Long-distance matrix elements in charmonium production fitted with LHCb data

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Motivation: effective theories with two heavy quarks

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$$\boxed{\Gamma[n] = \Gamma(b \to c\bar{c}[n] + q)}$$

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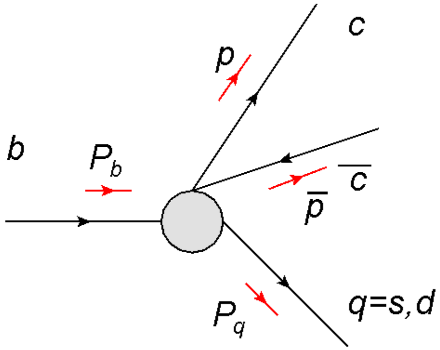
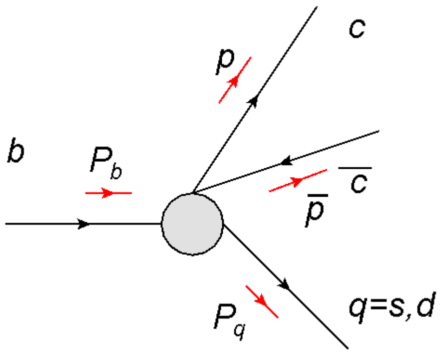


Short distance dynamics LO



$$\mathcal{H} = \frac{G_F}{\sqrt{2}} \sum_{s,d} \{ V_{cb}^* V_{cq} [\tfrac{1}{3} C_1 O_1 + C_8 O_8] - V_{tb}^* V_{tq} \sum_{i=3}^{6} [C_i O_i] \}$$

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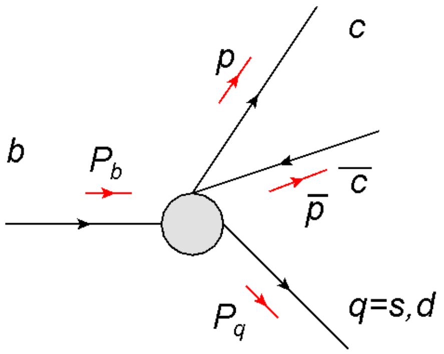

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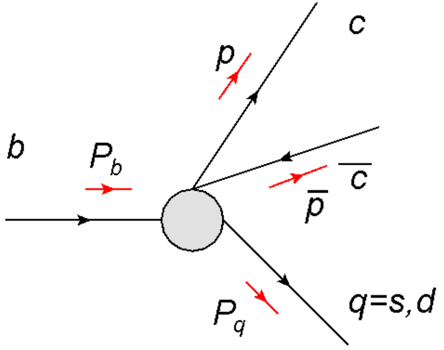

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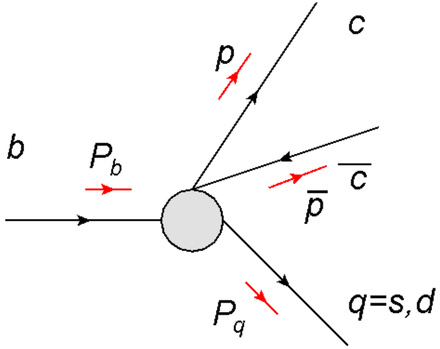

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QCD penguins

Results

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$$\Gamma[n] = \Gamma_0 (C_{1,8}^2 f[n](\eta)(1 + \delta_P[n]) + \frac{\alpha_s}{4\pi}(C_1^2 g_1(\eta) + 2C_1 C_8 g_2(\eta) + C_8^2 g_3(\eta)))$$

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M. Beneke, F. Maltoni, I.Z. Rothstein

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χ^2 FOR $\mathcal{B}(B \to \chi_{c0} + X)$

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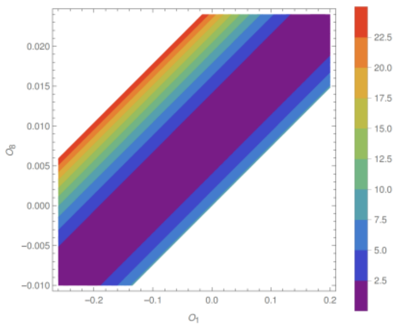

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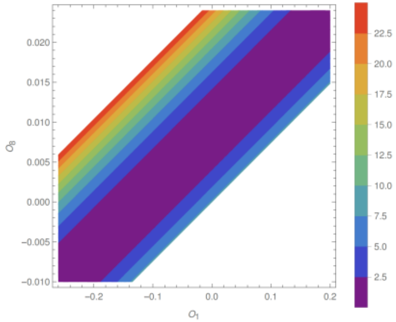

χ^2 FOR $\mathcal{B}(B \to \chi_{c1} + X)$

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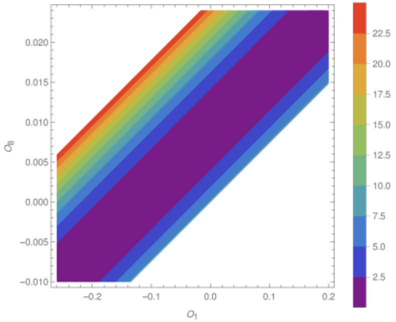

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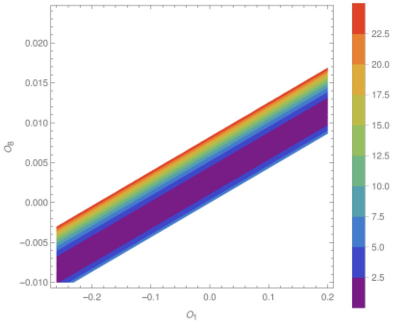

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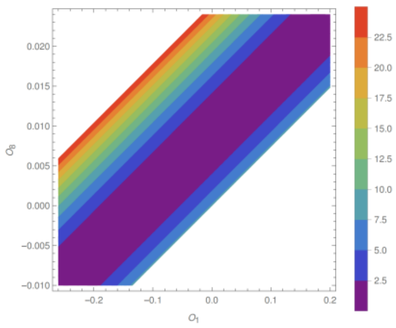

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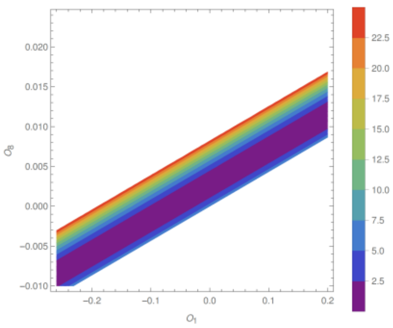

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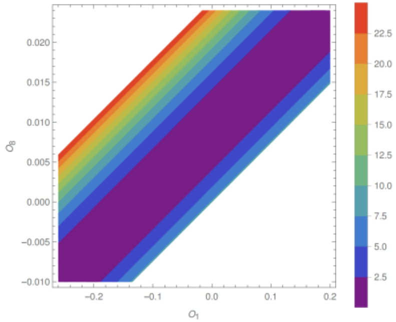

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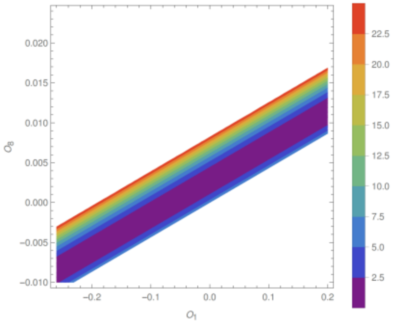

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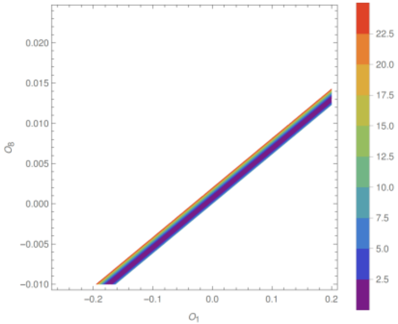

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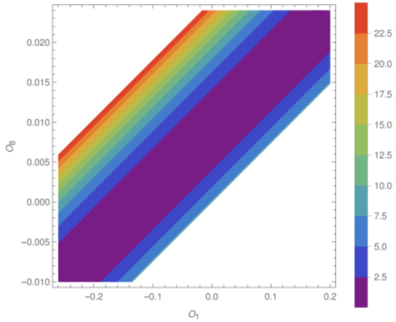

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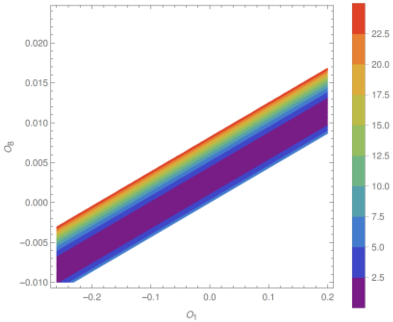

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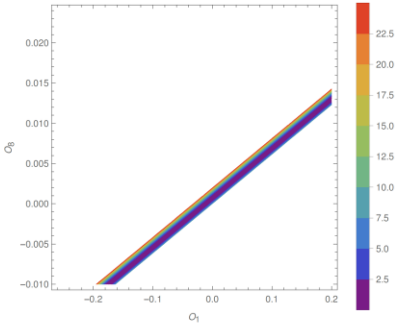

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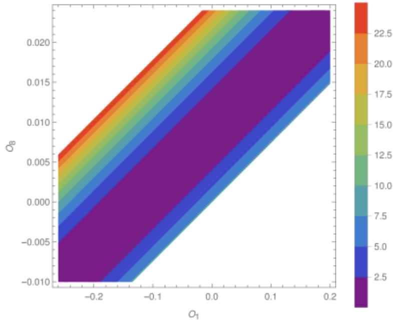

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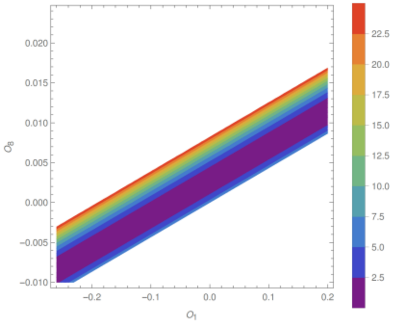

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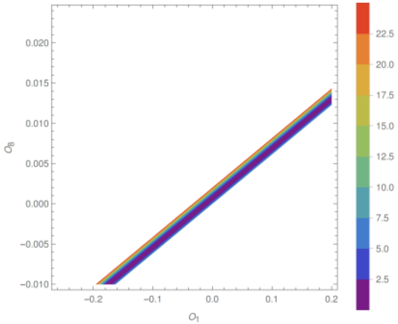

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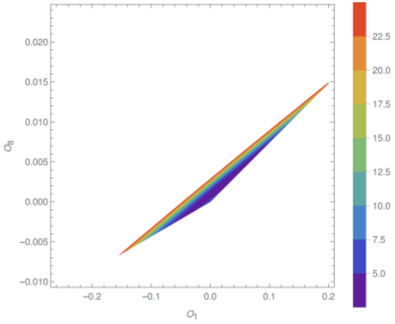

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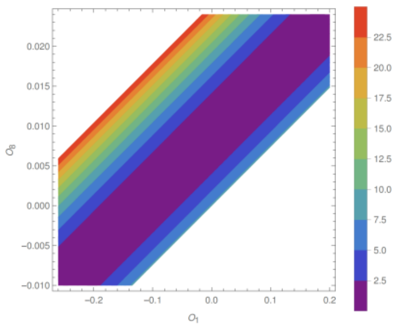

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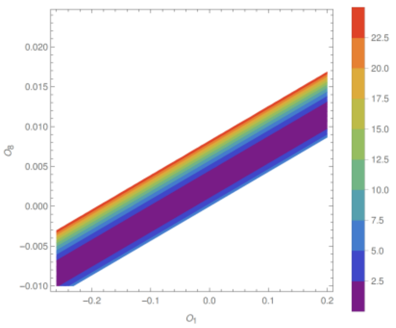

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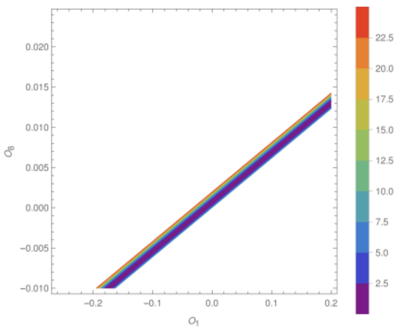

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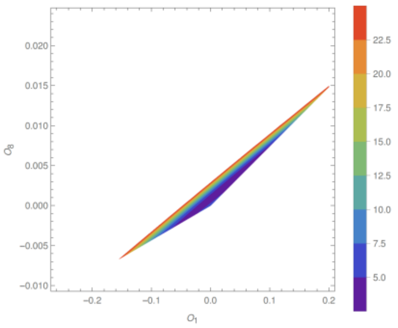

$$O_1 = 0.067 GeV^3$$
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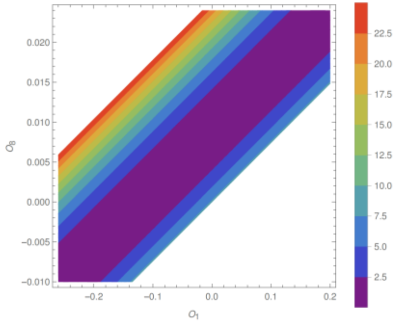

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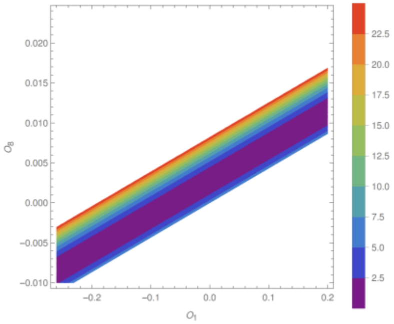
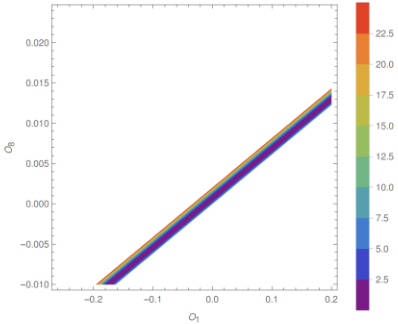


χ^2 **FOR** $\mathcal{B}(B \to \chi_{c2} + X)$



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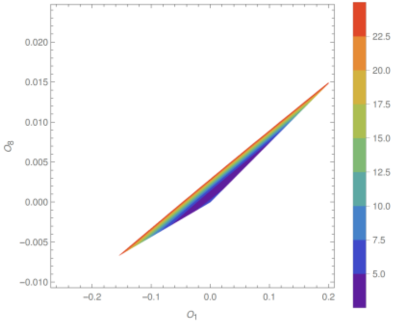

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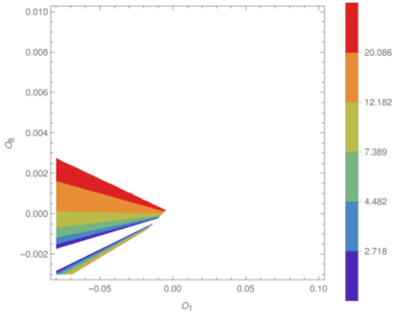

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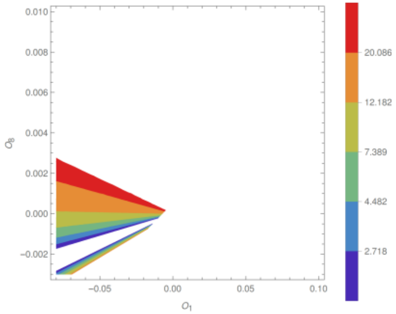

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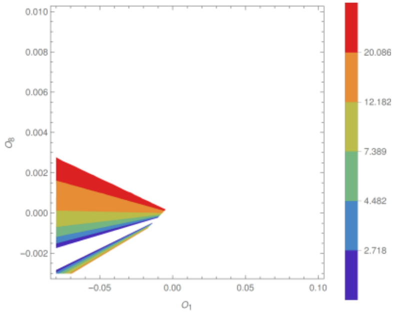

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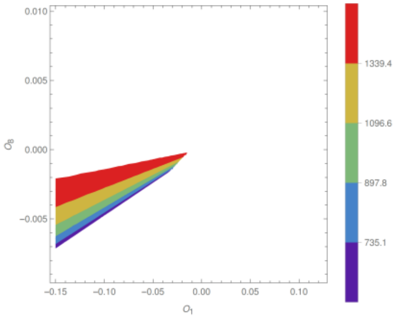

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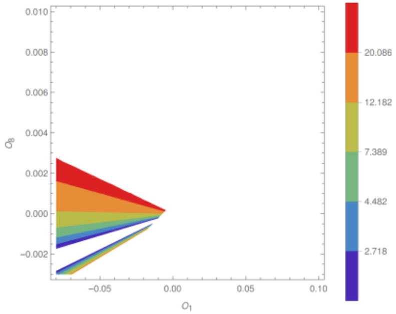

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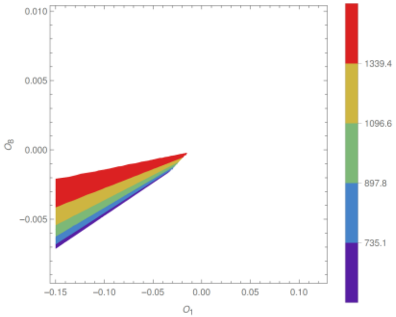

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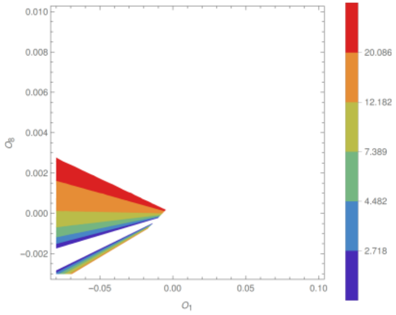

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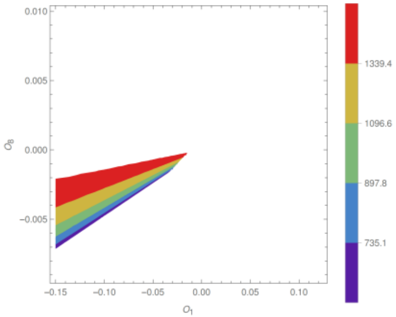
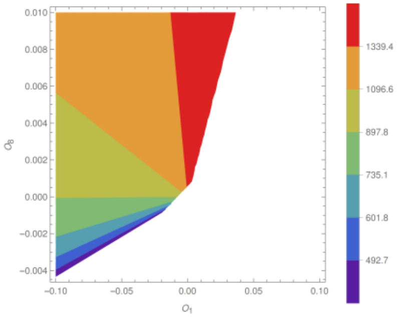


$$< \chi^2 >$$



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