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Study of W⁺±Z longitudinal-longitudinal interactions ($W_0^{\pm}Z_0$) with Full Leptonic Final States ($W^{\pm}Z \rightarrow l^{\pm}l^{\pm}l^{\mp}$)

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In the Standard Model of particle physics, the spontaneous symmetry breaking of the complex Higgs field gives rise to the massive Higgs boson and three Goldstone bosons, which represent the longitudinal degrees of freedom of the W^{\pm} and Z bosons. It is therefore critical to study the interactions of longitudinally-polarized W^{\pm} and Z bosons (W_0^{\pm} and Z_0). Here, we present the first such analysis, in inclusive fully-leptonic final states ($W^{\pm}Z \rightarrow l^{\pm}l^{\pm}l$) with 139 fb⁻¹ of proton-proton collision data recorded with the ATLAS detector at a 13 TeV of center of mass energy. We use kinematic variables like p_T^Z and $p_T^{W^{\pm}Z}$ to enhance the $W_0^{\pm}Z_0$ contribution. The so called radiation amplitude zero effect also enhances the $W_0^{\pm}Z_0$ contribution in the central region ($\cos \theta_V ~ 0$, where θ_V is the scattering angle of the W^{\pm} or Z boson in the parton center-ofmass frame). A multivariate variable is developed to separate the longitudinal-longitudinal polarization from other polarizations. A template fit will be performed to extract polarization fractions.

Career stage

Graduate student

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