First simultaneous differential measurement of tZq and $t\bar{t}Z$ processes at the CMS Experiment

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Abstract

At the Large Hadron Collider (LHC) at CERN, about millions of top quark events have been produced. The data recorded during LHC Run-2, in the years 2016-2018, gave access to first differential measurements of top quark production in association with Z-bosons, and precisely probes the coupling between top quarks and Z bosons for the first time. The cross sections of top quark pair producton, $t\bar{t}Z$, and single-top quark production, tZq, are similar, and both processes are mutual backgrounds to one another. Measurements of top-Z coupling and EFT analyses require measurements of both these processes and their correlation. In this analysis, tZq and $t\bar{t}Z$ are measured simultaneously for the first time, aiming to better understand the correlation between these two processes. Furthermore, the evaluation of their differential cross section can bring evidence of possible deviations from the standard model, providing information for EFT analyses and new physics scenarios.