Commun. Math. Phys. 182, 1 – 32 (1996)

Communications in Mathematical Physics

Global Aspects of Gauged Wess–Zumino–Witten Models

Kentaro Hori

Institute of Physics, University of Tokyo, Meguroku, Tokyo 153, Japan.
E-mail address: hori@danjuro.phys.s.u-tokyo.ac.jp

Received: 4 August 1994/Accepted: 20 December 1995

Abstract: A study of the gauged Wess–Zumino–Witten models is given focusing on the effect of topologically non-trivial configurations of gauge fields. A correlation function is expressed as an integral over a moduli space of holomorphic bundles with quasi-parabolic structure. Two actions of the fundamental group of the gauge group is defined: One on the space of gauge invariant local fields and the other on the moduli spaces. Applying these in the integral expression, we obtain a certain identity which relates correlation functions for configurations of different topologies. It gives an important information on the topological sum for the partition and correlation functions.

1. Introduction

The gauged Wess–Zumino–Witten model in two dimensions has two different aspects of interest. On the one hand, it is an exactly soluble quantum gauge theory and is interesting from the point of view of geometry of gauge fields. On the other hand, it is a conformally invariant quantum field theory (CFT): There are observations [1–5] that a wide class of solved CFTs such as unitary minimal models (bosonic [6] or supersymmetric [7]), parafermionic models [8], etc. are realized by gauged WZW models as lagrange field theories, up to a subtle point of field identification which will be addressed shortly.

In this paper, we focus on the former, the geometric aspects of the theory and propose a method to take into account the topologically non-trivial configurations of gauge fields. Then, we get an identity which shows that incorporation of non-trivial topology solves the problem of field identification, and which is therefore of vital importance from the point of view of the model building of CFTs.

A gauged WZW model is specified by a choice of the target group G, the gauge group H, and the level k. We concentrate on the case in which G is a compact, connected and simply connected Lie group and H is a connected, closed subgroup