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Measurement of electroweak $Z(\nu\bar{\nu})\gamma$ production and limits on anomalous quartic gauge couplings in pp collisions at $\sqrt{(s)} = 13$ TeV with the ATLAS detector

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The electroweak production of $Z(\nu\bar{\nu})\gamma$ in association with two jets is studied in a regime with a photon of high transverse momentum above 150 GeV using proton–proton collisions at centre-of-mass energy of 13 TeV at the Large Hadron Collider. The analysis uses a data sample with an integrated luminosity of 139 fb^{-1} collected by the ATLAS detector during the 2015–2018 LHC data taking period. This process is an important probe of the electroweak symmetry breaking mechanism in the Standard Model and is sensitive to quartic gauge boson couplings via vector-boson scattering. The fiducial $Z(\nu\bar{\nu})\gamma jj$ cross section for electroweak production is measured to be $0.77^{+0.34}_{-0.30}$ fb and is consistent with the Standard Model prediction. Evidence for the electroweak $Z(\nu\bar{\nu})\gamma jj$ production is found with an observed significance of 3.2σ in the background-only hypothesis, compared with an expected significance of 3.7σ. The combination of this result with the previously published ATLAS observation of electroweak $Z(\nu\bar{\nu})\gamma jj$ production yields in an observed (expected) signal significance of 6.3σ (6.6σ). Limits on anomalous quartic gauge boson couplings are obtained in the framework of effective field theory with dimension-eight operators.

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