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Measurement of quantum interference between doubly and singly resonant top quark production with the ATLAS experiment

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Physics processes involving top quarks compose a major background for many searches for new physics. Both doubly-resonant “ttbar” and singly-resonant “single top” processes can contribute at similar levels where sophisticated tools are used to effectively reduce ttbar backgrounds. However, because both ttbar and Wt single top with an additional b-quark in the final state can yield an identical final state (WWbb) the processes quantum-mechanically interfere. The ambiguity in how this interference is modeled can lead to large theoretical uncertainties on the Wt prediction.

A measurement is presented that is designed to probe the WWbb final state in a region of large interference, selecting final states with two isolated leptons and b-tagged jets. The result uses data from pp collisions delivered by the Large Hadron Collider in 2015 and 2016 at a center-of-mass energy of 13 TeV recorded by the ATLAS detector, corresponding to an integrated luminosity of 36/fb. Differential distributions of interference-sensitive variables are measured and subsequently unfolded to truth level. The analysis is sensitive to differences in the modeling of the interference term provided by state-of-the-art WWbb generators

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