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Probing the interplay between composite vector resonances and top partners at the LHC

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Fermionic and vector resonances are a generic prediction of theories where electroweak symmetry breaking is triggered by new strongly interacting dynamics at the TeV scale. We work in a concrete, predictive "discrete" **two site** prescription of the **Composite Higgs model** where the spontaneous breaking of the SO(5)/SO(4) coset gives the Standard Model gauge bosons and six heavy vector resonances. The heavy resonances come as an $SU(2)_L$ triplet with hypercharge $Y = 0$ and three $SU(2)_L$ singlets which hypercharges $Y = 0, \pm\ 1$. We implement a **partially composite scenario** for the top sector which gives us the $1/3, 2/3$ and $5/3$ charged top partners. These transform as a 4-plet and a singlet of SO(4). We focus on the **phenomenology of the heavy vector resonances** where the parameter space is able to account for the direct and indirect (electroweak and flavor precision) constraints and also satisfies the naturalness criteria. These considerations allow us to study the implications of the top partners on the vector resonances owing to a mild hierarchy between the top partners and the heavy vector resonances. In contrast with the top partners, the branching ratios of the heavy vector resonances strongly depend on model parameters. We find that when kinematically allowed, vector resonances decay to top partners instead of pure Standard Model final states. These top partner channels can be used to search for top partners from vector resonances and thereby discover (exclude) these vector resonances itself at the 13 TeV run of the LHC. We also discuss the 2 TeV diboson excess in the 8 TeV LHC data.

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