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The $SO_q(N)$-approach to the q-deformation of the free-particle description

Erhardt Papp* and Codruţa Micu**

Abstract

Proofs have been given that non-commutative geometry and differential calculus can be joined together by invoking an underlying quantum-group symetry. Choosing the quantum group $SO_q(N)$, we then have to proceed by using the corresponding R-matrix solution to the parameter dependent Yang-Baxter equation. This results in a non-trivial q-deformation of the Laplacian acting on the N-dimensional non-comutative quantum Euclidian-space R^N_q. Surprisingly enough, the radial reduction of the covariant derivative implied in this manner reproduces the q-difference derivative presented long ago by Jackson. This opens the way to derive nontrivial q-deformations of the eigenvalues of the second-order Casimirs of $SO_q(N)$. The representation-dependence of q-deformed eigenvalues reffered to above is also discussed in some more detail. The free particle can then be treated in terms of q-Jackson-Bessel functions.