

# Measurement of the $ZZ$ production cross section and limits on anomalous triple gauge boson couplings in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector

## Abstract

A measurement of  $ZZ$  production cross section in proton-proton collisions at  $\sqrt{s} = 7$  TeV has recently been measured by the ATLAS experiment using the final states of four leptons ( $ZZ \rightarrow \ell\ell\ell'\ell'$ ) and two leptons plus two neutrinos ( $ZZ \rightarrow \ell\ell\nu\nu$ ), where the term lepton is used for electrons and muons. A data sample of  $4.7 \text{ fb}^{-1}$  collected during 2011 is used. In the four lepton final states, events are selected by requiring four leptons forming two opposite-sign same-flavour pairs with the invariant mass of each pair,  $m_{\ell\ell}$ , lying in the mass region  $[66,116]$  GeV. In total, 62 candidate events are observed with a background expectation of  $0.7_{-0.7}^{+1.3}(\text{stat})_{-0.7}^{+1.3}(\text{syst})$ . The total cross section has been found to be  $7.2_{-0.9}^{+1.1}(\text{stat})_{-0.3}^{+0.4}(\text{syst}) \pm 0.3(\text{lumi})$  pb. In the two leptons plus two neutrinos channel, events are selected by requiring a pair of same-flavor opposite-sign leptons in a tighter mass window of  $[76,106]$  GeV. In addition these events must have large missing transverse energy due to the fact that neutrinos escape the detector. We observe 78 candidate events with a background expectation of  $40.7 \pm 4.3 \pm 3.7$  events. The total cross section for on-shell  $ZZ$  production has been determined to be  $5.4_{-1.2}^{+1.3}(\text{stat})_{-1.0}^{+1.4}(\text{syst}) \pm 0.2(\text{lumi})$  pb and agrees within error with the one calculated in the four lepton channel. Both measurements are statistically consistent with the Standard Model expectation of  $6.5_{-0.2}^{+0.3}$  pb calculated at the next to leading order in QCD. Limits on anomalous neutral triple gauge boson couplings are derived from the total number of observed events in the four lepton channel.