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Measurements of Zgamma and Zgammagamma Production in pp Collisions at 8 TeV with the ATLAS Detector

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The production of Z bosons with one or two isolated high energy photons is studied using pp collisions at 8 TeV. The analyses use a data sample with an integrated luminosity of 20.3 fb^{-1} collected by the ATLAS detector during the 2012 LHC data taking. The $Z\gamma$ and $Z\gamma\gamma$ production cross sections are measured with leptonic (ee, $\mu\mu$, $\nu\bar{\nu}$) decays of the Z boson, in extended fiducial regions defined in terms of the lepton and photon acceptance. They are then compared to cross-section predictions from the Standard Model where the sources of the photons are bremsstrahlung from the initial state quarks or final state charged leptons.
The yields of events with photon transverse energy E_T > 250 GeV from $ll\gamma$ events and with ET > 400 GeV from $\nu\bar{\nu}\gamma$ events are used to search for anomalous triple gauge-boson couplings $ZZ\gamma$ and $Z\gamma\gamma$. The yields of events with diphoton invariant mass $m_{\gamma\gamma}$ > 200 GeV from $ll\gamma\gamma$ events and with $m_{\gamma\gamma}$ > 300 GeV from $\nu\bar{\nu}\gamma\gamma$ events are used to search for anomalous quartic gauge-boson couplings $ZZ\gamma\gamma$ and $Z\gamma\gamma\gamma$. No deviations from Standard Model predictions are observed and limits are placed on parameters used to describe anomalous triple and quartic gauge-boson couplings.

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