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Worldsheet boundary conditions in non-Abelian T-dual sigma models with the AdS_2 metric

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Abstract

We show that the AdS_2 metric in the presence of a Maxwell field together with a constant dilaton field satisfies the equations of motion of the heterotic string theory. Then, by applying non-Abelian T-duality (here, Poisson-Lie T-duality on a semi-Abelian double), a non-Abelian dual pair for the AdS_2 metric is constructed. By using a certain parametrization of the two-dimensional non-Abelian Lie group A_2 we construct the original sigma model, which includes the AdS_2 metric in the absence of a B-field. It is shown that the dual background constructed by means of the Poisson-Lie T-duality is supported by a B-field and a metric that contains a true singularity. By examining the behavior of the dual metric in the region $r=0$, it is shown that the metric along with a non-trivial dilaton field and an appropriate Maxwell field satisfy the equations of motion of the heterotic string theory for very small r . Most interestingly, for large r , the dual metric approaches the asymptotic solution; in fact, the dual metric is asymptotically AdS_2 . Finally, we discuss D-branes and the worldsheet boundary conditions defined by a gluing matrix on the AdS_2 sigma model. Using the duality map obtained from the canonical transformation description of the Poisson-Lie T-duality for the gluing matrix, which locally defines the properties of the D-brane, we find three different cases of the gluing matrices for the AdS_2 sigma model and its dual pair.

Keywords: AdS_2 metric, Sigma model, String duality, Worldsheet boundary conditions, D-brane

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