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Search for Standard Model Higgs boson production in association with a top quark pair in the four lepton signature with the ATLAS detector

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An overview will be presented of a search for the Standard Model Higgs boson produced in association with a top quark pair decaying into the $t\bar{t}H \rightarrow 4\ell$ signature. The study has been performed using data with an integrated luminosity of $\mathcal{L} = 20.1 \text{ fb}^{-1}$ collected by the ATLAS experiment in pp collisions with $\sqrt{s} = 8 \text{ TeV}$ at the Large Hadron Collider. This production mode provides direct access to the top quark-Higgs coupling and can be beneficial to this measurement, despite its relatively small cross section. The 4ℓ analysis, which was carried out in combination with analyses of other multi-lepton final states, is sensitive to three Higgs boson decay modes, $H \rightarrow W^+W^-$, $H \rightarrow \tau^+\tau^-$ and $H \rightarrow ZZ$. The majority of the signal comes from the W^+W^- mode, which is probed by requiring that all W bosons (including those from the top quark decays) decay leptonically. This yields a final state signature which includes two bottom quarks, 4 charged leptons and neutrinos (in the form of missing energy). Preliminary plans for future study of this channel during LHC Run 2 will also be presented.

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