

LIST OF PUBLICATIONS

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- [1] A. P. Braun, J. Knapp, E. Scheidegger, H. Skarke and N. -O. Walliser, “PALP - a User Manual,” arXiv:1205.4147 [math.AG], to appear in *Strings, Gauge Fields, and the Geometry Behind - The Legacy of Maximilian Kreuzer*.

Abstract: This article provides a complete user’s guide to version 2.1 of the toric geometry package PALP by Maximilian Kreuzer and others. In particular, previously undocumented applications such as the program nef.x are discussed in detail. New features of PALP 2.1 include an extension of the program mori.x which can now compute Mori cones and intersection rings of arbitrary dimension and can also take specific triangulations of reflexive polytopes as input. Furthermore, the program nef.x is enhanced by an option that allows the user to enter reflexive Gorenstein cones as input. The present documentation is complemented by a Wiki which is available online.

- [2] A. P. Braun, N. Johansson, M. Larfors, N. -O. Walliser, *Restrictions on infinite sequences of type IIB vacua*, JHEP **1110** (2011) 091. [arXiv:1108.1394 [hep-th]].

Abstract: Ashok and Douglas have shown that infinite sequences of type IIB flux vacua with imaginary self-dual flux can only occur in so-called D-limits, corresponding to singular points in complex structure moduli space. In this work we refine this no-go result by demonstrating that there are no infinite sequences accumulating to the large complex structure point of a certain class of one-parameter Calabi–Yau manifolds. We perform a similar analysis for conifold points and for the decoupling limit, obtaining identical results. Furthermore, we establish the absence of infinite sequences in a D-limit corresponding to the large complex structure limit of a two-parameter Calabi-Yau. In particular, our results demonstrate analytically that the series of vacua recently discovered by Ahlqvist et al., seemingly accumulating to the large complex structure point, are finite. We perform a numerical study of these series close to the large complex structure point using appropriate approximations for the period functions. This analysis reveals that the series bounce out from the large complex structure point, and that the flux eventually ceases to be imaginary self-dual. Finally, we study D-limits for F-theory compactifications on $K3 \times K3$ for which the finiteness of supersymmetric vacua is already established. We do find infinite sequences of flux vacua which are, however, identified by automorphisms of $K3$.

- [3] A. P. Braun, N.-O. Walliser, *A new offspring of PALP*, [arXiv:1106.4529 [math.AG]], submitted to *Comput. Phys. Comm.*

Abstract: We describe the C program mori.x. It is part of PALP, a package for analyzing lattice polytopes. Its main purpose is the construction and analysis of three-dimensional smooth Calabi–Yau hypersurfaces in toric varieties. The ambient toric varieties are given in terms of fans over the facets of reflexive lattice polytopes. The program performs crepant star triangulations of reflexive polytopes and determines the Mori cones of the resulting toric varieties. Furthermore, it computes the intersection rings and characteristic classes of hypersurfaces.

- [4] J. Knapp, M. Kreuzer, C. Mayrhofer, N.-O. Walliser, *Toric construction of global F-theory GUTs*, JHEP **1103** (2011) 138. [arXiv:1101.4908 [hep-th]].

Abstract: We systematically construct a large number of compact Calabi-Yau fourfolds which are suitable for F-theory model building. These elliptically fibered Calabi-Yaus are complete intersections of two hypersurfaces in a six dimensional ambient space. We first construct three-dimensional base manifolds that are hypersurfaces in a toric ambient space. We search for divisors which can support an F-theory GUT. The fourfolds are obtained as elliptic fibrations over these base manifolds. We find that elementary conditions which are motivated by F-theory GUTs lead to strong constraints on the geometry, which significantly reduce the number of suitable models. The complete database of models is available at this http URL We work out several examples in more detail.

- [5] N.-O. Walliser, *On Large Volume moduli stabilization in IIB Orientifolds*, Ukrainian Journal of Physics 2010, Vol. **55**, N 5, p. 481-486.

Abstract: I present a brief introduction to the construction of explicit type IIB orientifold compactifications and summarize the “Large Volume Scenario” on compact four-modulus Calabi-Yau manifolds. I discuss the relevance of this kind of setups for the physical MSSM-like model building and gravitational cosmology. These notes are based on my talk at the ‘Bogolyubov Kyiv Conference 2009’ on ‘Modern Problems of Theoretical and Mathematical Physics’.

- [6] A. Collinucci, M. Kreuzer, C. Mayrhofer and N.-O. Walliser, *Four-modulus 'Swiss cheese' chiral models*, JHEP **0907** (2009) 074. [arXiv:0811.4599 [hep-th]].

Abstract: We study the 'Large Volume Scenario' on explicit, new, compact, four-modulus Calabi-Yau manifolds. We pay special attention to the chirality problem pointed out by Blumenhagen, Moster and Plauschinn. Namely, we thoroughly analyze the possibility of generating neutral, non-perturbative superpotentials from Euclidean D3-branes in the presence of chirally intersecting D7-branes. We find that taking proper account of the Freed-Witten anomaly on non-spin cycles and of the Kaehler cone conditions imposes severe constraints on the models. Nevertheless, we are able to create setups where the constraints are solved, and up to three moduli are stabilized.