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# (2, 2)-Superconformal Field Theories near Orbifold Points

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**Abstract.** A thorough analysis of the "blowing-up" modes of the $\mathbb{Z}_6$-orbifold based on the Lie algebra $A_2 \oplus D_4$ is presented. We discover that the descriptions of these modes in the language of superconformal field theory and Calabi-Yau compactification are not immediately in agreement. A solution to this apparent inconsistency is offered which leads to the possibility of differentiably distinct Calabi-Yau manifolds giving isomorphic physics.

## 1. Introduction

The fact that the superstring can propagate in ten-dimensional flat space-time led early models for superstring physics to be based on a ten-dimensional space globally of the form $M_4 \times K$, where $K$ is a compact space of 6 dimensions. With this assumption, and many more, it was shown in [1] that, in order to have an unbroken $N=1$ space-time supersymmetry, $K$ must be a complex 3-fold with Kähler metric and vanishing Ricci-curvature. Manifolds admitting such a structure (i.e., Kähler manifolds with trivial canonical class) are known usually as Calabi-Yau manifolds. Superstrings can also propagate on compactification spaces with suitably mild singularities such as orbifolds [8] and therefore it seems appropriate to use a slightly wider class of spaces as candidates for $K$. In the following we will use C–Y to denote this class of algebraic varieties possibly with singularities which may be blown up to give a smooth Calabi-Yau manifold.

A more general approach than the above ten-dimensional view is to take a superconformal field theory (SCFT) to model the compactification process. SCFTs are characterized by a central charge $\hat{c}$ giving operator products for the stress-energy tensor

$$T_B(z_1)T_B(z_2) \sim \frac{\frac{3}{4}\hat{c}}{(z_1-z_2)^4} + \frac{2}{(z_1-z_2)^2}T_B(z_2) + \frac{1}{(z_1-z_2)}\partial_2 T_B(z_2). \tag{1}$$
$$\vdots$$

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