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Gravitino DM and a Healthy EDM in D3/D7 mu-Split Supersymmetry

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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 with a high SUSY-breaking scale wherein the gravitino(LSP), squarks, sleptons, gauginos, Higgsino and one Higgs are very heavy and with fine tuning, one is able to obtain a 125-GeV light Higgs. 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 relevant to the former as well as the requirement of the latter to be (more than) the age of the universe, are satisfied. For the purpose of calculation of the gravitino relic density in terms of the neutralino/slepton relic density, we evaluate the former 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.

Primary author: Prof. MISRA, Aalok (Indian Institute of Technology Roorkee)

Co-author: Ms DHURIA, Mansi (Indian Institute of Technology Roorkee)

Presenter: Prof. MISRA, Aalok (Indian Institute of Technology Roorkee)

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