

Prospects of the longitudinally polarised vector boson scattering processes at the ATLAS detector

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The electroweak symmetry breaking mechanism can be experimentally tested in the electroweak vector boson scattering (VBS) processes that occur in proton-proton collisions at the LHC.

The unitarity of VBS cross sections of longitudinally polarised bosons $V_{1,L}V_{2,L} \rightarrow V_{3,L}V_{4,L}$, where ($V = W^\pm, Z$), in the Standard Model are preserved by including the Feynman diagrams with the Higgs boson propagator in calculations. The properties of the Higgs boson observed so far align with the predictions of the Standard Model (SM). However, even minor deviations in its couplings with vector bosons could lead to an enhancement in the scattering amplitude of longitudinal vector bosons as the center-of-mass energy increases. This makes longitudinal vector boson scattering a particularly sensitive method for detecting any anomalous Higgs couplings.

Thus, precise measurements of VBS processes of longitudinally polarised vector bosons are important experimental tests of the validity of the Standard Model Higgs mechanism. It is also a difficult process to study due to small production cross section making the study more challenging.

We present the preliminary study of the potential of measurements of polarisation observables in the MC Run-2 data sets collected by the ATLAS detector. VBS processes with different heavy vector boson decaying semi-leptonically are considered in the study.