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High Energy Physics - Theory

Enhanced Gauge Groups in N=4 Topological Amplitudes and Lorentzian Borcherds Algebras

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(Submitted on 12 Jul 2011)

We continue our study of algebraic properties of N=4 topological amplitudes in heterotic string theory compactified on T^2, initiated in arXiv:1102.1821. In this work we evaluate a particular one-loop amplitude for any enhanced gauge group h \subset e_8 + e_8, i.e. for arbitrary choice of Wilson line moduli. We show that a certain analytic part of the result has an infinite product representation, where the product is taken over the positive roots of a Lorentzian Kac-Moody algebra g^{++}. The latter is obtained through double extension of the complement g= (e_8 + e_8)/h. The infinite product is automorphic with respect to a finite index subgroup of the full T-duality group SO(2,18;Z) and, through the philosophy of Borcherds-Gritsenko-Nikulin, this defines the denominator formula of a generalized Kac-Moody algebra G(g^{++}), which is an 'automorphic correction' of g^{++}. We explicitly give the root multiplicities of G(g^{++}) for a number of examples.

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