Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Aspects of T-dually extended Superspaces

By

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The thesis is divided into three main parts where we show various applications of the T-dually extended superspaces.

In the first part we reformulate the manifestly T-dual description of the massless sector of the closed bosonic string, directly from the geometry associated with the (left and right) affine Lie algebra of the coset space Poincaré/Lorentz. This construction initially doubles not only the coordinates for translations but also those for Lorentz transformations. As a result, the Lorentz connection couples directly to the string. This reproduces the old definition of T-dual torsion and gives a general, covariant definition of T-dual curvature.

In the second part we give the manifestly T-dual formulation of the massless sector of the classical 3D Type II superstring in off-shell 3D $\mathcal{N} = 2$ superspace, including the action. It has a simple relation to the known superspace of 4D $\mathcal{N} = 1$ supergravity in 4D M-theory via 5D F-theory. The pre-potential appears as part of the vielbein, without derivatives.

In the last and the most involved part we found the pre-potential in the superspace with $AdS_5 \times S^5$ background. The pre-potential appears as part of the vielbeins, without derivatives. In both subspaces (AdS_5 and S^5) we used Poincaré coordinates. We picked one bulk coordinate in AdS_5 and one bulk coordinate in S^5 to define the space-cone gauge. Such space-cone gauge destroys the bulk Lorentz covariance. It still preserves boundary Lorentz covariance and so symmetries of boundary CFT are manifest.

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