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Partially composite supersymmetry

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Supersymmetric models are subject both to direct constraints from collider searches and to indirect limits from electroweak observables such as the Higgs mass and flavor-changing processes. A minimal scenario consistent with current experimental data suggests a supersymmetric spectrum with a split sfermion sector. Such a spectrum can naturally be realized when partial compositeness is used to explain the fermion mass hierarchy and predict the sfermion mass spectrum. We present a model in which the Higgs and third-generation matter superfields are elementary, while the first two generations are composite. Assuming supersymmetry is broken by the strong dynamics, a sfermion mass hierarchy arises that inverts the ordering of the fermion mass hierarchy. Third-generation sfermions are 10-100 TeV, consistent with the observed 125 GeV Higgs boson mass, and the first- and second-generation sfermions are above 100 TeV, ameliorating the flavor problem. Gauginos and Higgsinos are typically $\mathcal{O}(10)$ TeV. The gravitino, in the keV to TeV mass range, is the LSP, providing a warm dark matter candidate. We explore the rich parameter space of the model and discuss benchmark sparticle spectra and their calculation in the gravitational dual theory.

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