

Bases on Multipunctured Riemann Surfaces and Interacting Strings Amplitudes

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Abstract. The Krichever-Novikov bases are studied on Riemann surfaces with more-than-two punctures. The bases are presented and the completeness theorem is proven for the case of integer (up to a common constant) momenta. Then the interacting strings are considered, the amplitudes and partition functions are obtained, comparable with that of path-integral approach. For the amplitudes the simple geometric implication is proposed.

Introduction

The works [1, 2] of Novikov and Krichever stimulated an interest in the global operator expansions on Riemann surfaces of arbitrary genus. Originally KN considered the bases on these surfaces with two marked points. Physically it corresponds to a single self-interacting string at the perturbation theory order, equal to genus. In [8, 9] some attempts are presented to generalise the constructions of [1, 2] to the multi-point case. The work [10] concerns representations of Heisenberg-type KN algebra.

In their recent articles [3, 4] Krichever and Novikov applied the bases of [1, 2] to the operator quantization of the self-interacting string to obtain the amplitude and the partition function. The canonical operator product expansions of CFT were rederived using the well-defined quantities.

Our main goal in this paper is to generalise the results of [1–4] to obtain the multistrings quantization. We will get the correct tensor bases, the quantum state vectors and, finally, the scattering amplitudes, which turn out to be the generalised Kobo-Nielsen ones, obtained earlier in Polyakov's theory [7]. It is proven thus that the Krichever-Novikov operator quantization does lead to correct effects.

Moreover, this approach makes more transparent the geometric essence of bosonic amplitudes. These are simply related to the “Euclidean time” coordinates, intrinsic to KN theory.