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Complete measurement of the top-quark polarisation in t-channel single top-quark production with ATLAS detector

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At the LHC, electroweak production of single top quarks in the t-channel leads, in the standard model, to a high degree of top quark polarization. Two subprocesses, $ub \to dt$ and $\bar{d}b \to \bar{u}t$ contribute to t-channel production of single top, while charge-conjugate processes contribute to production of antitop. A high degree of top quark polarization along the direction of the scattered light-quark (or "spectator" quark) is expected for top production, and opposite to that direction for antitop production. This analysis extracts the polarization of samples of top and antitop quarks produced within a fiducial region of acceptance, using an integrated luminosity 80.52 fb^{-1} of proton-proton collisions at 13 TeV, collected with the ATLAS detector. From the angular distribution of top quark decay products, we obtain all three components of the polarization of both top quarks and top antiquarks.

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