Vertex Operators of Quantum Affine Lie Algebras $U_q(D_n^{(1)})$

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Abstract: We give an explicit formula for the vertex operators related to the level 1 representations of the quantum affine Lie algebras $U_q(D_n^{(1)})$ in terms of bosons. As an application, we derive an integral formula for the correlation functions of the vertex models with $U_q(D_n^{(1)})$-symmetry.

1. Introduction

In [FR], Frenkel and Reshetikhin constructed a q-analogue of the WZW model on the sphere based on the representation theory of the quantum affine Lie algebras. They defined q-deformed chiral vertex operators as intertwining operators between representations of certain types and derived a system of difference equations called the *quantum Knizhnik–Zamolodchikov equations*, which is satisfied by the vacuum expectation value of compositions of q-vertex operators. They also observed that the connection matrices between the solutions of quantum Knizhnik–Zamolodchikov equations with different asymptotics provide elliptic solutions of the Yang–Baxter equations in the face formulation. It shows that the above theory is very closely related to the solvable lattice model theory. The q-vertex operators are characterized by the intertwining conditions, however, it is difficult to know explicit forms for them in general. In [JMMN], the bosonization of the level 1 vertex operators for $U_q(\widehat{sl}_2)$ was constructed using the Frenkel–Jing construction of level 1 irreducible highest weight modules. Following [JMMN], the level 1 case for $U_q(\widehat{sl}_n)$ was done in [Ko]. For general levels for $U_q(\widehat{sl}_2)$, the bosonization of vertex operators was constructed in [KSQ] and in [M] using a q-deformation of Wakimoto modules. The main purpose of this article is to give an explicit formula for the level 1 vertex operators related to $U_q(D_n^{(1)})$.