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LHC Discovery Potential for Non-Standard Higgs Bosons in the 3b Channel

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Abstract:

In a variety of well motivated models, such as two Higgs Doublet Models (2HDMs) and the Minimal Supersymmetric Standard Model (MSSM), there are neutral Higgs bosons that have significantly enhanced couplings to b-quarks and tau leptons in comparison to those of the SM Higgs. These so called non-standard Higgs bosons could be copiously produced at the LHC in association with b quarks, and subsequently decay into b-quark pairs. However, this production channel suffers from large irreducible QCD backgrounds. We propose a new search strategy for non-standard neutral Higgs bosons at the 7 TeV LHC in the 3b's final state topology. We perform a simulation of the signal and backgrounds, using state of the art tools and methods for different sets of selection cuts, and conclude that neutral Higgs bosons with couplings to b-quarks of about 0.3 or larger, and masses up to 400 GeV, could be seen with a luminosity of 30 fb^{-1} . In the case of the MSSM we also discuss the complementarity between the 3b channel and the inclusive tau pair channel in exploring the supersymmetric parameter space.

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