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Spontaneous CP violation and a new Higgs doublet below 500 GeV

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It is common practice to study the phenomenology of extended Higgs sectors ad-hoc. This approach becomes much more convincing when the extension is required to address the fundamental puzzles of SM. We show that if CP violation originates from spontaneous symmetry breaking, an additional light Higgs doublet below about 500 GeV is needed, in the framework of minimal renormalizable SO(10). Its flavor-violating couplings are related to proton decay branching ratios. If the high-luminosity LHC and Hyper-Kamiokande can observe these signatures, a hint of minimal SO(10) will emerge in near future.

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