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## Observation of Single Top Quark Production in Association with a Z Boson in Proton-Proton Collisions at root s=13 TeV

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### Abstract

The observation of single top quark production in association with a Z boson and a quark (tZq) is reported. Events from proton-proton collisions at a center-of-mass energy of 13 TeV containing three charged leptons (either electrons or muons) and at least two jets are analyzed. The data were collected with the CMS detector in 2016 and 2017 and correspond to an integrated luminosity of 77.4fb(-1). The increased integrated luminosity, a multivariate lepton identification, and a redesigned analysis strategy improve significantly the sensitivity of the analysis compared to previous searches for tZq production. The tZq signal is observed with a significance well over 5 standard deviations. The measured tZq production cross section is sigma(pp -> tZq -> t(l(+)(-)(q)) = 111 +/- 13 (stat)(-9)(+11) (syst) fb, for dilepton invariant masses above 30 GeV, in agreement with the standard model expectation.

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