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Hidden $U_q(sl(2)) \otimes U_q(sl(2))$ Quantum Group Symmetry in Two Dimensional Gravity*

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Abstract: In a previous paper, the quantum-group-covariant chiral vertex operators in the spin 1/2 representation were shown to act, by braiding with the other covariant primaries, as generators of the well known $U_q(sl(2))$ quantum group symmetry (for a single screening charge). Here, this structure is transformed to the Bloch wave/Coulomb gas operator basis, thereby establishing for the first time its quantum group symmetry properties. A $U_q(sl(2)) \otimes U_q(sl(2))$ symmetry of a novel type emerges: The two Cartan-generator eigenvalues are specified by the choice of matrix element (bra/ket Verma-modules); the two Casimir eigenvalues are equal and specified by the Virasoro weight of the vertex operator considered; the co-product is defined with a matching condition dictated by the Hilbert space structure of the operator product. This hidden symmetry possesses a novel Hopf-like structure compatible with these conditions. At roots of unity it gives the right truncation. Its (non-linear) connection with the $U_q(sl(2))$ previously discussed is disentangled.

1. Introduction

Quantum integrability as we know it is essentially synonymous to the concept of R matrix and Yang-Baxter relations. While it is not known whether the latter always possess a group-theoretical interpretation, it is widely believed that this is true at least for the subclass of conformal integrable systems; well-known examples are given by the minimal models, the WZW models and Liouville/Toda theory, where the underlying symmetries are indeed known to be given by quantum groups [1–3]. However, in spite of extensive studies [4–6] our understanding of the quantum group symmetry in these

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