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Search for New Physics with Top quarks at the ATLAS experiment

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The top quark, given its high mass with respect to the other quarks and leptons, is expected to play a special role in searching for Physics Beyond the Standard Model. In particular, new heavy particles predicted by different models couple preferentially to top quarks, making searches involving top quarks in the final state of great interest. These include the search for heavy neutral resonances decaying to top-quark-pairs, for vector-like quarks originating top quarks in their decays or behaving as heavy top-partners (i.e. decaying to W-boson and b-quark pairs) and for enhancements of the production of multi-top-quark final states. With the proton-proton collision data collected by the ATLAS experiment during 2015 and 2016 at the center-of-mass energy of 13 TeV, the ATLAS experiment is exceeding the sensitivity reached with the analysis of the 7 and 8 TeV data during LHC Run 1 for many New Physics scenarios involving top quarks and its heavy partners. In this contribution, the latest ATLAS results in searching for top-pair resonances, top and bottom vector-like quarks and four-top-quark events are presented. These searches take advantage from the many precise measurements performed during LHC Run 1 in the context of top quark physics, both in terms of understanding of the SM processes involving top quarks and of new and improved techniques for identifying jets originated from b quarks (b-tagging) and from top quarks produced at high transverse momenta (boosted-top-tagging).

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