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Electroweak production of single vector bosons, vector boson scattering, and triple gauge-boson production with the ATLAS detector (WG3)

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The production of single W and Z bosons with two jets at high invariant mass has been studied by the ATLAS collaboration in detail using data corresponding to $20.3/\text{fb}$ at a centre-of-mass energy of 8 TeV. Integrated and differential cross sections are measured in many different phase space regions with varying degree of sensitivity to the electroweak production in vector boson fusion. The cross section for the electroweak production has been extracted for both integrated and for the first time differential distributions. The results have also been used to derive limits on anomalous triple gauge couplings.

Vector-boson scattering processes provide a unique way to probe the mechanism of electroweak symmetry breaking. Similar physics can be probed by studying the production of three gauge bosons. The results can also be used for a model-independent search for new physics at the TeV scale via anomalous quartic gauge couplings.

The ATLAS collaboration has studied vector boson scattering in final states with two gauge bosons and two forward jets in $20.3/\text{fb}$ of 8 TeV proton-proton collision data, in particular two same-sign W bosons, a WZ boson pair, and a W or Z boson in association with an isolated photon. The studies are complemented by a search for anomalous vector boson production of $WW+WZ$ pairs in their semileptonic decays to $l\nu jj$ in association with two forward jets.

A measurement of exclusive production of W boson pairs produced by the interaction of two photons will be presented. This topology is found to provide strong constraints on anomalous quartic gauge couplings.

The collaboration has used this data set as well to study the production of three gauge bosons. A search was carried out for the production of three W bosons. The cross sections for the production of a W or Z boson in association with two isolated photons has been measured. For the Z boson, decays into charged leptons as well as neutrinos have been studied.

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