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Limits on exotic contributions to electroweak symmetry breaking

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The Standard Model breaks electroweak symmetry using an isospin-doublet scalar Higgs field, i.e. a field in the minimal nontrivial representation of SU(2)_L. But there could in principle be contributions to the vacuum condensate from "exotic" scalars in higher isospin representations. Such exotic models are in general strongly constrained by electroweak precision measurements, which I'll use to set bounds on the maximum contribution of the exotic scalars to the W and Z boson masses. Model-building can get around these bounds, allowing larger contributions to the W and Z masses and deviations in the discovered Higgs boson's couplings; these models comprise the Georgi-Machacek model, its generalizations to higher isospin, and the scalar septet model. These models predict a distinctive phenomenology involving doubly-charged scalars that couple to W boson pairs, which have been directly searched for at the LHC and in turn constrain the exotic scalars. I'll review the models and their constraints, and try to summarize what we can say so far about exotic contributions to electroweak symmetry breaking.

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