

Constraints on spin-0 dark matter mediators and invisible Higgs decays using ATLAS 13 TeV pp collision data with two top quarks and missing transverse momentum in the final state

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This paper presents a statistical combination of searches targeting final states with two top quarks and invisible particles, characterised by the presence of zero, one or two leptons, at least one jet originating from a b-quark and missing transverse momentum. The analyses are searches for phenomena beyond the Standard Model consistent with the direct production of dark matter in pp collisions at the LHC, using 139 fb^{-1} of data collected with the ATLAS detector at a centre-of-mass energy of 13 TeV.

The results are interpreted in terms of simplified dark matter models with a spin-0 scalar or pseudoscalar mediator particle. In addition,

the results are interpreted in terms of upper limits on the Higgs boson invisible branching ratio, where the Higgs boson is produced

according to the Standard Model in association with a pair of top quarks.

For scalar (pseudoscalar) dark matter models, with all couplings set to unity, the statistical combination extends the mass range

excluded by the best of the individual channels by 50 (25) GeV, excluding mediator masses up to 370 GeV.

In addition, the statistical combination improves the expected coupling exclusion reach by 14% (24%), assuming a scalar (pseudoscalar) mediator mass of 10 GeV.

An upper limit on the Higgs boson invisible branching ratio of 0.38 ($0.30^{+0.13}_{-0.09}$) is observed (expected) at 95% confidence level.

Primary author: LOU, Xuanhong (Stockholm University (SE))

Presenter: LOU, Xuanhong (Stockholm University (SE))

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