

Triangle Singularity in the Production of $T_{cc}(3875)$ and a Soft Pion

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The double-charm tetraquark meson T_{cc}^+ (3875) can be produced in high-energy proton-proton collisions by the creation of the charm mesons $D^{*+}D^0$ at short distances followed by their binding into T_{cc}^+ . The T_{cc}^+ can also be produced by the creation of $D^{*+}D^{*+}$ at short distances followed by their rescattering into T_{cc}^+ . A charm-meson triangle singularity produces a narrow peak in the T_{cc}^+ invariant mass distribution 6.1 MeV above the threshold with a width of about 1 MeV. Well beyond the peak, the differential cross section decreases with the invariant kinetic energy E of T_{cc}^+ as $E^{-1/2}$. The fraction of T_{cc}^+ that are accompanied by π^+ with $E < m_\pi$ is estimated to be roughly 3%. The fraction of T_{cc}^+ events with T_{cc}^+ in the narrow peak from the triangle singularity could be comparable.

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