Feigin, B.; Jimbo, M.; Mukhin, E.
Combinatorics of vertex operators and deformed $W$-algebra of type $D(2,1;\alpha)$.
(English)

Zbl 07534679
Adv. Math. 403, Article ID 108331, 54 p. (2022)

Summary: We consider sets of screening operators with fermionic screening currents. We study sums of vertex operators which formally commute with the screening operators assuming that each vertex operator has rational contractions with all screening currents with only simple poles. We develop and use the method of $q_q$-characters which are combinatorial objects described in terms of deformed Cartan matrix. We show that each $q_q$-character gives rise to a sum of vertex operators commuting with screening operators and describe ways to understand the sum in the case it is infinite.

We discuss combinatorics of the $q_q$-characters and their relation to the $q$-characters of representations of quantum groups.

We provide a number of explicit examples of the $q_q$-characters with the emphasis on the case of $D(2,1;\alpha)$.

We describe a relationship of the examples to various integrals of motion.

MSC:
17Bxx Lie algebras and Lie superalgebras
81Rxx Groups and algebras in quantum theory
81Txx Quantum field theory; related classical field theories

Keywords:
$q_q$-characters; $q$-characters; vertex operators; screening operators

Full Text: DOI

References:

[1] Awata, H.; Kubo, H.; Odake, S.; Shiraiishi, J., Quantum $\mathfrak{W}_N$ algebras and Macdonald polynomials. Commun. Math. Phys., 179, 2, 401-416 (1996) · Zbl 0873.17016
[2] Bazhanov, V.; Lukyanov, S., Integrable structure of quantum field theory: classical flat connections versus quantum stationary states, J. High Energy Phys., 1409, Article 147 pp. (2014), front matter+67 pp. · Zbl 1333.81193
[3] Bezerra, L.; Mukhin, E., Braid actions on quantum toroidal superalgebras, 25 pp. · Zbl 07373700
[4] Chari, V., Minimal affinizations of representations of quantum groups: the rank 2 ASE, Publ. Res. Inst. Math. Sci., 31, 5, 873-911 (1995) · Zbl 0855.17010
[5] Feigin, B.; Jimbo, M.; Miwa, T.; Mukhin, E., Finite type modules and Bethe ansatz for the quantum toroidal $\mathfrak{W}$, Commun. Math. Phys., 356, 1, 285-327 (2017) · Zbl 1425.17020
[6] Feigin, B.; Jimbo, M.; Miwa, T.; Mukhin, E., Finite type modules and Bethe Ansatz equations, Ann. Henri Poincaré, 18, 8, 2543-2579 (2017) · Zbl 1407.82019
[7] Feigin, B.; Jimbo, M.; Mukhin, E., Towards trigonometric deformation of $(\mathfrak{w} \mathfrak{sl}_n)$ coset VOA, J. Math. Phys., 60, 7, Article 073507 pp. (2019), 17 pp. · Zbl 1416.81093
[8] Feigin, B.; Jimbo, M.; Mukhin, E., Integrals of motion from quantum toroidal algebras, J. Phys. A, Math. Theor., 50, 46, Article 464001 pp. (2017), 28 pp. · Zbl 1386.20037
[9] Feigin, B.; Jimbo, M.; Mukhin, E.; Vilkovisky, I., Deformations of $(\mathfrak{w} \mathfrak{sl}_n)$ algebras via quantum toroidal algebras, Selecta Math., 27, 52 (2021), 62 pp. · Zbl 1481.17022
[10] Feigin, B.; Kojima, T.; Shiraishi, J.; Watanabe, H., The integrals of motion for the deformed $(\mathfrak{w} \mathfrak{sl}_n)$ algebra $(\mathfrak{w}_{q,t} \mathfrak{sl}_n)$, J. Math. Phys., 52, 4 (2021), Article 435001 pp. (2021), 27 pp. · Zbl 1481.81093
[11] Frenkel, E.; Mukhin, E., Combinatorics of $q$-characters of finite-dimensional representations of quantum affine algebras, Commun. Math. Phys., 216, 1, 29-56 (2001) · Zbl 1051.17013
[12] Frenkel, E.; Reshetikhin, N., Deformations of W-algebras associated to simple Lie algebras, Commun. Math. Phys., 197, 1, 1-32 (1998) · Zbl 0939.17011
[13] Frenkel, E.; Reshetikhin, N., The $q$-characters of representations of quantum affine algebras and deformations of W-algebras, (Contemp. Math., vol. 248 (1999), Amer. Math. Soc.: Amer. Math. Soc. Providence, RI), 163-205 · Zbl 0973.17015
[14] Heckenberger, I.; Spill, F.; Torrielli, A.; Yamane, H., Drinfeld second realization of the quantum affine superalgebras of $D$
\((\{\} - \{(1,1)\{(2,1; x)\})\) via the Weyl groupoid, RIMS Kôkyûroku Bessatsu, B8, 171-216 (2008) - Zbl 1175.17005

[15] Kac, V., Infinite Dimensional Lie Algebras (1990), Cambridge University Press: Cambridge University Press Cambridge - Zbl 0716.17022

[16] Kimura, T.; Pestun, V., Quiver W-algebras, Lett. Math. Phys., 108, 1351-1381 (2018) - Zbl 1388.81850

[17] Kimura, T.; Pestun, V., Fractional quiver W-algebras, Lett. Math. Phys., 108, 11, 2425-2451 (2018) - Zbl 1402.81245

[18] Nekrasov, N., BPS/CFT correspondence: non-perturbative Dyson-Schwinger equations and qq-characters, J. High Energy Phys., 1603, Article 181 pp. (2016) - Zbl 1388.81872

[19] Van der Jeugt, J., Irreducible representations of the exceptional Lie superalgebras D \((\{2,1; \alpha)\)\), J. Math. Phys., 26, 5, 913-924 (1985) - Zbl 0604.17001

[20] Yamane, H., On defining relations of affine Lie superalgebras and affine quantized universal enveloping superalgebras, Publ. RIMS, Kyoto Univ., 35, 321-390 (1999) - Zbl 0987.17007

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.