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First observation of production of four top quark in the multi-lepton channel with the CMS Run 2 dataset

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The production of four top quarks (tttt) is studied as a rare standard model process with sensitivity to new physics. The four top quark production cross section also allows investigations of virtual Higgs boson production and the top quark Yukawa coupling, EFT interpretations, and is an essential test of Quantum Chromodynamics. This presentation summarises the recent observation for four top quark production with LHC Run 2 data samples collected by the CMS experiment at a center-of-mass energy of 13 TeV, corresponding to integrated luminosities of up to 138 fb−1. The signal is identified using either same-sign dileptons or multileptons. Boosted decision trees are used for both lepton identification and signal to background separation. Several orthogonal datasets are used to estimate the backgrounds and control their systematic uncertainties.

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