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The $t\bar{t}VV$ Background to Four-Top Quark Production; Towards New Physics Studies

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Abstract

The study of four-top-quark production, $t\bar{t}t\bar{t}$, constitutes an important tool in the search for signals of new physics, due to its sensitivity to possible deviations from the predictions made within the Standard Model, particularly in the heavy-particle and Higgs sectors. To exploit this sensitivity, a precise description of the Standard Model processes that can imitate (background) this signal is required. Among these, there are the $t\bar{t}VV$ processes, with $V = Z, W$. In this work, we study top-quark pair production in association with two gauge bosons, $t\bar{t}VV$, at next-to-leading-order (NLO) QCD corrections and their matching to parton showers, which is is essential for an accurate description of the events that can be observed experimentally, matching that has been made within the POWHEG framework. The goal has been to develop a Monte Carlo generator that provides a precise description of these processes. The resulting generator represents a tool for studying the properties of these background processes and for their incorporation into future phenomenological studies of four-top-quark production, contributing to a more precise study of the most important backgrounds in searches for new physics. The dissemination of this type of work in precision collider physics can contribute to strengthening the field in Latin America and fostering its development within the broader LHC community.

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