Gravitino DM and a Healthy EDM up to Two Loops in D3/D7 mu-Split SUSY.

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Abstract

We present a phenomenological model which could possibly be obtained as a local Swiss-Cheese Calabi-Yau string-theoretic compactification in the large volume limit with a mobile D3-brane restricted to a nearly special Lagrangian cycle in the Calabi-Yau and fluxed stacks of wrapped D7-branes. The model provides a natural realization of mu-Split SUSY. By explicitly calculating the lifetimes of decays of the co-NLSPs the squarks/sleptons and a neutralino to the LSP the gravitino as well as gravitino decays, we verify that BBN constraints as well as the requirement of the latter to be (more than) the age of the universe, are satisfied. Assuming a non-thermal gravitino production, we estimate the gravitino relic abundance to be around 0.1 by evaluating the neutralino/slepton annihilation cross sections and hence show that the former satisfies the requirement for a dark matter candidate. We also show that it is possible to obtain the electron/neutron EDM "d/e" to two loops to be around $10^{-28} cm$ for diagrams with SM vertices and $10^{-33} cm$ for diagrams with BSM vertices.