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Rare and exclusive few-body decays of the top quark

We will report on an extensive survey of rare and exclusive few-body decays of the top quark, defined as those with branching fractions $BR \geq 10^{-5}$ and two or three final-state particles [1]. Such rare decays probe physics beyond the Standard Model (BSM), constitute a background for exotic decays into new BSM particles, and provide precise information on quantum chromodynamics factorization with small nonperturbative corrections. We tabulate the theoretical BR values for almost 40 rare decay channels of the heaviest elementary particle, indicating the current experimental limits in their observation. Among those, we have computed for the first time semiexclusive top-quark decays into a quark plus a meson, while updating predictions for a few other rare partial widths. The feasibility of measuring each of these unobserved decays is estimated for p-p collisions at the high-luminosity Large Hadron Collider (HL-LHC), and for e+e- and p-p collisions at the future circular collider (FCC).

[1] David d'Enterria, Van Dung Le, "Rare and exclusive few-body decays of the Higgs, Z, W bosons, and the top quark", J.Phys.G 52 (2025) 5, 053001; arXiv:2312.11211 [hep-ph]

Field

Pheno

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