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General Form of Effective Operators from Hidden Sectors

Wednesday, September 24, 2025 10:00 AM (30 minutes)

I discuss a model-independent analysis of the dimension-six terms that are generated in the low energy effective theory when a hidden sector that communicates with the Standard Model through a specific portal operator is integrated out. I work within the Standard Model Effective Field Theory (SMEFT) framework and consider the Higgs, neutrino, and hypercharge portals. I show that, for each portal, the forms of the leading dimension-six terms in the low-energy effective theory are fixed and independent of the dynamics in the hidden sector. For the Higgs portal, two independent dimension-six terms are generated, one of which has a sign that, under certain conditions, is fixed by the requirement that the dynamics in the hidden sector be causal and unitary. In the case of the neutrino portal, for a single generation of SM fermions and assuming that the hidden sector does not violate lepton number, a unique dimension-six term is generated, which corresponds to a specific linear combination of operators in the Warsaw basis. For the hypercharge portal, a unique dimension-six term is generated, which again corresponds to a specific linear combination of operators in the Warsaw basis. For both the neutrino and hypercharge portals, under certain conditions, the signs of these terms are fixed by the requirement that the hidden sector be causal and unitary. I perform a global fit of these dimension-six terms to electroweak precision observables, Higgs measurements, and diboson production data and determine the current bounds on their coefficients.

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