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REMARK ON THE INTEGRALS OF MOTION ASSOCIATED WITH LEVEL k REALIZATION OF THE ELLIPTIC ALGEBRA $U_{q,p}(\widehat{\mathfrak{sl}_2})$ *

TAKEO KOJIMA and JUN'ICHI SHIRAISHI†

Department of Mathematics, College of Science and Technology, Nihon University Surugadai, Chiyoda-ku, Tokyo 101-0062, Japan

†*Graduate School of Mathematical Science, University of Tokyo Komaba, Megro-ku, Tokyo, 153-8914, Japan*

Abstract. We give one parameter deformation of level k free field realization of the screening current of the elliptic algebra $U_{q,p}(\widehat{\mathfrak{sl}_2})$. By means of these free field realizations, we construct infinitely many commutative operators, which are called the nonlocal integrals of motion associated with the elliptic algebra $U_{q,p}(\widehat{\mathfrak{sl}_2})$ for level k. They are given as integrals involving a product of the screening current and elliptic theta functions. This paper give level k generalization of the nonlocal integrals of motion given in [1].

1. Introduction

One of the results in Bazhanov, Lukyanov and Zamolodchikov [4] is construction of field theoretical analogue of the commuting transfer matrix $\mathbf{T}(z)$, acting on the highest weight representation of the Virasoro algebra. Their commuting transfer matrix $\mathbf{T}(z)$ is the trace of the image of the universal R-matrix associated with the quantum affine symmetry $U_q(\widehat{\mathfrak{sl}_2})$. This construction is very simple and the commutativity $[\mathbf{T}(z), \mathbf{T}(w)] = 0$ is direct consequence of the Yang-Baxter equation. They call the coefficients of the Taylor expansion of $\mathbf{T}(z)$ the nonlocal integrals of motion. The higher-rank generalization of [4] is considered in [5, 6]. The elliptic deformation of the nonlocal integrals of motion is considered in [1]. Bazhanov, Lukyanov and Zamolodchikov [4] constructed the continuous transfer matrix $\mathbf{T}(z)$ by taking the trace of the image of the universal R-matrix associated with $U_q(\widehat{\mathfrak{sl}_2})$.

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