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A simultaneous measurement of the top quark mass and decay width with single top quark events at CMS

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We report a precise simultaneous measurement of the mass and decay width of the top quark in the t-channel, which is the most dominant production process for single top quarks at the LHC. The final state comprises a top quark along with a light quark, giving rise to at least two jets, of which one arises from the hadronization of b-quark, an isolated high-momentum lepton (electron or muon), and a large missing transverse momentum due to an escaping neutrino from the W decay. The study uses 138 fb^{-1} proton-proton collision data recorded by the CMS experiment during 2016–2018 at $\sqrt{s} = 13$ TeV. Dominant standard model backgrounds are studied in complementary regions defined based on the number of b- and light-quark jets in the final state. A multivariate technique that relies on deep neural networks has been deployed to separate signal from backgrounds. The top-quark mass is reconstructed using kinematic information from the W boson and the b jet. We obtain the top quark mass and decay width from a fit to its reconstructed mass distribution using a suitable combination of parametric shapes.

Session

Top Quark and EW Physics

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