A. Dijet Mass Spectrum

Many new physics models predict particles which decay into two high p_{T} jets. These particles can be identified by the reconstructed mass of the dijet system provided their intrinsic mass width is narrow. Such models include excited quarks [63], axigluons [64], flavor-universal colorons [65], color-octet techni-ρ [66], Randall Sundrum (RS) gravitons [67], heavy vector bosons [68] and diquarks in the string-inspired E_6 model [69]. The excited quarks q^* decay into qg. Heavy vector bosons W', Z' decay into $q\bar{q}$ or $q\bar{q}'$. The axigluon A decays into $q\bar{q}$, and E_6 diquarks $D\,(D^c)$ decay into $\bar{q}\bar{q}(qq)$. The RS Graviton G^* and color-octet techni-ρ ρ_{T8} both decay into either a qq or gg pair but their branching ratios are different.

All these models predict an intrinsic mass width which is much smaller than both the detector resolution and mass broadening effects due to QCD radiation. These models can be divided into three categories depending on the decay channel, i.e. gg, gq and qq. The expected mass shapes for q^*, G^*, W', and Z' particles with a mass of 800 GeV/c^2 are shown in Figure 8. Because q^* and G^* decay into gluons, their widths are broader than the widths for W' and Z'. Gluons radiate more than quarks, resulting in a broader dijet mass distribution. These distributions are close and change the final limits by only 10-20%. These shapes can be used to search for resonance structure, independent of the model details.

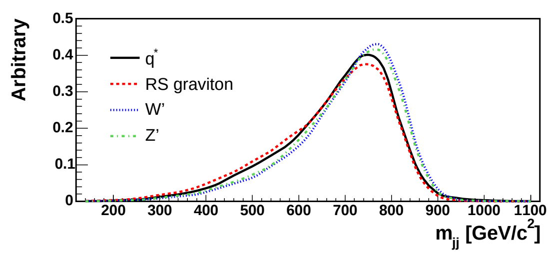

FIG. 8: Expected dijet mass distributions for simulated signals for the following new physical models: $q^* \to qg$, RS graviton ($\to gg$, $q\bar{q}$) and $W' \to q\bar{q}$ and $Z' \to q\bar{q}$ with a mass of 800 GeV/c^2.

To measure the dijet mass spectrum [70], the CDF collaboration used the same data set as used in the inclusive jet cross section measurement described in Section V A 2 [46]. The dijet mass is reconstructed from the two highest p_{T} jets using

$$m_{jj} = \sqrt{(E_1 + E_2)^2 - (\vec{p}_1 + \vec{p}_2)^2}. \tag{8}$$