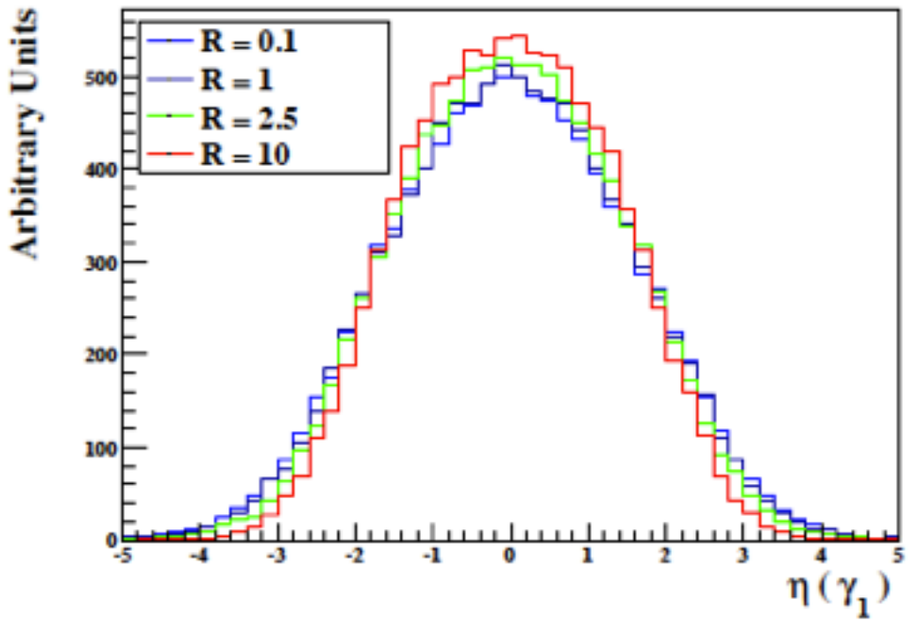

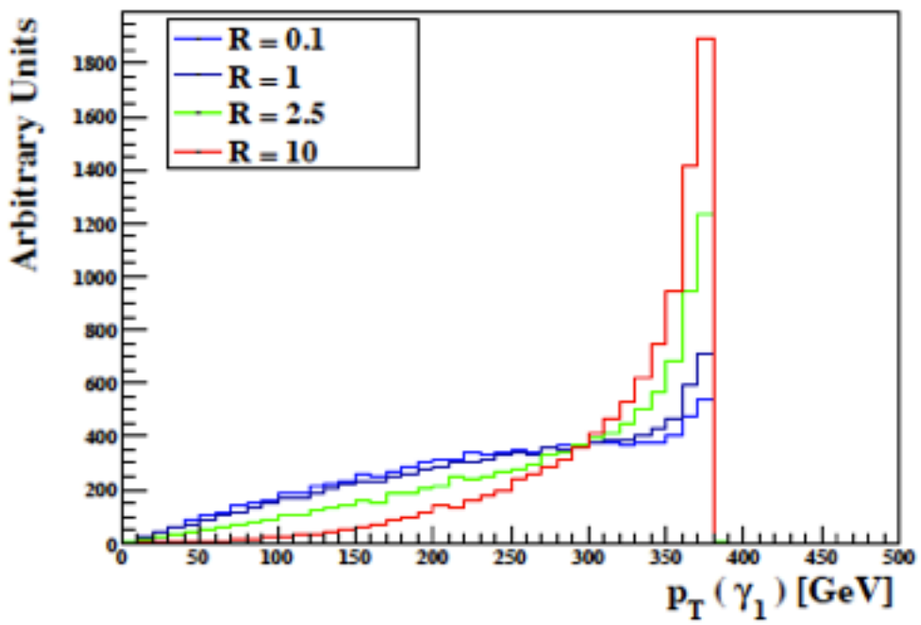

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