High Energy Physics - Phenomenology

F-theory and the LHC: Stau Search

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F-theory GUT models favor a relatively narrow range of soft supersymmetry breaking parameters in the MSSM Lagrangian. This leads to the specific predictions that a 10-100 MeV mass gravitino is the LSP, and the NLSP is quasi-stable, with a lifetime between a second to an hour. In a wide range of parameter space, the NLSP turns out to be a stau, though a bino-like lightest neutralino is also possible. Focusing on F-theory GUTs with a stau NLSP, we study the discovery potential at the LHC for such scenarios. Models with a quasi-stable stau predict a striking signature of a heavy charged particle passing through the detector. As a function of the parameters of minimal F-theory GUTs, we study how many of such events to expect, and additional signatures correlated with the presence of quasi-stable staus. We also study the prospects for staus to become stopped in or near the detector, as well as potential ways to distinguish such models from minimal gauge mediation models with similar spectra.

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