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Superconformal Compactifications in Weighted Projective Space

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Abstract. We discuss some aspects of string vacua constructed from orbifolded nonminimal Landau–Ginzburg theories which correspond to Calabi–Yau manifolds in weighted projective space. In contrast to previous expectations, we find that these theories allow for the construction of numerous stable $(2,0)$ Calabi–Yau vacua (most of which are not simply deformations of an underlying $(2,2)$ theory) thus indicating that this phenomenologically promising sector of the space of classical vacua is quite robust. We briefly discuss methods for extracting the phenomenology of these models and show, for example, that the full renormalizable superpotential of our $SU(5)$ theories is not corrected by world sheet instantons and is thus given exactly by its tree-level value.

1. Introduction

The initial attempts at constructing four dimensional string theories stressed a geometric interpretation [1,2] for the extra degrees of freedom required by the demands of an underlying superconformal symmetry. It was found that six dimensions should be compactified on a complex threefold with vanishing Ricci tensor. This tether to geometry was gradually slackened by a number of groups [3–7] whose work emphasized that so long as the extra degrees of freedom meet the demands of conformal symmetry, there is no need for them to admit a geometric interpretation. In particular, any unitary $c = 9$, $N = 2$ superconformal theory may be chosen for the internal degrees of freedom for a four dimensional superstring theory. A general method of converting such a superstring theory into a heterotic string theory was given in [7]. This philosophy was pursued further in [8], with the emphasis on using the simplest nontrivial $N = 2$ theories: the minimal models. The surprising observation of [8] is the unexpected *reemergence* of geometry: numerous correspondences between detailed properties of the minimal model

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