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Search for a doubly charged Higgs boson through vector boson scattering in the Georgi-Machacek model with the ATLAS detector at the LHC

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The hierarchy problem suggests that there must be physics beyond the Standard Model (SM) in the electroweak sector. A deviation from SM-predicted values in the Higgs coupling to vector bosons would allow these new physics in the form of an extension to the Higgs sector. The Georgi-Machacek model introduces scalars in higher isospin multiplets to the SM, including a doubly-charged Higgs, while preserving custodial symmetry. This new scalar is potentially accessible as a resonance through charged vector boson scattering ($W^+ + W^+ \to W^+ + W^+$) in the 30 fb^{-1} of $\sqrt{s} = 13$ TeV data collected by the ATLAS detector at the Large Hadron Collider (LHC).

This search focuses on the final state of this resonance which includes a pair of same-sign leptons accompanied by a pair of forward jets and missing transverse momentum (MET). Same-sign leptons in the final state are a rare feature of the standard model, and so the background is dominated by charge misidentification. Techniques to reduce these types of background are presented, and the potential for discovery or exclusion is discussed.

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