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New 4D EFT from 10D non-Abelian DBI action in magnetic compactifications

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We study a systematic derivation of four dimensional N = 1 supersymmetric effective theory (EFT) from ten dimensional non-Abelian Dirac-Born-Infeld (DBI) action compactified on a six dimensional torus with magnetic fluxes on the D9-branes. We find a new type of matter Kahler metric while gauge kinetic function and superpotential are consistent with previous studies. For the ten dimensional action, we use a symmetrized trace prescription and focus on the bosonic part up to O(F^4). In the presence of the supersymmetry, four dimensional chiral fermions can be obtained via index theorem. The new matter Kahler metric is independent of flavor but depends on the fluxes, 4D dilaton, Kahler moduli and complex structure moduli, and will be always positive definite if an induced RR charge of the D-branes on which matters are living are positive. We read the superpotential from an F-term scalar quartic interaction derived from the ten dimensional action and the contribution of the new matter Kahler metric to the scalar potential which we derive turns out to be consistent with the supergravity formulation.

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