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Search for pair production of Higgs bosons in the 4b final state using pp collisions at 13 TeV with the ATLAS detector

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The discovery of a Higgs boson at the Large Hadron Collider motivates an enhanced effort to search for new physics via the Higgs sector. Many new physics models predict rates of Higgs boson pair production significantly higher than the SM rate.
TeV-scale resonances such as the first Kaluza-Klein excitation of the graviton predicted in the bulk Randall-Sundrum model or a heavy neutral scalar of two-Higgs-doublet models can decay into pairs of Higgs bosons. Enhanced non-resonant pp->hh production can also arise in models such as those with new, light, coloured scalars or direct $t\bar{t}hh$ vertices.
This poster presents an analysis based on the Run 2 ATLAS search in the 4b final state which set limits on both resonant and non-resonant Higgs boson pair production.
Two complementary Higgs boson reconstruction techniques are employed. The first—resolved"—technique reconstructs Higgs boson candidates from pairs of nearby anti-kt jets with radius parameter R = 0.4, each b-tagged with a multivariate b-tagging algorithm. This resolved technique offers good efficiency over a wide range of Higgs boson momenta and so can be used to reconstruct di-Higgs-boson resonances with mass up to 1200~\GeV.
At higher masses the anti-kt R-0.4 jets begin to merge, motivating the use of a second—boosted"—Higgs boson reconstruction technique that maintains acceptance for these higher-mass resonances through the use of large radius jets and jet substructure techniques. In boosted regime, the Higgs boson candidate is reconstructed as a single, trimmed anti-kt R=1.0 jet which must have two associated b-tagged anti-kt R = 0.2 track-jets.
This poster presents the first run-2 results and lessons learned.

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