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Search for new physics in $t\bar{t} + \text{MET} \rightarrow b\bar{b} + q\bar{q}$ final state in $p\bar{p}$ collisions at $\sqrt{s} = 1.96 \text{ TeV}$

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We present a search for a new particle T' decaying to a top quark via $T' \rightarrow t + X$, where X goes undetected. We use a data sample corresponding to 5.7 inverse fb of integrated luminosity of $p\bar{p}$ collisions with $\sqrt{s} = 1.96 \text{ TeV}$, collected at Fermilab Tevatron by the CDF II detector. Our search for pair production of T' is focused on the hadronic decay channel, $p\bar{p} \rightarrow T'\bar{T}' \rightarrow t\bar{t} + XX \rightarrow b\bar{b} + q\bar{q} + \text{MET}$. We interpret our results in terms of a model where T' is an exotic fourth generation quark and X is a dark matter particle. The data are consistent with standard model expectations. We set a limit on the generic production of $T'\bar{T}' \rightarrow t\bar{t} + XX$, excluding the fourth generation exotic quarks T' at 95% confidence level up to $m_{T'} = 400 \text{ GeV}/c^2$ for $m_X < 70 \text{ GeV}/c^2$.

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