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Discovering a Higgs decaying to four jets in SUSY cascade decays

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The Higgs boson may dominantly decay to 4 light jets through a light pseudo-scalar intermediary: $h \rightarrow 2 \text{ eta} \rightarrow 4j$, making reconstruction at the LHC particularly challenging. We explore the phenomenology of such “Buried Higgs” scenarios in which the primary discovery channel of the Higgs is in cascade decays of superpartners. QCD backgrounds that would otherwise overwhelm the Higgs decay are suppressed by the requirement of high p_T jets and large missing transverse momentum that are the typical signatures of TeV scale supersymmetry. Utilizing jet substructure techniques, we find that for buried Higgses in the 100-120 GeV range, a 5-sigma discovery can be expected with roughly 10-25 inverse fb of data at $E_{CM} = 14$ TeV. For lighter Higgs bosons, the signal is contaminated by hadronically decaying W bosons, and discovery remains an unsolved challenge.

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