

# Recent ATLAS results of Dark Matter and Dark Photon combinations and Dark Higgs searches

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Results from a wide range of searches targeting different experimental signatures with and without missing transverse momentum ( $\cancel{E}_T$ ) are used to constrain a Two-Higgs-Doublet Model (2HDM) with an additional pseudo-scalar mediating the interaction between ordinary and dark matter (2HDM+a). The analyses use up to  $139 \text{ fb}^{-1}$  of proton-proton collision data at a centre-of-mass energy  $\sqrt{s} = 13 \text{ TeV}$  recorded with the ATLAS detector at the Large Hadron Collider between 2015-2018. The results from three of the most sensitive searches are combined statistically. These searches target signatures with large  $E_{\text{miss}}$  and a leptonically decaying Z boson; large  $\cancel{E}_T$  and a Higgs boson decaying to bottom quarks; and production of charged Higgs bosons in final states with top and bottom quarks, respectively. Constraints are derived for several common as well as new benchmark scenarios within the 2HDM+a.

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A first dedicated search is performed for dark matter particles produced in association with a resonantly produced pair of b-quarks with  $m(bb) < 150 \text{ GeV}$  using  $140 \text{ fb}^{-1}$  of proton-proton collisions recorded by the ATLAS detector at a center-of-mass energy of 13 TeV. This signature is expected in extensions of the Standard Model predicting the production of dark matter particles, in particular those containing dark Higgs bosons. This search uses a novel experimental method to extend the experimental reach to lower bb-pair invariant masses, considers a wider range of dark Higgs boson interpretations and excludes new regions of parameter space for this model. For dark Higgs boson masses between 30 and 150 GeV,  $Z'$  mediator masses up to 3.4 TeV and 4.8 TeV are excluded for benchmark scenarios.

**Primary authors:** LIU, Qibin (TDLI, Shanghai JiaoTong University); LI, Shu (TDLI, SJTU)

**Presenter:** LIU, Qibin (TDLI, Shanghai JiaoTong University)

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