



Contribution ID: 442

Type: Experimental poster

Measurements of the inclusive and differential production cross sections of a top-quark–antiquark pair in association with a Z boson at $\sqrt{s} = 13$ TeV with the ATLAS detector

Thursday, June 10, 2021 6:45 PM (1 hour)

An increasing center-of-mass energy of proton-proton collisions and higher luminosities at the CERN Large Hadron Collider make it possible to study rare processes of the Standard Model (SM). In this poster, the measurements of both the inclusive and differential cross sections of top-quark–antiquark production in association with a Z boson ($t\bar{t}Z$) are presented. Collision data corresponding to a total integrated luminosity of 139/fb, recorded in years 2015–2018 with the ATLAS detector at a center-of-mass energy of 13 TeV are analysed. Both inclusive and differential measurements are performed by selecting final states with either three or four isolated leptons (electrons or muons). The inclusive cross section is measured to be 0.99 ± 0.05 (stat.) ± 0.08 (syst.) pb, in agreement with the most precise theoretical predictions of the SM. In the differential measurements both absolute and normalised cross sections are measured as a function of a number of kinematic variables which probe the kinematics of the $t\bar{t}Z$ system. Differential measurements are performed at particle and parton levels for specific fiducial phase-space volumes and are compared with theoretical predictions at different levels of precision. Based on a χ^2/ndf and p-value compatibility comparison, good agreement is observed between the measured differential cross sections and the SM predictions.

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Session Classification: Poster Session

Track Classification: Top physics