TWISTING POINCARÉ ALGEBRAS ‡

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Abstract

We consider the twisting of the Hopf structure for the classical enveloping algebra $U(\hat{g})$, where $\hat{g}$ is the inhomogenous rotation algebra, with explicit formulas given for the $D = 4$ Poincaré algebra ($\hat{g} = \mathcal{P}_4$). We show that the quantum deformation of the Poincaré algebra recently proposed by Chaichian and Demiczev is a twisted classical Poincaré algebra. The interpretation of the twisted Poincaré algebra as describing relativistic symmetries with clustered 2-particle states is proposed.

1. INTRODUCTION

Let us consider the Poincaré algebra $\mathcal{P}_4$ with the generators $\hat{g} = (P_\mu, M_{\mu\nu})$ as a classical Hopf algebra. We supplement the well-known algebraic relations

$$[M_{\mu\nu}, M_{\rho\tau}] = i(g_{\mu\tau}M_{\nu\rho} - g_{\nu\tau}M_{\mu\rho} + g_{\nu\rho}M_{\mu\tau} - g_{\mu\rho}M_{\nu\tau}) ,$$

$$[M_{\mu\nu}, P_\rho] = i(g_{\nu\rho}P_\mu - g_{\mu\rho}P_\nu) , \qquad [P_\mu, P_\nu] = 0 \tag{1.1}$$

by the "primitive " coproduct relations

$$\Delta_0(M_{\mu\nu}) = M_{\mu\nu} \otimes 1 + 1 \otimes M_{\mu\nu} , \qquad \Delta_0(P_\mu) = P_\mu \otimes 1 + 1 \otimes P_\mu \tag{1.2}$$

and the antipode $S_0(\hat{g}) = -\hat{g}$ $(\hat{g} \in \mathcal{P}_4)$. The relations (1.1) imply that (1.1), (1.2)

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