estimate of the background.

We define a $5\,\sigma$ significance by treating the LO QCD rate as a Poisson distribution. To estimate the effect of large NLO corrections we multiply the LO QCD rate used in the Poisson distribution by $\left[1+\frac{\alpha_s(m_b)}{4\pi}\,\ln\left(p_T^2/m_b^2\right)\right]$ and we take $p_T = 1.5\,\mathrm{TeV}$.[4] We insist on five signal events after a suppression factor of $10^{-4} \simeq (3\%)^2 \times (25\%)^2$ is applied for the branching ratios of both b quarks to final states containing a muon and a total signal efficiency of $25\,\%$ [3, 4] for each muon, b jet trigger.

A $5\,\sigma$ discovery of colorons is possible in this channel with a reach out to $\sim 2\,p_T^{\max}$, however, a significant event rate will require $\gtrsim 1\,\mathrm{fb}^{-1}$ of integrated luminosity because of the suppression of the signal due to selection efficiencies and branching ratios. We show the total integrated luminosity required for various coloron masses and operating energies that pass these tests in Figure 2. Other sources of events from the $t\,\bar{t}$ background in the signal region are estimated to be a small $\%$ level background [3]. Fakes from c quarks are reduced with the associated b jet trigger and light quark fakes are removed by a $p_T > 15\,\mathrm{GeV}$ cut on the muons. The experimental cross section uncertainty is approximately $20\,\%$ [3] for the p_T regions we consider and is dominated by a systematic jet energy scale uncertainty of 12%.

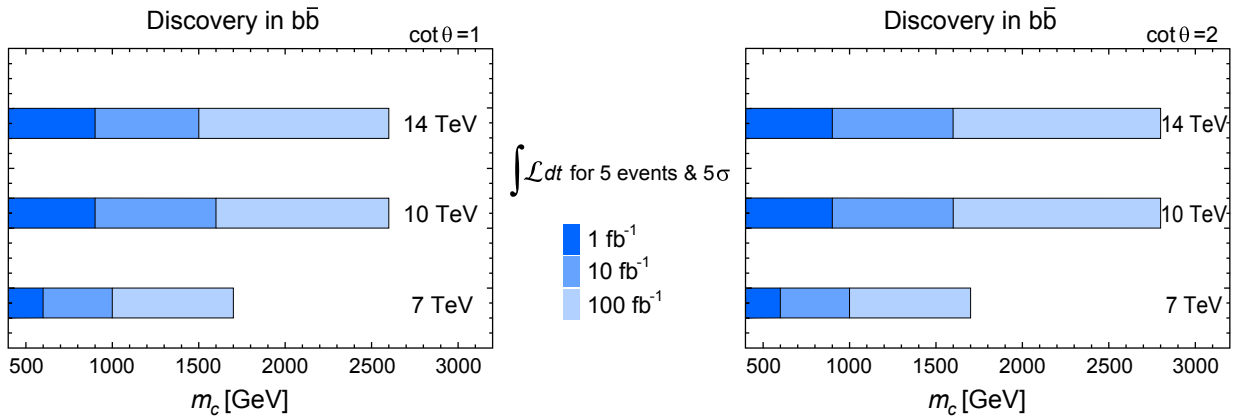

FIG. 2: The discovery potential of colorons in the p_T tail of $b\,\bar{b}$ production for p_T in the range $1.0 - 1.4\,\mathrm{TeV}$ for CM energies $7\,\mathrm{TeV}$, $10\,\mathrm{TeV}$, and in the range $\sqrt{s}/11$ to $1.4\,\mathrm{TeV}$ for $14\,\mathrm{TeV}$. We show the range of coloron masses that can be discovered with $5\,\sigma$ significance and at least 5 signal events after branching ratio and event selection suppression of 10^{-4} is applied to the signal rate. On the left we take $\cot\theta = 1$, on the right $\cot\theta = 2$. Our discovery reach is dominated by the requirement of 5 signal events after the suppression of 10^{-4} is applied to the signal rate, not PDF or theory uncertainties. For example, the signal to background ratio for the entire discovery reach region for $\cot\theta = 1$ and $\sqrt{s} = 7\,\mathrm{TeV}$ is $S/B > 98$.

[4] One can reduce the QCD errors through a NLO QCD calculation utilizing the FONLL formalism of [32] which resums the large logs of p_T/m_b but this is beyond the scope of this work. Such a resummation while running down from the p_T scale to m_b justifies our choice of the renormalization scale at $\mu \simeq m_b$.