

BPS states of Fourfolds as candidates for Kaluza-Klein modes

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Within the framework of the cosmological theory of the Big Bang, F-theory is represented that unifies all four types of fundamental interactions [1]. Among the most exciting predictions of physics beyond the Standard Model is the assumption of the space of extra dimensions [2] that solves the problem of the hierarchy of interactions. With the presence of this extra dimensions are connected the searches for Kaluza-Klein (KK) partners of gravitons, gauge bosons and microscopic black holes at the Large Hadron Collider (LHC). The theoretical models of the space of extra dimensions are models of Arkani-Hamed, Dimopoulos and Dvali and of Randall, Sundrum. In the framework of F-theory is considered the fourfold [3], as a space of extra dimensions, the choice of which is dictated by the "good" group of holonomy. We study the duality between the F-theory compactified on the K3-surface and $E8 \times E8$ heterotic string compactified on the torus T^2 . The set of BPS states corresponding to the Calabi-Yau fourfolds, which has either an elliptic curve or a K3-fibration as a layer, is studied in the aspect of correspondence to the KK modes of the M-theory on $R^8 \times (S^1 \times S^1 = T^2) \times S^1/Z_2$ [4]. The singularities of the moduli space of the Calabi-Yau fourfold make it possible to observe massive KK modes [5], the masses of which are obtained from the M-theory of supergravity. The result is of interest for a theoretical understanding of the KK modes, the experimental searches for which are carried out at the LHC [6].

REFERENCES

- [1] Cumrun Vafa. Evidence for F-theory. *Nucl. Phys.*, B469: 403–418, 1996.
- [2] Yuri A. Kubyshin. Models with Extra Dimensions and Their Phenomenology. arXiv:hep-ph/0111027v2.
- [3] 3. A. Klemm, B. Lian, S-S. Roan and S-T. Yau. Calabi-Yau fourfolds for M- and F-Theory compactifications. hep-th/9609239.
- [4] 4. Petr Horava, Edward Witten. Heterotic and Type I string dynamics from eleven dimensions. *Nucl. Phys.*, B460: 506–524, 1996.
- [5] Albrecht Klemm, Peter Mayr and Cumrun Vafa. BPS States of Exceptional Non-Critical Strings. hep-th/9607139.
- [6] Lisa Randall. Extra Dimensions and Warped Geometries. *Science*, 296 (5572): 1422–1427, 2002.