High Energy Physics - Phenomenology

# A Two-Tiered Correlation of Dark Matter with Missing Transverse Energy: Reconstructing the Lightest Supersymmetric Particle Mass at the LHC

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We suggest that non-trivial correlations between the dark matter particle mass and collider based probes of missing transverse energy H_T^miss may facilitate a two tiered approach to the initial discovery of supersymmetry and the subsequent reconstruction of the LSP mass at the LHC. These correlations are demonstrated via extensive Monte Carlo simulation of seventeen benchmark models, each sampled at five distinct LHC center-of-mass beam energies, spanning the parameter space of No-Scale F-SU (5).This construction is defined in turn by the union of the Flipped SU(5) Grand Unified Theory, two pairs of hypothetical TeV scale vector-like supersymmetric multiplets with origins in F-theory, and the dynamically established boundary conditions of No-Scale Supergravity. In addition, we consider a control sample comprised of a standard minimal Supergravity benchmark point. Led by a striking similarity between the H_T^miss distribution and the familiar power spectrum of a black body radiator at various temperatures, we implement a broad empirical fit of our simulation against a Poisson distribution ansatz. We advance the resulting fit as a theoretical blueprint for deducing the mass of the LSP, utilizing only the missing transverse energy in a statistical sampling of >= 9 jet events. Cumulative uncertainties central to the method subsist at a satisfactory 12-15% level. The fact that supersymmetric particle spectrum of No-Scale F-SU(5) has thrived the withering onslaught of early LHC data that is steadily decimating the Constrained Minimal Supersymmetric Standard Model and minimal Supergravity parameter spaces is a prime motivation for augmenting more conventional LSP search methodologies with the presently proposed alternative.

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