Abstract

In this talk, we discuss in detail how one can obtain a 2-parameter family of unitarily equivalent irreducible representations of the triply extended group $G_{\rm NC}$ of translations of \mathbb{R}^4 associated with a family of its 4-dimensional coadjoint orbits. We, in turn, show how a continuous 2-parameter family of gauge potentials emerges from these unitarily equivalent irreducible representations. It follows that the Landau and the symmetric gauges of noncommutative quantum mechanics, widely used in the literature, in fact, belong to this 2-parameter family of gauges. We also provide an explicit construction of noncommutative 4-tori and compute the associated star products using the unitary dual of the group $G_{\rm NC}$ that was studied at length in an earlier paper [S. H. H. Chowdhury and S. T. Ali, J. Phys. A: Math. Theor. 47, 085301 (2014)]. Finally, we construct projective modules over such noncommutative 4-tori and compute constant curvature connections on them using Rieffel's method.