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Performance of Boosted W-boson Identification at sqrt{s} = 8 TeV using the ATLAS detector

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The high center-of-mass energy of the pp collisions at the LHC enables searches for new particles with masses at the TeV scale. These heavy resonances can decay to final states with high p_{T} W- and Z-bosons. The hadronic decay modes of these bosons are of special interest of the potential increase in sensitivity for measurements and searches. However the cross-section of background events originating from light-quark and gluons jets is orders of magnitudes higher than the production of W-bosons. At large transverse-momentum, the decay products of the boson are collimated into one individual large-radius jets. Due to the high-luminosity conditions, soft particles unrelated to the hard scattering can contaminate the jets in the detector resulting in a diminished mass resolution. To enhance the sensitivity to new physics processes and to mitigate the influence of pile-up, jet grooming algorithms like trimming, pruning and mass-drop filtering have been designed. In addition substructure techniques are used to explore the internal structure of jets to distinguish between a two-body decay of a boson from a jet originating from gluons or light-quarks. Within the ATLAS collaboration the combination of grooming algorithm and substructure techniques have been extensively studied and are of key importance for the performance at an increased center-of-mass energy of 13 TeV.

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