High Energy Physics - Phenomenology

# SO(10) SUSY GUTs with mainly axion cold dark matter: implications for cosmology and colliders

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Supersymmetric grand unified theories based on the gauge group SO (10) are highly motivated. In the simplest models, one expects t-b-\tau Yukawa coupling unification, in addition to gauge, matter and Higgs unification. Yukawa unification only occurs with very special GUT scale boundary conditions, leading to a spectra with ~10 TeV first and second generation scalars, TeV-scale third generation scalars, and light gauginos. The relic density of neutralino cold dark matter is calculated to be 10^2-10^4 times higher than observation. If we extend the theory with the PQWW solution to the strong CP problem, then instead a mixture of axions and axinos comprises the dark matter, with the measured abundance. Such a solution solves several cosmological problems. We predict a rather light gluino with m(gluino)~300-500 GeV that should be visible in either Tevatron or forthcoming LHC run 1 data. We would also expect ultimately a positive result from relic axion search experiments.

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