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Search for type-III seesaw heavy leptons using proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector at the LHC

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A search for type III seesaw heavy leptons decaying into pairs of leptons, a pair of jets and large missing transverse energy is presented. The results reported here use the pp collision data sample corresponding to 80.0 fb^{-1} of integrated luminosity collected in 2015, 2016 and 2017 by the ATLAS detector at the LHC with a centre-of-mass energy of 13 TeV. The observation of neutrino oscillation provides strong evidence that neutrinos have mass and that their masses are expected to be much smaller than those of the charged leptons. The Type III seesaw mechanism introduces additional heavy lepton triplets in the seesaw mechanism. The analysis is performed in a simplified model where only one fermionic triplet is assumed, (L^+, L^-, N_0) . This simplification has little impact on LHC physics as in most cases only the lighter states can be generated in TeV collider experiments. The search is performed in the final states that both N_0 and L^\pm decay to final states containing a W boson, the process with the largest effective cross-section. One of the W bosons decays leptonically and the other decays hadronically. Only the final states containing electrons and muons are considered, including leptonic tau decays. The combination of the opposite- and same-charge lepton channels is presented. One of the search goals is an efficient data-driven background estimation of mis-identified (fake) prompt leptons, originating from either hadronic jets or secondary weak hadron decays, and electrons with mis-identified charge in the high pile-up environment of the 2017 LHC data taking.

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