HVT exclusion contours from full run-2 searches at high-mass in $\ell\ell$ and $\ell\nu$ final states

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This note presents summary plots of the excluded coupling space in a Heavy Vector Triplet scenario from searches for high-mass resonances in the dilepton ($\ell\ell$) and lepton + $E_T^{\text{miss}}$ ($\ell\nu$) final states using the full ATLAS Run-2 dataset.

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1 Introduction

Searches in the $\ell\ell$ (dilepton) and $\ell\nu$ (lepton + $E_T^{\text{miss}}$) final states constrain the strength of couplings to vector bosons outside the Standard Model. This note contains summary plots of excluded couplings in a Heavy Vector Triplet (HVT) scenario [1, 2] using the limits from the full run-2 search in the lepton + $E_T^{\text{miss}}$ final state [3], based on the same technique as was used for the dilepton final state [4].

2 Summary plots of HVT exclusion contours in the $\ell\nu$ and $\ell\ell$ channels

The HVT expected and observed exclusion contours in the $\ell\nu$ channel are shown in figure 1 for the $g_{\ell^-}g_h$ plane and in figure 2 for the $g_{\ell^-}g_q$ plane. Figures 3 and 4 show the $\ell\nu$ channel contours overlaid with the $\ell\ell$ contours from [4]. These overlaid contours using the 139 fb$^{-1}$ dataset are updated results for the separate leptonic channels which were combined at 36.1 fb$^{-1}$ in [5].
Figure 1: Expected (a) and observed (b) 95% exclusion contours at 139 fb\(^{-1}\) in the HVT \(\{g_f, g_h\}\) coupling space from cross section limits on resonances in the \(\ell \nu\) final state with masses of 3, 4, and 5 TeV [arXiv:1906.05609]. Regions outside the contours are excluded in each case. Comparison of the upper limiting and predicted cross section values is done following the same methodology as in the 139 fb\(^{-1}\) dilepton analysis [Phys. Lett. B 796 (2019) 68], matching the resonance width where possible. The \(\ell \nu\) channel sets observed upper limits on the coupling of the HVT triplet field to fermions of \(|g_f| < 0.05, 0.13, \text{ and } 0.32\) for pole masses of 3, 4, and 5 TeV respectively, and for \(g_h = 0\). As a reference, the corresponding limits from the leptonic \(\ell \ell + \ell \nu\) combination at 36.1 fb\(^{-1}\) [Phys. Rev. D 98 (2018) 052008] are \(|g_f| < 0.06, 0.15, \text{ and } 0.42\) at the same masses.

Figure 2: Expected (a) and observed (b) 95% exclusion contours at 139 fb\(^{-1}\) in the HVT \(\{g_f, g_q\}\) coupling space from cross section limits on resonances in the \(\ell \nu\) final state with masses of 3, 4, and 5 TeV [arXiv:1906.05609]. Regions outside the contours are excluded in each case. Comparison of the upper limiting and predicted cross section values is done following the same methodology as in the 139 fb\(^{-1}\) dilepton analysis [Phys. Lett. B 796 (2019) 68], matching the resonance width where possible.
As a reference, the corresponding limits from the leptonic values is done following the same methodology as in the matching the resonance width where possible. The regions outside the contours are excluded in each case. Comparison of the upper limiting and predicted cross section from cross section limits on resonances in the Figure 3: Expected (a) and observed (b) 95% exclusion contours at 139 fb⁻¹ in the HVT \(g_f, g_h\) coupling space from cross section limits on resonances in the \(\ell\nu\) (green) and \(\ell\ell\) (blue) final states with masses of 3, 4, and 5 TeV. As a reference, the corresponding limits from the leptonic \(\ell\ell + \ell\nu\) combination at 36.1 fb⁻¹ [Phys. Rev. D 98 (2018) 052008] are \(|g_f| < 0.06, 0.15, \text{and} 0.42\) at the same masses.

Figure 4: Expected (a) and observed (b) 95% exclusion contours at 139 fb⁻¹ in the HVT \(g_f, g_q\) coupling space from cross section limits on resonances in the \(\ell\nu\) (green) and \(\ell\ell\) (blue) final states with masses of 3, 4, and 5 TeV. Regions outside the contours are excluded in each case. Comparison of the upper limiting and predicted cross section values is done following the same methodology as in the 139 fb⁻¹ dilepton analysis [Phys. Lett. B 796 (2019) 68], matching the resonance width where possible.
References


