

Wigner functions for gauge equivalence classes of unitary irreducible representations of noncommutative quantum mechanics

ABSTRACT

While Wigner functions forming phase space representation of quantum states is a well-known fact, their construction for noncommutative quantum mechanics (NCQM) remains relatively lesser known, in particular with respect to gauge dependencies. This paper deals with the construction of Wigner functions of NCQM for a system of 2-degrees of freedom using 2-parameter families of gauge equivalence classes of unitary irreducible representations (UIRs) of the Lie group G_{NC} which has been identified as the kinematical symmetry group of NCQM in an earlier paper. This general construction of Wigner functions for NCQM, in turn, yields the special cases of Landau and symmetric gauges of NCQM.

Keyword: Non-commutative quantum mechanics (NCQM); Unitary irreducible representations (UIRs)