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A triplet gauge boson with hypercharge one

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A vector boson W_1 with the quantum numbers $(3,1)$ under the electroweak group $SU(2)_L \times U(1)_Y$ could in principle couple
with the Higgs field via the renormalizable term $W_1^{\mu *} H D_\mu H$. This interaction is known to affect the T parameter and, in so doing, it could potentially explain the 2022 CDF measurement of the W-boson mass.

As it is often the case with vectors, building a viable model with a W_1 gauge boson is non-trivial. In this talk I will describe two variations of a minimal setup containing this field; they are based on an extended $SO(5) \times SU(2) \times U(1)$ electroweak group. I will nevertheless show that interactions such as $W_1^{\mu *} H \partial_\mu H$ are not generated in a Yang-Mills theory. A coupling between W_1, H and another Higgs doublet H' is possible though.

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