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Search for $pp \rightarrow tt\bar{c}$, $tt\bar{t}$ and $bt\bar{b}$ at the LHC as Probe of Top-changing Extra Higgs Bosons

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Abstract: with the absence of New Physics at the LHC or elsewhere, we argue that a general two Higgs doublet model (g2HDM) with extra Yukawa couplings as the compelling — and accessible — New Physics. The exotic H, A and H^+ bosons should be sub-TeV in mass, but well-hidden from our view so far by 1) fermion mass-mixing hierarchy, 2) alignment (small h(125)-H mixing), and 3) (the mysterious) near-diagonal d-type extra Yukawa coupling matrix. We give a general perspective on search strategies at the LHC, focusing on extra top Yukawa couplings, both top changing and conserving, of the exotic Higgs boson. These couplings connect with electroweak baryogenesis and the electron electric dipole moment, and there is a plethora of other flavor observables. At the LHC, we advocate the $cg \rightarrow tt\bar{c}$, $tt\bar{t}$ and $bt\bar{b}$ production processes, and urge experimental search.

Brief bio: Prof. George Wei-Shu Hou holds an NTU Chair in the Physics Department since 2015. Receiving his Ph.D. at UCLA, he returned to NTU in 1992, after conducting theoretical research in Pittsburgh, Munich and PSI, Switzerland. He then initiated the NTU High Energy Physics experimental group. Recent significant honors are: Academic Award (2010, MOE), Academic Summit Project (2010-2015, NSC/MOST), National Chair (2012-2015, MOE). He became an APS Fellow in 2019.