

Havlíček, M.; Pošta, S.

On the classification of irreducible finite-dimensional representations of  $U'_q(\mathfrak{so}_3)$  algebra.

(English) [Zbl 1032.17022](#)

J. Math. Phys. 42, No. 1, 472-500 (2001).

Summary: In an earlier work [*M. Havlíček, A. U. Klimyk and S. Posta*, J. Math. Phys. 40, 2135-2161 (1999; [Zbl 0959.17015](#))] we defined for any finite dimension five nonequivalent irreducible representations of the nonstandard deformation  $U'_q(\mathfrak{so}_3)$  of the Lie algebra  $\mathfrak{so}_2$  where  $q$  is not a root of unity [for each dimension only one of them (called classical) admits limit  $q \rightarrow 1$ ]. In the first part of this paper we show that any finite-dimensional irreducible representation is equivalent to some of these representations. In the case  $q^n = 1$  we derive new Casimir elements of  $U'_q(\mathfrak{so}_3)$  and show that the dimension of any irreducible representation is not higher than  $n$ . These elements are Casimir elements of  $U'_q(\mathfrak{so}_m)$  for all  $m$  and even of  $U_q(\mathfrak{iso}_{m+1})$  due to Inönü-Wigner contraction. According to the spectrum of one of the generators, the representations are found to belong to two main disjoint sets. We give a full classification and explicit formulas for all representations from the first set (we call them nonsingular representations). If  $n$  is odd, we have a full classification also for the remaining singular case with the exception of a finite number of representations.

**MSC:**

**17B37** Quantum groups (quantized enveloping algebras) and related deformations

**81R50** Quantum groups and related algebraic methods applied to problems in quantum theory

Cited in **1** Review  
Cited in **13** Documents

**Keywords:**

nonstandard deformation; Lie algebra; finite-dimensional irreducible representation; Casimir elements; Inönü-Wigner contraction

**Full Text:** [DOI](#)

**References:**

- [1] DOI: 10.1007/BF00420371 · [Zbl 0735.17020](#) · doi:10.1007/BF00420371
- [2] Nelson J. E., Commun. Math. Phys. 141 pp 211– (1991) · [Zbl 0746.53062](#) · doi:10.1007/BF02100010
- [3] Havlíček M., J. Math. Phys. 40 pp 2135– (1999) · [Zbl 0959.17015](#) · doi:10.1063/1.532856
- [4] Havlíček M., Czech. J. Phys. 50 pp 79– (2000) · [Zbl 0977.22005](#) · doi:10.1023/A:1022825031633
- [5] Samoilenko Y., Quantum Groups and Quantum Spaces 40 pp 21– (1997)

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